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Implementation of Floating Weir System for Surface Skimming of Temporary Stormwater Ponds

Joel Toso, Principal Investigator
Wenck Associates, Inc.

May 2014

Research Project
Final Report 2014-18

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16. Abstract (Limit: 250 words)

This study provides design information for temporary stormwater ponds with floating head skimmers. The purpose of the ponds is to remove suspended sediment and nutrient loads from stormwater runoff on active construction sites. The design information is directed at meeting the standards in the National Pollution Discharge Elimination System (NPDES) general permit which includes storing runoff from the 2-year, 24-hour rainfall event or providing the equivalent sediment control. The study results include:

- Research of currently available floating head skimmers,
- Estimation of runoff hydrology and hydraulics from active constructions sites using HydroCAD,
- Estimation of water quality improvements using P8, and
- Design plans.

The study shows several available technologies for pond skimming. The pond and skimmer design manages a 2-year, 24-hour rainfall event while removing an average of 80 percent of total suspended solids (TSS) from runoff. Smaller systems do not operate equivalently without additional treatment such as adding flocculants. Plans, maintenance requirements, and special provisions are included.

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Final Report

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TABLE OF CONTENTS

Contents

EXECUTIVE SUMMARY

This study provides design information for temporary stormwater ponds with floating head skimmers. The purpose of the ponds is to remove suspended sediment and nutrient loads from stormwater runoff on active construction sites. The design information is directed at meeting the standards in the National Pollution Discharge Elimination System (NPDES) general permit which includes storing runoff from the 2-year, 24-hour rainfall event or providing the equivalent sediment control.[1] The study results include:

- Research of currently available floating head skimmers,
- Estimation of runoff hydrology and hydraulics from active constructions sites using HydroCAD,
- Estimation of water quality improvements using P8, and
- Design plans.

The study shows several available technologies for pond skimming. The pond and skimmer design manages a 2-year, 24-hour rainfall event while removing an average of 80 percent of total suspended solids (TSS) from runoff. Smaller systems do not operate equivalently without additional treatment such as adding flocculants. Plans, maintenance requirements, and special provisions are included.

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Purpose and Scope

The purpose of this study is to provide design information for temporary stormwater ponds with floating head skimmers to remove suspended sediment and nutrient loads from stormwater runoff on active construction sites. The design information is directed at meeting the standards in the National Pollution Discharge Elimination System (NPDES) general permit which includes storing runoff from the 2-year, 24-hour rainfall event or providing equivalent sediment controls.[1] These items are outlined in more detail in Section III.C of the Minnesota General Permit MN R100001 and apply to watersheds of 5 acres or more draining to one location that discharges to a protected water or watershed of 10 acres or more draining to the same location in all other scenarios. [1] The study explores a defined set of basin sizes, watershed sizes, retention times, soil types, and alternate configurations. These parameters are used to investigate rate control and pollutant removal efficiency in stormwater ponds with skimmers.

The results of the investigation were used to develop a standard set of plans and a general Stormwater Pollution Prevention Plan (SWPPP) directed at meeting the requirements of the NPDES general permit and local watershed management organizations. The plan set and SWPPP will be used by the Minnesota Department of Transportation (MnDOT) for pollution control on active construction sites throughout the state.

1.2 Framework

The study includes research of currently available floating head skimmers for use by MnDOT. Each skimmer type varies greatly in application. A rating curve was created to determine the theoretical effluent rate from various skimmer sizes. The rating curve found that most skimmers provide a constant effluent rate which is restricted by outlet orifice or pipe size. Figure 1 of Appendix B is a sample rating curve used in this evaluation.

Based on the available technology and calculated rating curve, computer models were developed to evaluate the basin and skimmer hydrology and water quality improvement. The hydrology and hydraulics of runoff from active constructions sites was predicted and evaluated using HydroCAD. P8 was used to model the water quality. HydroCAD is a widely used modeling tool for the evaluation and design of stormwater systems. P8 is a useful diagnostic tool for evaluating water quality benefits of various watershed improvements. Both models require user input on watershed characteristics, infrastructure dimensions, and precipitation. HydroCAD was used to design the required pond dimensions. These were then used as input parameters to the P8 model. The modeling results estimate the water quality improvements that can be expected from the ponds.

A standard plan for a temporary stormwater pond was developed based on the results of the research and modeling. The narrative for the MnDOT SWPPP template was updated to

include this information. This standard plan includes maintenance protocols that define cleanout frequency based on Stokes' settling velocity.

1.3 HydroCAD Computer Model

HydroCAD is a stormwater modeling software that uses the standard Natural Resources Conservation Service (NRCS) Curve Number (CN) method.[2] HydroCAD is used to model rainfall events for a specified reoccurrence interval or rainfall depth. The flow routing in HydroCAD allows for modeling of a range of stormwater control measures. For this study, the standard 2-year, 24-hour rainfall event (2.8 inches) for the Minneapolis/St. Paul area was used to model the pond and skimmer system. HydroCAD includes a pond outlet device that operates like a skimmer for constant flow after a certain water depth is achieved.

1.4 P8 Computer Model

P8 calculates runoff separately for pervious and impervious areas. Calculations for pervious areas use the NRCS CN method.[2] Runoff from impervious areas begins once the cumulative storm rainfall exceeds the specified depression storage, with the runoff rate equal to the rainfall intensity. The P8 model uses an hourly precipitation record (rain and snowfall) and daily temperature record. Precipitation and temperature data were obtained from the Minneapolis-St. Paul International Airport. Records from 2001 to 2010 were used for this study. The bare soil particle file was selected to model active construction sites.

1.5 Limitations and Significant Assumptions

Five watershed sizes were used to design the temporary ponds. These watersheds were 2, 5, 10, 15, and 20 acres. Four ponds were designed for each watershed with varying dead pool storage volumes based on the size of the watershed. 1200, 1800, 2400, and 3200 cubic feet of dead pool storage were provided per acre of watershed. 4-foot and 2-foot dead pool storage depths were used for the basin modeling. The NURP stormwater pond standards recommend 3 to 10 feet of dead pool storage for prevention of re-suspension of accumulated sediment.[3]

Soil types consistent with typical Minnesota construction sites were used in the modeling process. These soils were clay loam, sandy loam, silt loam, and loam. Clay loam is consistent with soils from various locations in Districts 1 and 6. Sandy loam can be found in the Anoka Sand Plain. Silt loam and loam are reflective of the Red River Valley and Mankato, respectively. NRCS recommends a curve number of 96 for compacted soil.[2] In order to model different soil types, a range of curve numbers from 93 to 96 was used in the P8 model to estimate the soil loading rate for construction sites. The soil loading rate produced by P8 was compared with the results using the Revised Universal Soil Loss Equation[4] for clay loam (CN:93), sandy loam (CN:96), silt loam (CN:95), and loam (CN:94). The loading rates can be found in Table 1 of Appendix B.

CHAPTER 2: PROJECT TASKS

2.1 Task 1: Summary of Existing Technology

The internet was researched for available passive pond skimming technologies. A technical memo describing the results is provided in Appendix A. Five designs were found and described, as well as associated basin design considerations produced by the North Carolina Department of Transportation. While the capability to improve water quality for each specific practice is not known, research suggests that devices of this type have the potential to remove upwards of 90 percent of suspended sediment. Each technology has its own specifications for discharge rate based on desired retention time.

2.2 Task 2: Modeling

Using HydroCAD, temporary sedimentation basins were designed to satisfy the requirements for various watershed sizes from 2 to 20 acres. The pond design uses a rectangular configuration for modeling simplicity. The basins were designed to accommodate runoff from the 2-year, 24-hour rainfall event in the live storage area with overflow in the event of a larger rainfall event. The live storage is defined as any volume above the lowest height at which water will be discharged through the skimmer. The dead storage for these basins ranged from 1200 to 3200 cubic feet per acre.

The entire watershed was considered impervious with entirely exposed soils to most accurately reflect construction sites. Soils were modeled separately for clay loam, sandy loam, silt loam, and loam using NRCS CNs that ranged from 93 to 96.[2] The HydroCAD model produced various basin configurations based on the size of the contributing watershed and desired retention time of 3.25 days. These basin configurations were then adapted for modeling in P8 to predict pollutant removal efficiency. Specific particle size removal efficiency was estimated using Stokes' settling velocity for clay, silt, and very fine sand particles.[4]

The effect of dead storage was evaluated at 4-feet and 2-feet deep. Based on these results, deadpool depth has little effect on the efficacy of the skimming basins. The results from these models can be found in Tables 2 and 3 in Appendix B. The 4-foot and 2-foot deep deadpool ponds have average TSS removal efficiencies of 79 percent and 82 percent, respectively. The deadpool does not affect treatment efficiency, because the skimmer causes discharge rates to remain constant and only the water from the pond surface is discharged. As a result, consistently clean water is discharged regardless of the size of the deadpool volume. Because the deadpool has little effect on treatment efficiency, the standard pond design uses a 1.5-foot dead pool depth (Appendix C). This reduces the cost associated with excavating larger ponds, but still provides enough depth to prevent the skimmer from becoming trapped by accumulated sediment.

A separate design was included to incorporate dead storage as low as 200 cubic feet per acre using a 2-foot dead storage depth. These smaller basin designs predict the effect of using a smaller system, such as ditch blocks, when space for properly sized systems is unavailable. The TSS removal efficiencies of these systems are shown in Table 4 of Appendix B. When the basins

are unable to retain the 2-yr rainfall event, the efficiency of the system is reduced. The addition of chemical treatment may be needed in order to maintain the removal efficiency on sites where full sized ponds are not feasible.

Stokes' settling velocity was used to evaluate the composition of the pond effluent water.[4] Because the skimmer removes water from the pond surface, Stokes' equation predicts that all of the sand and silt content of the suspended sediment is captured while clay particles are largely untreated. At a 5-foot total basin depth, only 31percent of the clay particles are retained (See Table 5, Appendix B). In watersheds with soils having high clay content, a flocculent may be added to improve removal efficiencies.

The density of various Minnesota River sediments was used to predict sediment volume accumulation in the basin. An annual rate of basin cleanout was estimated from these sediment densities and modeled sediment accumulation. According to the NPDES general permit, cleanout is needed when the pond has been filled halfway with sediment. By estimating the frequency at which this will occur, a less ambiguous standard can be maintained. Tables 6, 7, and 8 show the predicted cleanout frequencies based on basin sizes and the soil type of the contributing watershed. Estimated pond cleanout frequencies that can retain the 2-yr rainfall event range from once every three years to multiple times per year.

2.3 Task 3: Engineering and Stormwater Pollution Prevention Plan (SWPPP)

Using the modeling outputs, a standard plan was developed. This plan includes details for pond design, sizing requirements, outlet structure, SWPPP language, and maintenance protocols. In addition, special provisions for the plan set were developed. A set of plans and special provisions can be found in Appendix C. Manufacturer recommendations should be followed to ensure that the average retention time of the 2-year, 24-hr rainfall event is 3.25 days. A floating absorbent boom should be included in the design to remove oil or grease in the runoff.

2.4 Task 4: Project Report

Contents of this technical report compile the results of the study.

2.5 Task 5: Meetings

A kickoff meeting was held on January 31st, 2014 to initialize the project after the initial research had been conducted. Meeting notes are contained in Appendix D.

Other meetings were held to discuss draft results of the model and report. This report is the compilation of the result of those meetings.

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4. Wurbs, Ralph A., and James, Wesley P., *Water Resources Engineering*. Upper Saddle River, NJ: Prentice Hall, 2002.
5. North Carolina Sedimentation Control Commission. North Carolina Dept. of Natural Resources and Community Development. *Erosion and Sediment Control Planning and Design Manual.* By M. D. Smolen. Raleigh, NC: North Carolina, 2013
6. James, W. F., "Nutrient Dynamics and Budgetary Analysis of the Lower Minnesota River: Interim Report 2006," ERDC Eau Galle Aquatic Ecology Laboratory, Spring Valley, WI, 30 September (2006).

APPENDIX A: Existing Technology

2014-05-06

List of Pond Skimming Devices:

1. ESC Skimmer, by Erosion Supply Company (http://www.erosionsupply.com/).
2. Faircloth Skimmer, by J.W. Faircloth and Sons Inc. (http://www.fairclothskimmer.com/).
3. IAS Skimmer, by Innovative Applied Solutions, LLC (http://iasllcusa.com/).
4. Marlee Float, by Fee Saver (http://swfeesaver.com/).
5. Thirsty Duck Buoyant Flow Control Device, by Thirsty Duck (http://thirsty-duck.com/).

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TECHNICAL MEMORANDUM

TO: Dwayne Stenlund
Minnesota Department of Transportation

FROM: Joel Toso, PE
Ian Peterson, EIT

DATE: January 31, 2014

SUBJECT: Research of existing pond skimmer technology

Introduction:

This memo provides web research results on available passive discharge skimming technologies (i.e. floating head skimmers). Surface skimmers are intended to greatly reduce suspended sediment, oil, and grease loads in rainwater runoff when properly designed and installed.

A floating head skimmer can be defined as a raised discharge device with an inlet at or near the water's surface where higher water quality is expected. Drawing water from the surface of the basin reduces the re-suspension of sediment due to mixing that is prevalent when draining at lower points.

Results:

Of the technologies found to be viable floating head skimmer options (see figures), the Faircloth Skimmer appears to the most prevalently used (Figure 1). The Faircloth Skimmer is available through J.W. Faircloth and Sons Inc. located in North Carolina (http://www.fairclothskimmer.com/). A similar design is the Erosion Supply Company Skimmer (Figure 2). Erosion Supply Company is also located in North Carolina (http://www.erosionsupply.com/). Innovative Applied Solutions, LLC (http://iasllcusa.com/), again in North Carolina, provides a similar design as well (Figure 3). Thirsty Duck (http://thirsty-duck.com/), in Florida, produces a floating system that is activated by rising water levels (Figure 4). The system closes at a specific water level, as the basin fills the floating valve is opened. Fee Saver (http://swfeesaver.com/), in South Carolina, produces the Marlee Float which has an orifice in in the horizontal plane (Figure 5).

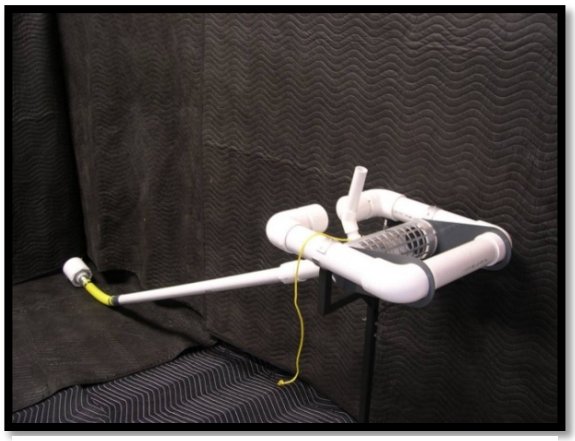


Figure 1: Typical Faircloth Skimmer shown in floating position.

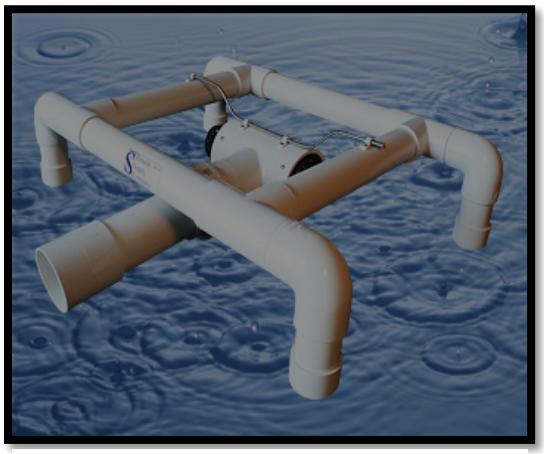


Figure 2: Erosion Supply Company passive dewatering device.

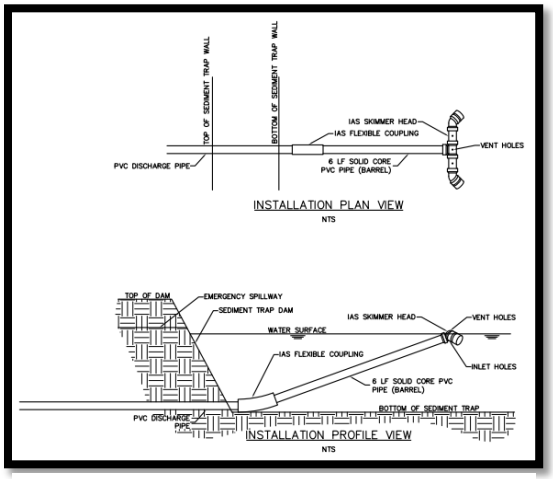


Figure 3: Innovative Applied Solutions water quality skimmer detail.

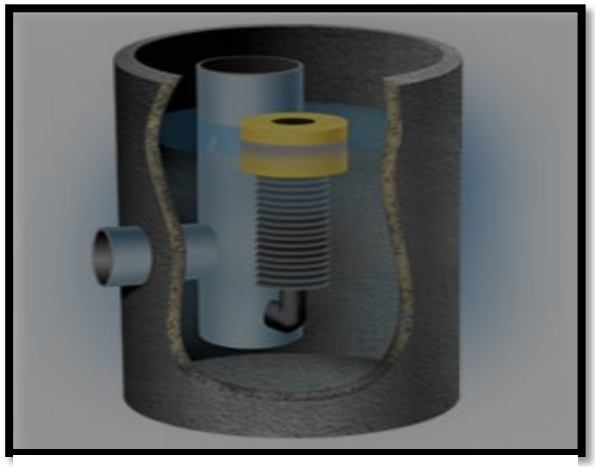


Figure 4: Thirsty Duck TD series floating head pond skimmer.

Figure 5: Fee Saver Stormwater Services "The Marlee Float Skimmer."

The use of floating head skimmers is often associated with a retrofitted basin design (Figure 6). The basin design includes pervious basin partitions that filter sediment and oil prior to reaching the skimmer device. This is done to further increase water quality and reduce the frequency of necessary maintenance on the pond skimmer. Retrofitted basin designs, depending on the type of skimmer, may also include a skimmer pit which is a shallow pit filled with riprap that prevents the skimmer from settling in accumulated sediment. This, again, improves the performance of the skimmer and reduces the need for maintenance. When oil and grease are of concern, EnviroHazmat provides a non-discharge skimmer that collects hydrocarbons. Effluent capacity and design characteristics for the skimmer devices vary greatly with the technology and are available on the websites provided. In order to achieve the desired dewatering rates, skimmer devices should be designed accordingly.

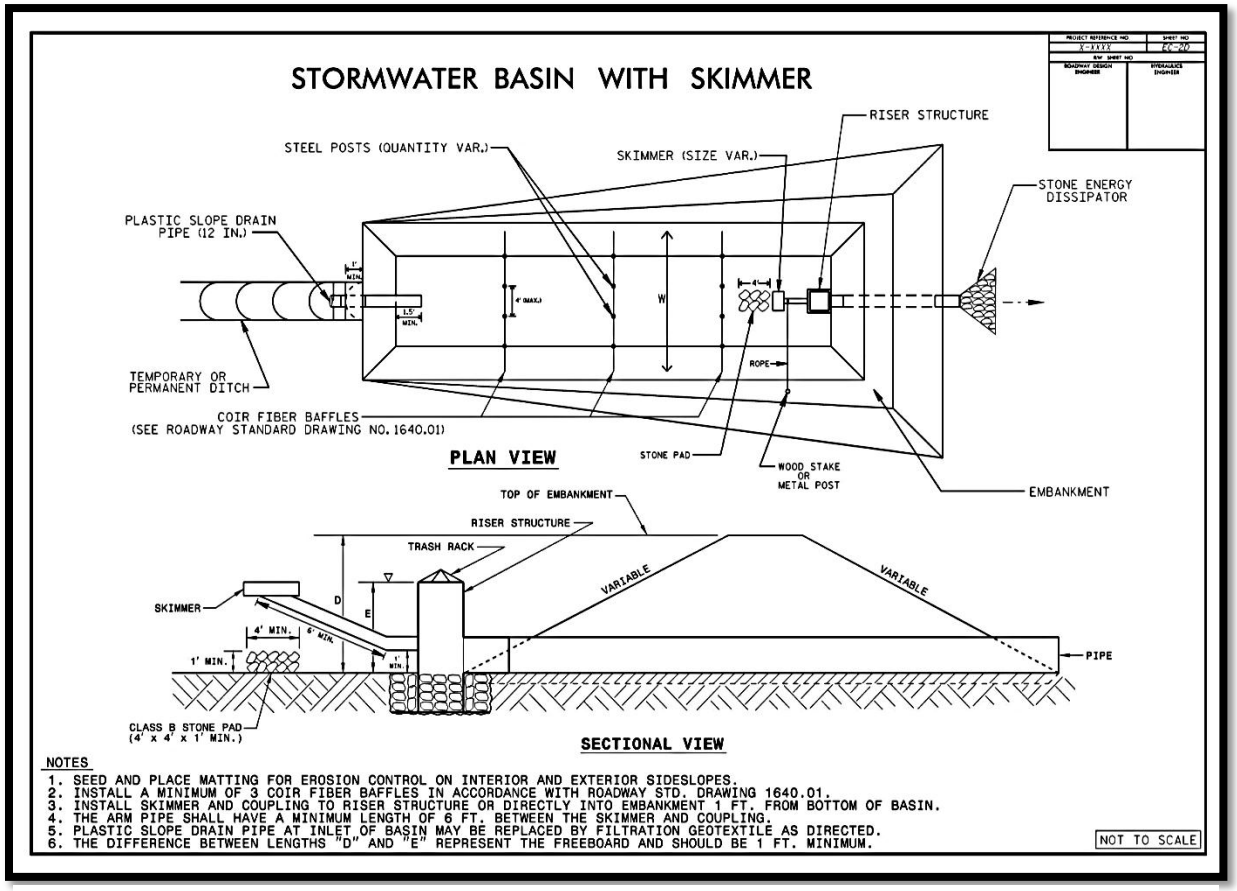


Figure 6: Stormwater basin design for use with a floating head skimmer (North Carolina Department of Transportation).

Several research endeavors have explored the effectiveness of floating head skimmers. The Faircloth skimmer has received the most attention in this research. Research conducted at North Carolina State University and Penn State University suggests that skimmers, specifically the Faircloth Skimmer, can achieve upwards of 90% total suspended solids removal. This assumes that skimmer and basin have been designed in consideration of the basin retrofits discussed above. Research conducted at the University of Minnesota, St. Anthony Falls Laboratory suggests similar results for the Thirsty Duck system. Not all of these technologies have been researched to the same extent and their compared effectiveness is therefore unknown.

Conclusion:

Available passive pond skimming technologies were researched. Five designs were found and described, as well as associated basin design considerations. While the capability to improve water quality for each specific practice is not known, research suggests that devices of this type have the potential to remove upwards of 90% of suspended sediment. Each technology has its own specifications for discharge rate based on desired retention.

APPENDIX B: Model Outputs

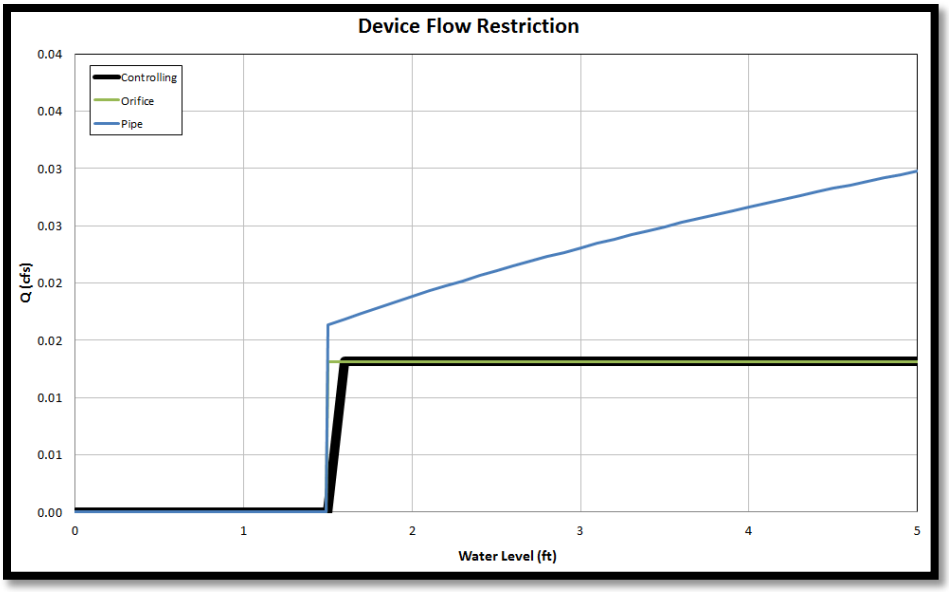


Figure 1: Device rating curve based on the orifice equation and pipe flow for a generic skimmer device. This graph assumes that the basin has a deadpool depth of 1.5 feet and a maximum depth of 5 feet. The pipe has a diameter of 2 inches and the pipe length is 1.4 times the pond depth per the Faircloth Skimmer recommendations

Table 1: This table shows the annual TSS load (tons/ac/yr) produced by the P8 models. These are then compared to values calculated using the Revised Universal Soil Loss Equation. The P8 loadings were used in combination with the listed soil densities to predict needed pond cleanout frequency. The soil densities are based on soil samples taken from the bed of the Minnesota River (James, 2009)[6].

	Annual TSS Load P8 (tons/ac/yr)	Annual TSS Load RUSLE (tons/ac/yr)	Soil Density (lb/ft^3)
Clay Loam	14.70	13.88	44.9
Sandy Loam	23.91	22.67	69.6
Silt Loam	20.25	22.67	51.0
Loam	17.22	17.92	61.7

Table 2: This table shows the annual TSS removal efficiency predicted in P8 of a basin and skimmer designed to match the parameters presented for the associated basin having 4 foot deep dead storage. The average removal efficiency for these systems is 79%. The curve number for Clay Loam, Sandy Loam, Silt Loam, and Loam were 93, 96, 95, and 94 respectively.

		TSS Removal Efficiency			
	Dead pool	Clay Loam	Sandy Loam	Silt Loam	Loam
2 Acre Watershed	1,200 cf/ac	80%	79%	79%	79%
	1,800 cf/ac	82%	81%	81%	81%
	2,400 cf/ac	83%	82%	82%	83%
	3,600 cf/ac	85%	84%	85%	85%
5 Acre Watershed	1,200 cf/ac	77%	76%	77%	77%
	1,800 cf/ac	79%	78%	79%	79%
	2,400 cf/ac	81%	80%	81%	81%
	3,600 cf/ac	84%	83%	83%	84%
10 Acre Watershed	1,200 cf/ac	75%	73%	74%	75%
	1,800 cf/ac	78%	77%	77%	78%
	2,400 cf/ac	80%	79%	79%	80%
	3,600 cf/ac	83%	82%	82%	83%
15 Acre Watershed	1,200 cf/ac	74%	71%	72%	73%
	1,800 cf/ac	77%	76%	77%	77%
	2,400 cf/ac	80%	78%	79%	79%
	3,600 cf/ac	83%	81%	82%	82%
20 Acre Watershed	1,200 cf/ac	73%	70%	71%	72%
	1,800 cf/ac	77%	75%	76%	77%
	2,400 cf/ac	79%	78%	78%	79%
	3,600 cf/ac	83%	81%	82%	82%

Table 3: This table shows the annual TSS removal efficiency predicted in P8 of a basin and skimmer designed to match the parameters presented for the associated basin having 2 foot deep dead storage. The average removal efficiency for these systems is 82%. The curve number for Clay Loam, Sandy Loam, Silt Loam, and Loam were 93, 96, 95, and 94 respectively.

		TSS Removal Efficiency			
	Dead pool	Clay Loam	Sandy Loam	Silt Loam	Loam
2 Acre Watershed	1,200 cf/ac	81%	80%	81%	81%
	1,800 cf/ac	83%	82%	83%	83%
	2,400 cf/ac	85%	84%	84%	84%
	3,600 cf/ac	87%	86%	87%	87%
5 Acre Watershed	1,200 cf/ac	80%	79%	79%	79%
	1,800 cf/ac	82%	81%	81%	82%
	2,400 cf/ac	84%	83%	83%	83%
	3,600 cf/ac	86%	86%	86%	86%
10 Acre Watershed	1,200 cf/ac	79%	78%	78%	78%
	1,800 cf/ac	81%	80%	81%	81%
	2,400 cf/ac	83%	82%	83%	83%
	3,600 cf/ac	86%	85%	85%	86%
15 Acre Watershed	1,200 cf/ac	78%	77%	77%	78%
	1,800 cf/ac	81%	80%	80%	80%
	2,400 cf/ac	83%	82%	82%	83%
	3,600 cf/ac	86%	85%	85%	86%
20 Acre Watershed	1,200 cf/ac	78%	77%	77%	77%
	1,800 cf/ac	81%	80%	80%	80%
	2,400 cf/ac	83%	82%	82%	82%
	3,600 cf/ac	86%	85%	85%	85%

Table 4: This table shows the annual TSS removal efficiency predicted in P8 of a basin and skimmer designed to match the parameters presented for the associated basin having 2 foot deep dead storage on a project that does not have enough space to accommodate a larger basin. The average removal efficiency for these systems is 67%. The curve number for Clay Loam, Sandy Loam, Silt Loam, and Loam were 93, 96, 95, and 94 respectively.

		TSS Removal Efficiency			
	Dead pool	Clay Loam	Sandy Loam	Silt Loam	Loam
15 Acre Watershed	200 cf/ac	60%	57%	58%	59%
	400 cf/ac	69%	66%	67%	68%
	600 cf/ac	73%	71%	72%	73%
	800 cf/ac	75%	74%	74%	75%
20 Acre Watershed	200 cf/ac	57%	54%	55%	56%
	400 cf/ac	67%	64%	65%	66%
	600 cf/ac	72%	70%	71%	72%
	800 cf/ac	74%	73%	73%	74%

Table 5: The top half of the table shows the percent by mass of clay (Cl), silt (MS), and very fine sand (VFS) for each design soil type. The bottom portion of the table shows basin removal efficiency based on soil type and Stokes' settling velocity. This assumes that the live storage depth is 5 feet deep and the settling velocity for CL, MS, and VFS is 62.5, 12.5, and 0.02 ft/hr, respectively.

	Soil Type and Removal Efficiency			
	Clay Loam	Sandy Loam	Silt Loam	Loam
Soil Content				
%VFS	40%	70%	20%	40%
%MS	30%	20%	70%	40%
%Cl	30%	10%	10%	20%
Removal Efficiency				
VFS	100%	100%	100%	100%
MS	100%	100%	100%	100%
Cl	31%	31%	31%	31%
Total	79.4%	93.1%	93.1%	86.2%

Table 6: The left portion of the table shows the sizing, footprint, volume, and peak depth of the design basin based on the watershed size. These basins are designed to accommodate a 2-yr, 24-hr rainfall event and have a design dead storage depth of 4 feet. The basins are sized not to exceed 10 feet in total depth. Where the peak depth indicated "Overflow," this design depth maximum has been exceeded in a 2-year, 24-hour rainfall event. The left portion of the table shows the predicted annual pond cleanout frequency based on watershed size, sediment accumulation, basin removal efficiency, soil type, soil density, and a cleanout depth of 2 feet.

	Dead pool	Top Footprint (sq-ft)	Bottom Footprint (sq-ft)	Dead pool Volume (ft^3)	2 yr storm peak depth (ft)	Cleanout Frequency ($year^{-1}$)			
						Clay Loam	Sandy Loam	Silt Loam	Loam
2 Acre Watershed	1,200 cf/ac	5114	131	2396	8.85	1.1	1.1	1.3	0.9
	1,800 cf/ac	6007	305	3659	8.21	0.7	0.8	0.9	0.6
	2,400 cf/ac	6721	484	4792	7.78	0.5	0.6	0.7	0.5
	3,600 cf/ac	8102	902	7231	7.13	0.4	0.4	0.4	0.3
5 Acre Watershed	1,200 cf/ac	7492	697	6142	9.92	1.1	1.1	1.3	0.9
	1,800 cf/ac	9017	1220	9017	9.40	0.7	0.8	0.9	0.6
	2,400 cf/ac	10629	1830	12284	8.69	0.5	0.6	0.6	0.5
	3,600 cf/ac	13242	3023	18165	7.82	0.4	0.4	0.4	0.3
10 Acre Watershed	1,200 cf/ac	10629	1830	12284	Overflow	1.1	1.1	1.3	0.9
	1,800 cf/ac	13242	3006	18165	9.96	0.7	0.8	0.9	0.6
	2,400 cf/ac	15856	4356	24524	9.63	0.5	0.6	0.6	0.5
	3,600 cf/ac	20430	6882	36285	8.49	0.4	0.4	0.4	0.3
15 Acre Watershed	1,200 cf/ac	13242	3006	18165	Overflow	1.1	1.1	1.3	0.9
	1,800 cf/ac	16901	4879	27094	Overflow	0.7	0.8	0.9	0.6
	2,400 cf/ac	20430	6882	36285	9.93	0.5	0.6	0.7	0.5
	3,600 cf/ac	26877	10803	54014	8.77	0.4	0.4	0.4	0.3
20 Acre Watershed	1,200 cf/ac	15856	4356	24524	Overflow	1.1	1.1	1.3	0.9
	1,800 cf/ac	20430	6882	36285	Overflow	0.7	0.8	0.9	0.6
	2,400 cf/ac	24960	9583	48613	9.97	0.5	0.6	0.7	0.5
	3,600 cf/ac	33498	15115	73094	8.85	0.4	0.4	0.4	0.3

Table 7: The left portion of the table shows the sizing, footprint, volume, and peak depth of the design basin based on the watershed size. These basins are designed to accommodate a 2-yr, 24-hr rainfall event and have a design dead storage depth of 2 feet. The basins are sized not to exceed 10 feet in total depth. The left portion of the table shows the predicted annual pond cleanout frequency based on watershed size, sediment accumulation, basin removal efficiency, soil type, soil density, and a cleanout depth of 1 foot.

	Dead pool	Top Footprint (sq-ft)	Bottom Footprint (sq-ft)	Dead pool Volume (ft^3)	2 yr storm peak depth (ft)	Cleanout Frequency ($year^{-1}$)			
						Clay Loam	Sandy Loam	Silt Loam	Loam
2 Acre Watershed	1,200 cf/ac	7832	812	2396	6.33	1.1	1.1	1.3	0.9
	1,800 cf/ac	9216	1296	3572	5.63	0.7	0.8	0.9	0.6
	2,400 cf/ac	10609	1849	4835	5.08	0.5	0.6	0.7	0.5
	3,600 cf/ac	12996	2916	7231	4.40	0.4	0.4	0.4	0.3
5 Acre Watershed	1,200 cf/ac	11772	2352	5968	7.31	1.1	1.2	1.3	0.9
	1,800 cf/ac	14641	3721	9017	6.27	0.7	0.8	0.9	0.6
	2,400 cf/ac	17292	5112	12023	5.57	0.5	0.6	0.7	0.5
	3,600 cf/ac	22201	7921	18077	4.70	0.4	0.4	0.4	0.3
10 Acre Watershed	1,200 cf/ac	17292	5112	12023	8.06	1.1	1.1	1.3	0.9
	1,800 cf/ac	22201	7921	18077	6.78	0.7	0.8	0.9	0.6
	2,400 cf/ac	26732	10712	24002	5.95	0.5	0.6	0.7	0.5
	3,600 cf/ac	35344	16384	35937	4.94	0.4	0.4	0.4	0.3
15 Acre Watershed	1,200 cf/ac	22201	7921	18077	8.49	1.1	1.1	1.3	0.9
	1,800 cf/ac	28900	12100	26920	7.07	0.7	0.8	0.9	0.6
	2,400 cf/ac	35344	16384	35937	6.14	0.5	0.6	0.7	0.5
	3,600 cf/ac	47524	24964	53797	5.04	0.4	0.4	0.4	0.3
20 Acre Watershed	1,200 cf/ac	26732	10712	24002	8.80	1.1	1.1	1.3	0.9
	1,800 cf/ac	35344	16384	35937	7.24	0.7	0.8	0.9	0.6
	2,400 cf/ac	43681	22201	48090	6.25	0.5	0.6	0.7	0.5
	3,600 cf/ac	59536	33856	72222	5.09	0.4	0.4	0.4	0.3

Table 8: The left portion of the table shows the sizing, footprint, volume, and peak depth of the design basin based on the watershed size. These basins are designed assuming that the project does not have enough space to accommodate a larger basin and have a design dead storage depth of 2 feet. Where the peak depth indicated "Overflow," this design depth maximum has been exceeded in a 2-yr, 24-hr rainfall event. The left portion of the table shows the predicted annual cleanout frequency based on watershed size, sediment accumulation, basin removal efficiency, soil type, soil density, and a cleanout depth of 1 foot.

	Dead pool	Top Footprint (sq-ft)	Bottom Footprint (sq-ft)	Dead pool Volume (ft^3)	2 yr storm peak depth (ft)	Cleanout Frequency ($year^{-1}$)			
						Clay Loam	Sandy Loam	Silt Loam	Loam
15 Acre Watershed	200 cf/ac	8538	1045	3006	Overflow	6.5	6.9	7.9	5.6
	400 cf/ac	11761	2352	5968	Overflow	3.3	3.5	4.0	2.8
	600 cf/ac	14636	3703	9017	Overflow	2.2	2.3	2.6	1.9
	800 cf/ac	17293	5097	11631	9.92	1.7	1.8	2.0	1.4
20 Acre Watershed	200 cf/ac	9714	1481	3485	Overflow	7.5	7.9	9.1	6.4
	400 cf/ac	13678	3267	7971	Overflow	3.3	3.4	4.0	2.8
	600 cf/ac	17293	5097	12023	Overflow	2.2	2.3	2.6	1.9
	800 cf/ac	19863	6578	15159	Overflow	1.7	1.8	2.1	1.5

APPENDIX C: SWPPP and Plan Set

PLOTTED/REVISED: $$$$@DATE@$$$$

DISTRICT : $@DISTRICT@$
IPLOT NAME: $$@IPLOT$NAME@$$
PATH & FILENAME: $$$@PATHFILENAME@$$$

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) NARRATIVE

PROJECT DESCRIPTION/LOCATION

SP XXXX-XX IS LOCATED ON TH XX FROM XXX TO XXX IN THE CITIES OF XXXX IN XXXX COUNTY.

THE PLANNED SCOPE OF THE PROJECT INCLUDES:

(INCLUDE A DETAILED LIST OF ITEMS TO BE COMPLETED. IF IT INCLUDES BRIDGE REHAB INCLUDE WHAT REHAB WORK IS GETTING DONE I.E. REDECK, PIER REPAIRS, GIRDER REPAIR, ETC.)

Temporary Construction Pond - Sheets No. XX-XX

SPECIAL AND IMPAIRED WATERS

THESE SPECIAL AND IMPAIRED WATERS ARE LOCATED WITHIN ONE MILE (AERIAL RADIUS) OF THE PROJECT LIMITS AND RECEIVE RUNOFF FROM THE PROJECT SITE. DUE TO THE PROXIMITY OF THESE SPECIAL AND IMPAIRED WATERS. THE BMPS DESCRIBED IN APPENDIX A OF THE NPDES PERMIT WILL APPLY TO ALL AREAS OF THE SITE.

WATERBODY	IMPAIRMENT(S)
LIST IMPAIRED OR SPECIAL	PHOSPHOROUS (NUTRIENT EUTROPHICATION BIOLOGICAL INDICATORS), TURBIDITY,
WATERS	DISSOLVED OXYGEN OR AQUATIC BIOTA (FISH BIOASSESSMENT, AQUATIC PLANT
	BIOASSESSMENT AND AQUATIC MACROINVERTEBRATE BIOASSESSMENT)

AREAS OF ENVIRONMENTAL SENSITIVITY (AES) AND INFESTED WATERS

IN ADDITION TO THE LIST OF SPECIAL AND IMPAIRED WATERS THE CONTRACTOR SHALL BE AWARE THAT THERE ARE WETLANDS AND EXISTING STORMWATER FACILITIES WITHIN AND NEAR THE PROJECT BOUDARY. THERE IS A MAP OF KNOWN NATURAL RESOURCES ON THE LAST PAGE OF THE SWPPP.

THE FOLLOWING WATER BODIES HAVE BEEN LISTED BY THE DNR AS BEING INFESTED BY INVASIVE SPECIES: LIST WATERBODIES HERE.

SOIL TYPES

SOIL TYPES TYPICALLY FOUND ON THIS PROJECT ARE XXXXXX

LONG TERM MAINTENANCE AND OPERATION

MNDOT METRO DISTRICT MAINTENANCE STAFF ARE RESPONSIBLE FOR THE LONG TERM MAINTENANCE AND OPERATION OF THE PERMANENT STORMWATER SYSTEM. SEE METRO MNDOT MS4 SWPPP FOR INFORMATION REGARDING ONGOING MAINTENANCE. THE MS4 SWPPP CAN BE FOUND AT WWW.DOT.STATE.MN.US/METRO/WATERRESOURCES/PDF/SWPPP.PDF.

OR

MNDOT HAS ENTERED INTO A COOPERATIVE AGREEMENT WITH (CITY/COUNTY) THAT IDENTIFIES THE AGENCY THAT IS RESPONSIBLE FOR ONGOING MAINTENANCE. SEE AGREEMENT NUMBER ***, ON FILE WITH MNDOT, FOR MORE INFORMATION.

PROJECT PERSONNEL AND TRAINING

THIS SWPPP WAS PREPARED BY PERSONNEL THAT ARE CERTIFIED IN THE DESIGN OF CONSTRUCTION SWPPPS. COPIES OF THE CERTIFICATIONS ARE ON FILE WITH MNDOT AND ARE AVAILABLE UPON REQUEST.

PROVIDE A CERTIFIED EROSION CONTROL SUPERVISOR IN GOOD STANDING WHO IS KNOWLEDGEABLE AND EXPERIENCED IN THE APPLICATION OF EROSION PREVENTION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES. THE EROSION CONTROL SUPERVISOR WILL WORK WITH THE PROJECT ENGINEER TO OVERSEE THE IMPLEMENTATION OF THE SWPPP AND THE INSTALLATION, INSPECTION, AND MAINTENANCE OF THE EROSION PREVENTION AND SEDIMENT CONTROL BMPS BEFORE, DURING AND AFTER CONSTRUCTION UNTIL THE NOTICE OF TERMINATION (NOT) HAS BEEN FILED WITH THE MPCA. PROVIDE PROOF OF CERTIFICATION AT THE PRECONSTRUCTION MEETING. WORK WILL NOT BE ALLOWED TO COMMENCE UNTIL PROOF OF CERTIFICATION HAS BEEN PROVIDED TO THE PROJECT ENGINEER.

THE EROSION CONTROL SUPERVISOR IS INCIDENTAL. (ONLY USE WHEN THERE IS LESS THAN ONE ACRE OF DISTURBANCE.)

PROVIDE AT LEAST ONE CERTIFIED INSTALLER FOR EACH CONTRACTOR OR SUBCONTRACTOR THAT INSTALLS THE PRODUCTS LISTED IN SPECIFICATION SECTION 2573.3.A.2. PROVIDE PROOF OF CERTIFICATION AT THE PRECONSTRUCTION MEETING. WORK WILL NOT BE ALLOWED TO COMMENCE UNTIL PROOF OF CERTIFICATION HAS BEEN PROVIDED TO THE PROJECT ENGINEER.

CHAIN OF RESPONSIBILITY (ONLY USE WHEN THERE IS AN NPDES PERMIT)

MNDOT AND THE CONTRACTOR ARE COPERMITEES FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION PERMIT. THE CONTRACTOR IS RESPONSIBLE TO COMPLY WITH ALL ASPECTS OF THE NPDES CONSTRUCTION PERMIT AT ALL TIMES UNTIL THE NOTICE OF TERMINATION (NOT) HAS BEEN FILED WITH THE MPCA. THE CONTRACTOR WILL DEVELOP A CHAIN OF COMMAND WITH ALL OPERATORS ON THE SITE TO ENSURE THAT THE SWPPP WILL BE IMPLEMENTED AND STAY IN EFFECT UNTIL THE CONSTRUCTION PROJECT IS COMPLETE, THE ENTIRE SITE HAS UNDERGONE FINAL STABILIZATION, AND A NOTICE OF TERMINATION (NOT) HAS BEEN SUBMITTED TO THE MPCA.

PROJECT CONTACTS

(ONLY USE IF THERE IS AN NPDES PERMIT)

THE PROJECT ENGINEER AND CONTRACTOR ARE RESPONSIBLE FOR IMPLEMENTATION OF THE SWPPP AND INSTALLATION, INSPECTION, AND MAINTENANCE OF THE EROSION PREVENTION AND SEDIMENT CONTROL BMPS BEFORE, DURING AND AFTER CONSTRUCTION UNTIL THE NOTICE OF TERMINATION HAS BEEN FILED. MNDOT METRO DISTRICT WATER RESOURCES STAFF ARE ALSO AVAILABLE FOR TECHNICAL ASSISTANCE.

ORGANIZATION	CONTACT NAME	PHONE
MNDOT METRO WATER RESOURCES (WRE) DESIGN	NAME	651-234-XXXX
MNDOT METRO CONSTRUCTION RESIDENT ENGINEER	NAME	651-XXX-XXXX
METRO DISTRICT MAINTENANCE CONTACT	NAME	651-XXX-XXXX
MNDOT METRO DESIGN	NAME	651-234-XXXX
MNDOT METRO WRE (EROSION CONTROL/MS4)	CAROLYN ADAMSON	651-775-0921
MINNESOTA POLLUTION CONTROL AGENCY (MPCA)	DAN SULLIVAN	651-757-2768
MINNESOTA DEPARTMENT OF NATURAL RESOURCES	PETER LEETE	651-366-3634
WATERSHED DISTRICT	NAME	XXX-XXX-XXXX
ARMY CORP OF ENGINEERS	NAME	XXX-XXX-XXXX
COUNTY AGRICULTURE INSPECTOR	NAME	XXX-XXX-XXXX

ONLY USE IF THE PROJECT HAS PERMIT FROM THE LISTED AGENCY

MPCA DUTY OFFICER 24 HOUR EMERGENCY NOTIFICATION:
651-649-5451 OR 800-422-0798

A

C-1

I HEREBY CERTIFY THAT THESE SWPPP SHEETS HAVE BEEN PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME:_____ LICENSE#_____

DATE:_____ SIGNATURE:_____
Licensed Professional Engineer

LOCATION OF SWPPP REQUIREMENTS

THE REQUIRED SWPPP ELEMENTS MAY BE LOCATED IN MANY PLACES WITHIN THE PLAN SET AS WELL AS IN THE SPECIAL PROVISIONS, MNDOT SPEC BOOK (2014 EDITION), OR ON FILE WITH MNDOT. THE NOTES AND TABLE BELOW ARE INTENDED TO BE A QUICK REFERENCE FOR THE CONTRACTOR AND PROJECT ENGINEER TO USE IN THE FIELD. THERE MAY BE ADDITIONAL REQUIRED SWPPP ELEMENTS INCLUDED ON THE PROJECT THAT ARE NOT LISTED ON THIS SHEET.

LOCATION OF SWPPP REQUIREMENTS IN PROJECT PLAN

DESCRIPTION	LOCATION
TEMPORARY EROSION CONTROL MEASURES	SHEETS NO. XX-XX
PERMANENT EROSION CONTROL MEASURES	SHEETS NO. XX-XX
DIRECTION OF FLOW	SHEETS NO. XX-XX
FINAL STABILIZATION	SHEETS NO. XX-XX
SOILS AND CONSTRUCTION NOTES	SHEETS NO. XX-XX
DRAINAGE STRUCTURES	SHEETS NO. XX-XX
DRAINAGE TABULATION	SHEETS NO. XX-XX
STORM SEWER PROFILE SHEETS	SHEETS NO. XX-XX
STORM SEWER TABULATION	SHEETS NO. XX-XX
EROSION AND SEDIMENT CONTROL DETAILS	SHEETS NO. XX-XX
EROSION CONTROL TABULATION	SHEETS NO. XX-XX
TURF ESTABLISHMENT TABULATION	SHEETS NO. XX-XX
SITE MAP	SHEETS NO. XX-XX
STORMWATER TREATMENT CONSTRUCTION STAGING	SHEETS NO. XX-XX
STORMWATER CALCULATIONS	PROJECTWISE AND S:\PROJECTWISE\XXX\XXXX\XXX\XXXXXX
WATER RESOURCES NOTES	SHEET NO. XX

STORMWATER CALCULATIONS AND ADDITIONAL HYDRAULIC DESIGN INFORMATION IS STORED IN THE PROJECT'S HYDRAULICS FOLDER IN PROJECTWISE OR ON S:\PROJECTWISE. WATER RESOURCES WILL MAKE THIS INFORMATION AVAILABLE UPON REQUEST.

SITE INSPECTION AND MAINTENANCE

(ONLY USE IF THERE IS AN NPDES PERMIT)

INSPECT THE ENTIRE CONSTRUCTION SITE A MINIMUM OF ONCE EVERY SEVEN DAYS DURING ACTIVE CONSTRUCTION AND WITHIN 24 HOURS AFTER A RAINFALL EVENT GREATER THAN 0.5 INCHES IN 24 HOURS. INSPECT ALL TEMPORARY AND PERMANENT WATER QUALITY MANAGEMENT, EROSION PREVENTION AND SEDIMENT CONTROL BMPS UNTIL THE SITE HAS UNDERGONE FINAL STABILIZATION AND THE NOT HAS BEEN SUBMITTED. INSPECT SURFACE WATER INCLUDING DRAINAGE DITCHES FOR SIGNS OF EROSION AND SEDIMENT DEPOSITION. INSPECT CONSTRUCTION SITE VEHICLE EXIT LOCATIONS FOR EVIDENCE OF TRACKING ONTO PAVED SURFACES. INSPECT SURROUNDING PROPERTIES FOR EVIDENCE OF OFF SITE SEDIMENT ACCUMULATION. INSPECT INFILTRATION AREAS FOR SIGNS OF SEDIMENT DEPOSITION AND COMPACTION (TO ENSURE THAT EQUIPMENT IS NOT BEING DRIVEN ACROSS THE AREA).

RECORD ALL INSPECTIONS AND MAINTENANCE ACTIVITIES IN WRITING WITHIN 24 HOURS. SUBMIT INSPECTION REPORTS IN A FORMAT THAT IS ACCEPTABLE TO THE PROJECT ENGINEER. INCLUDE THE FOLLOWING IN THE RECORDS OF EACH INSPECTION AND MAINTENANCE ACTIVITY:

A. DATE AND TIME OF INSPECTIONS
B. NAME OF PERSONS CONDUCTING INSPECTIONS
C. FINDINGS OF INSPECTIONS, INCLUDING RECOMMENDATIONS FOR CORRECTIVE ACTIONS
D. CORRECTIVE ACTIONS TAKEN, INCLUDING DATES, TIMES, AND PARTY COMPLETING MAINTENANCE ACTIVITIES
E. DATE AND AMOUNT OF ALL RAINFALL EVENTS GREATER THAN 0.5 INCH IN 24 HOURS
F. DOCUMENTS AND CHANGES MADE TO THE SWPPP

C

B

REPLACE, REPAIR OR SUPPLEMENT ALL NONFUNCTIONAL BMPS BY THE END OF THE NEXT BUSINESS DAY FOLLOWING DISCOVERY UNLESS LISTED DIFFERENTLY BELOW:

A. REPAIR, REPLACE, OR SUPPLEMENT PERIMETER CONTROL DEVICES WHEN IT BECOMES NONFUNCTIONAL OR SEDIMENT REACHES 1/2 THE HEIGHT OF THE DEVICE. COMPLETE REPAIRS BY THE END OF THE NEXT BUSINESS DAY FOLLOWING DISCOVERY.
B. REPAIR OR REPLACE INLET PROTECTION DEVICES WHEN THEY BECOME NONFUNCTIONAL OR SEDIMENT REACHES 1/2 THE HEIGHT AND/OR DEPTH OF THE DEVICE.
C. DRAIN AND REMOVE SEDIMENT FROM TEMPORARY AND PERMANENT SEDIMENT BASINS ONCE THE SEDIMENT HAS REACHED 1/2 THE STORAGE VOLUME. COMPLETE WORK WITHIN 72 HOURS OF DISCOVERY.
D. REMOVE ALL DELTAS AND SEDIMENT DEPOSITED IN SURFACE WATERS INCLUDING DRAINAGE WAYS, CATCH BASINS, AND OTHER DRAINAGE SYSTEMS. RESTABILIZE ANY AREAS THAT ARE DISTURBED BY SEDIMENT REMOVAL OPERATIONS. SEDIMENT REMOVAL AND STABILIZATION MUST BE COMPLETED WITHIN 7 DAYS OF DISCOVERY. PREPARE AND SUBMIT A SITE MANAGEMENT PLAN FOR WORKING IN SURFACE WATERS. CONTACT ALL APPROPRIATE AUTHORITIES PRIOR TO WORKING IN SURFACE WATERS.
E. REMOVE TRACKED SEDIMENT FROM PAVED SURFACES BOTH ON AND OFF SITE WITHIN 24 HOURS OF DISCOVERY. STREET SWEEPING MAY HAVE TO OCCUR MORE OFTEN TO MINIMIZE OFF SITE IMPACTS. LIGHTLY WET THE PAVEMENT PRIOR TO SWEEPING.
F. MAINTAIN ALL BMPS UNTIL WORK HAS BEEN COMPLETED, SITE HAS GONE UNDER FINAL STABILIZATION, AND THE NOTICE OF TERMINATION (NOT) HAS BEEN SUBMITTED TO THE MPCA. ONLY USE IF THERE IS AN NPDES PERMIT

ENVIRONMENTAL REVIEW

THERE ARE/ARE NO STORMWATER MITIGATION MEASURES REQUIRED AS A RESULT OF AN ENVIRONMENTAL, ARCHEOLOGICAL OR AGENCY REVIEW. ALL MITIGATION MEASURES HAVE BEEN ADDRESSED IN THIS PLAN SET OR THE SPECIAL PROVISIONS.

THIS PROJECT IS/IS NOT LOCATED IN A WELL HEAD PROTECTION AREA.

THIS PROJECT IS/IS NOT LOCATED IN A DRINKING WATER SUPPLY MANAGEMENT AREA (DWSMA). THE DWSMA VULNERABILITY IS CLASSIFIED AS XXXX.

LAND FEATURE CHANGES

TOTAL DISTURBED AREA	XX.X ACRES
TOTAL EXISTING IMPERVIOUS SURFACE AREA	XX.X ACRES
TOTAL PROPOSED IMPERVIOUS SURFACE AREA	XX.X ACRES
TOTAL PROPOSED NET CHANGE IN IMPERVIOUS SURFACE AREA	XX.X ACRES

STORM WATER POLLUTION PREVENTION PLAN NARRATIVE

DRAWN BY: XXX | CHECKED BY: XXX | CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO._____ DATE _____

STATE PROJ. NO. XXXX-XX (T.H. XX) SHEET NO. OF SHEETS

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) NARRATIVE (CONTINUED)

STABILIZATION TIME FRAMES

AREA	TIME FRAME	NOTES
LAST 200 LINEAL FEET OF DRAINAGE DITCH OR SWALE	WITHIN 24 HOURS OF CONNECTION TO SURFACE WATER OR PROPERTY EDGE	1, 2, 3
REMAINING PORTIONS OF DRAINAGE DITCH OR SWALE	14 DAYS/7 DAYS	1, 3
PIPE AND CULVERT OUTLETS	24 HOURS	
STOCKPILES	14 DAYS/7 DAYS	1

1. INITIATE STABILIZATION IMMEDIATELY WHEN CONSTRUCTION HAS TEMPORARILY OR PERMANENTLY CEASED ON ANY PORTION OF THE SITE. COMPLETE STABILIZATION WITHIN THE TIME FRAME LISTED. IN MANY INSTANCES THIS WILL REQUIRE STABILIZATION TO OCCUR MORE THAN ONCE DURING THE COURSE OF THE PROJECT. TEMPORARY SOIL STOCKPILES WITHOUT SIGNIFICANT CLAY OR SILT AND STOCKPILED AND CONSTRUCTED ROAD BASE ARE EXEMPT FROM THE STABILIZATION REQUIREMENT.

2. STABILIZE WETTED PERIMETER OF DITCH (I.E. WHERE THE DITCH GETS WET).

3. APPLICATION OF MULCH, HYDROMULCH, TACKIFIER AND POLYACRYLAMIDE ARE NOT ACCEPTABLE STABILIZATION METHODS IN THESE AREAS.

4. STABILIZE ALL AREAS OF THE SITE PRIOR TO THE ONSET OF WINTER. ANY WORK STILL BEING PERFORMED WILL BE SNOW MULCHED, SEEDED, AND BLANKETED WITHIN THE TIME FRAMES IN THE NPDES PERMIT.

5. TOPSOIL BERMS MUST BE STABILIZED IN ORDER TO BE CONSIDERED PERIMETER CONTROL BMPS. USE RAPID STABILIZATION METHOD 2, 3, OR 4 AS DIRECTED BY THE ENGINEER. THE SEED MIX USED IN THE RAPID STABILIZATION MAY BE SUBSTITUTED AS FOLLOWS:
   A. SINGLE YEAR CONSTRUCTION BETWEEN MAY 1 - AUGUST 1, SEED WITH SEED MIXTURE 21-111
   B. SINGLE YEAR CONSTRUCTION BETWEEN AUGUST 1 AND OCTOBER 31, SEED WITH SEED MIXTURE 21-112
   C. MULTI YEAR CONSTRUCTION 22-111

6. KEEP DITCHES AND EXPOSED SOILS IN AN EVEN ROUGH GRADED CONDITION IN ORDER TO BE ABLE TO APPLY EROSION CONTROL MULCHES, HYDROMULCHES AND BLANKETS.

GENERAL SWPPP NOTES FOR CONSTRUCTION ACTIVITY

1. AMMEND THE SWPPP AND DOCUMENT ANY AND ALL CHANGES TO THE SWPPP AND ASSOCIATED PLAN SHEETS IN A TIMELY MANNER. STORE THE SWPPP AND ALL AMENDMENTS ON SITE AT ALL TIMES.

2. PREPARE AND SUBMIT A SITE MANAGEMENT PLAN FOR THE ENGINEER'S ACCEPTANCE FOR CONCRETE MANAGEMENT, CONCRETE SLURRY APPLICATION AREAS, WORK IN AND NEAR AREAS OF ENVIRONMENTAL SENSITIVITY, AREAS IDENTIFIED IN THE PLANS AS "SITE MANAGEMENT PLAN AREA", ANY WORK THAT WILL REQUIRE DEWATERING, AND AS REQUESTED BY THE ENGINEER. SUBMIT ALL SITE MANAGEMENT PLANS TO THE ENGINEER IN WRITING. ALLOW A MINIMUM OF 7 DAYS FOR MNDOT TO REVIEW AND ACCEPT SITE MANAGEMENT PLAN SUBMITTALS. WORK WILL NOT BE ALLOWED TO COMMENCE IF A SITE MANAGEMENT PLAN IS REQUIRED UNTIL ACCEPTANCE HAS BEEN GRANTED BY THE ENGINEER. THERE WILL BE NO EXTRA TIME ADDED TO THE CONTRACT DUE TO THE UNTIMELY SUBMITTAL.

3. IT IS THE DESIGNER'S INTENT THAT THE CONTRACTOR BUILD PONDS AND INSTALL EROSION CONTROL BMPS BEFORE PUTTING THEM INTO ACTIVE SERVICE TO THE MAXIMUM EXTENT PRACTICABLE.

4. BURNING OF ANY MATERIAL IS NOT ALLOWED WITHIN PROJECT BOUNDARY.

5. DO NOT DISTURB AREAS OUTSIDE OF THE CONSTRUCTION LIMITS. DELINEATE AREAS NOT TO BE DISTURBED PRIOR TO STARTING GROUND DISTURBING ACTIVITIES. IF IT BECOMES NECESSARY TO DISTURB AREAS OUTSIDE OF THE CONSTRUCTION LIMITS OBTAIN WRITTEN PERMISSION FROM THE PROJECT ENGINEER PRIOR TO PROCEEDING. PRESERVE ALL NATURAL BUFFERS SHOWN ON THE PLANS.

6. ROUTE STORMWATER AROUND UNSTABILIZED AREAS OF THE SITE WHENEVER FEASIBLE. PROVIDE EROSION CONTROL AND VELOCITY DISSIPATION DEVICES AS NEEDED TO KEEP CHANNELS FROM ERODING AND TO PREVENT NUISANCE CONDITIONS AT THE OUTLET.

7. DIRECT DISCHARGES FROM BMPS TO VEGETATED AREAS WHENEVER FEASIBLE. PROVIDE VELOCITY DISSIPATION DEVICES AS NEEDED TO PREVENT EROSION.

8. THE EROSION PREVENTION AND SEDIMENT CONTROL BMPS SHALL BE PLACED AS NECESSARY TO MINIMIZE EROSION FROM DISTURBED SURFACES AND TO CAPTURE SEDIMENT ON SITE. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO COMMENCEMENT OF ANY REMOVAL WORK AND/OR GROUND DISTURBING ACTIVITIES COMMENCE.

9. ESTABLISH SEDIMENT CONTROL DEVICES ON ALL DOWN GRADIENT PERIMETERS AND UPGRADIENT OF ANY BUFFER ZONES BEFORE ANY UP GRADIENT LAND DISTURBING ACTIVITIES BEGIN. MAINTAIN SEDIMENT CONTROL DEVICES UNTIL CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED.

10. LOCATE PERIMETER CONTROL ON THE CONTOUR TO CAPTURE OVERLAND, LOW- VELOCITY SHEET FLOWS DOWN GRADIENT OF ALL EXPOSED SOILS AND PRIOR TO DISCHARGING TO SURFACE WATERS. PLACE J-HOOKS AT A MAXIMUM OF 100 FOOT INTERVALS.

11. PROVIDE PERIMETER CONTROL AROUND ALL STOCKPILES. PLACE BMP A MINIMUM 5 FEET FROM THE TOE OF SLOPE WHERE FEASIBLE. DO NOT PLACE STOCKPILES IN NATURAL BUFFER AREAS, SURFACE WATERS OR STORMWATER CONVEYANCES.

12. FLOATING SILT CURTAIN IS ALLOWED AS PERIMETER CONTROL FOR IN WATER WORK ONLY. INSTALL THE FLOATING SILT CURTAIN AS CLOSE TO SHORE AS POSSIBLE. PLACE PERIMETER CONTROL BMP ON LAND IMMEDIATELY AFTER THE IN WATER WORK IS COMPLETED.

13. DITCH CHECKS WILL BE PLACED AS INDICATED ON THE PLANS DURING ALL PHASES OF CONSTRUCTION.

14. PROTECT STORM SEWER INLETS AT ALL TIMES WITH THE APPROPRIATE INLET PROTECTION FOR EACH SPECIFIC PHASE OF CONSTRUCTION. PROVIDE INLET PROTECTION DEVICES WITH EMERGENCY OVERFLOW CAPABILITIES. SILT FENCE PLACED IN THE INLET GRATE IS NOT AN ACCEPTABLE INLET PROTECTION BMP FOR GRADING OPERATIONS. SILT FENCE PLACED IN THE GRATE IS ONLY ALLOWED FOR SHORT INTERVALS DURING MILLING OR PAVING OPERATIONS. INLET PROTECTION DEVICES MAY NEED TO BE PLACED MULTIPLE TIMES IN THE SAME LOCATION OVER THE LIFE OF THE CONTRACT. INLET PROTECTION DEVICES WILL BE PAID FOR ONCE PER INLET REGARDLESS OF THE NUMBER OF TIMES THE BMP IS PLACED. KEEP ALL STORM SEWER INLET PROTECTION DEVICES IN GOOD FUNCTIONAL CONDITION AT ALL TIMES. REPLACE INLET PROTECTION DEVICE WITH A SUITABLE ALTERNATIVE IF THE PROJECT ENGINEER DEEMS AN INLET PROTECTION DEVICE TO BE NONFUNCTIONAL, IN POOR CONDITION, INEFFECTIVE, OR NOT APPROPRIATE FOR THE CURRENT CONSTRUCTION ACTIVITIES. THERE WILL BE NO COST TO MNDOT FOR REPLACEMENT OF INLET PROTECTION DEVICES.

15. PLACE CONSTRUCTION EXITS, AS NECESSARY, TO PREVENT TRACKING OF SEDIMENT ONTO PAVED SURFACES BOTH ON AND OFF THE PROJECT SITE. PROVIDE CONSTRUCTION EXITS OF SUFFICIENT SIZE TO PREVENT TRACK OUT. MAINTAIN CONSTRUCTION EXITS WHEN EVIDENCE OF TRACKING IS DISCOVERED. REGULAR STREET SWEEPING IS NOT AN ACCEPTABLE ALTERNATIVE TO PROPER CONSTRUCTION EXIT INSTALLATION AND MAINTENANCE.

16. DISCHARGE TURBID OR SEDIMENT LADEN WATER TO TEMPORARY SEDIMENT BASINS WHENEVER FEASIBLE. IN THE EVENT THAT IT IS NOT FEASIBLE TO DISCHARGE THE SEDIMENT LADEN WATER TO A TEMPORARY SEDIMENT BASIN, THE WATER MUST BE TREATED SO THAT IT DOES NOT CAUSE A NUISANCE CONDITION IN THE RECEIVING WATERS OR TO DOWNSTREAM LANDOWNERS. CLEAN OUT ALL PERMANENT STORMWATER BASINS REGARDLESS OF WHETHER USED AS TEMPORARY SEDIMENT BASINS OR TEMPORARY SEDIMENT TRAPS TO THE DESIGN CAPACITY AFTER ALL UPGRADIENT LAND DISTURBING ACTIVITY IS COMPLETED.

17. PROVIDE SCOUR PROTECTION AT ANY OUTFALL OF DEWATERING ACTIVITIES.

18. PROVIDE STABILIZATION IN ANY TRENCHES CUT FOR DEWATERING OR SITE DRAINING PURPOSES.

POLLUTION PREVENTION

1. PROVIDE A SPILL KIT AT EACH WORK LOCATION ON THE SITE.

2. STORE ALL BUILDING MATERIALS THAT HAVE THE POTENTIAL TO LEACH POLLUTANTS, PESTICIDES, HERBICIDES, INSECTICIDES, FERTILIZERS, TREATMENT CHEMICALS, AND LANDSCAPE MATERIALS UNDER COVER AND WITH SECONDARY CONTAINMENT.

3. PROVIDE A SECURE STORAGE AREA WITH RESTRICTED ACCESS FOR ALL HAZARDOUS MATERIALS AND TOXIC WASTE. RETURN ALL HAZARDOUS MATERIALS AND TOXIC WASTE TO THE DESIGNATED STORAGE AREA AT THE END OF THE BUSINESS DAY UNLESS INFEASIBLE. STORE ALL HAZARDOUS MATERIALS AND TOXIC WASTE (INCLUDING BUT NOT LIMITED TO OIL, DIESEL FUEL, GASOLINE, HYDRAULIC FLUIDS, PAINT, PETROLEUM BASED PRODUCTS, WOOD PRESERVATIVES, ADDITIVES, CURING COMPOUNDS, AND ACIDS) IN SEALED CONTAINERS WITH SECONDARY CONTAINMENT. CLEAN UP SPILLS IMMEDIATELY.

4. STORE, COLLECT AND DISPOSE OF ALL SOLID WASTE.

5. POSITION ALL PORTABLE TOILETS SO THAT THEY ARE SECURE AND CANNOT BE TIPPED OR KNOCKED OVER. PROPERLY DISPOSE OF ALL SANITARY WASTE.

6. FUEL AND MAINTAIN VEHICLES IN A DESIGNATED CONTAINED AREA WHENEVER FEASIBLE. USE DRIP PANS OR ABSORBENT MATERIALS TO PREVENT SPILLS OR LEAKED CHEMICALS FROM DISCHARGING TO SURFACE WATER OR STORMWATER CONVEYANCES. PROVIDE A SPILL KIT AT EACH LOCATION THAT VEHICLES AND EQUIPMENT ARE FUELED OR MAINTAINED AT.

7. LIMIT VEHICLE AND EQUIPMENT WASHING TO A DEFINED AREA OF THE SITE. CONTAIN RUNOFF FROM THE WASHING AREA TO A TEMPORARY SEDIMENT BASIN OR OTHER EFFECTIVE CONTROL. PROPERLY DISPOSE OF ALL WASTE GENERATED BY VEHICLE AND EQUIPMENT WASHING. ENGINE DEGREASING IS NOT ALLOWED ON THE SITE.

8. PROVIDE EFFECTIVE CONTAINMENT FOR ALL LIQUID AND SOLID WASTES GENERATED BY WASHOUT OF CONCRETE, STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS. LIQUID AND SOLID WASHOUT WASTES MUST NOT CONTACT THE GROUND. DESIGN THE CONTAINMENT SO THAT IT DOES NOT RESULT IN RUNOFF FROM THE WASHOUT OPERATIONS OR CONTAINMENT AREA.

9. CREATE AND FOLLOW A WRITTEN DISPOSAL PLAN FOR ALL WASTE MATERIALS. INCLUDE IN THE PLAN HOW THE MATERIAL WILL BE DISPOSED OF AND THE LOCATION OF THE DISPOSAL SITE. SUBMIT PLAN TO THE ENGINEER.

10. USE METHODS AND OPERATIONAL PROCEDURES THAT PREVENT DISCHARGE OR PLACEMENT OF BITUMINOUS GRINDINGS, CUTTINGS, MILLINGS, AND OTHER BITUMINOUS WASTES FROM AREAS OF EXISTING OR FUTURE VEGETATED SOILS AND FROM ALL WATER CONVEYANCE SYSTEMS, INCLUDING INLETS, DITCHES AND CURB FLOW LINES.

11. USE METHODS AND OPERATIONAL PROCEDURES THAT PREVENT CONCRETE DUST, PARTICLES, CONCRETE WASH OUT, AND OTHER CONCRETE WASTES FROM LEAVING MNDOT RIGHT OF WAY, DEPOSITING IN EXISTING OR FUTURE VEGETATED AREAS, AND FROM ENTERING STORMWATER CONVEYANCE SYSTEMS, INCLUDING INLETS, DITCHES AND CURB FLOW LINES. USE METHODS AND OPERATIONAL PROCEDURES THAT PREVENT SAW CUT SLURRY AND PLANING WASTE FROM LEAVING MNDOT RIGHT OF WAY AND FROM ENTERING STORMWATER CONVEYANCE SYSTEMS INCLUDING DITCHES AND CULVERTS.

STORM WATER POLLUTION PREVENTION PLAN NARRATIVE

DRAWN BY: XXX | CHECKED BY: XXX | CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE _____

STATE PROJ. NO. XXXX-XX (T.H. XX) SHEET NO. _ OF __ SHEETS

PLOTTED/REVISED: $$$$@DATE@$$$$

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) NARRATIVE (CONTINUED)

WATER RESOURCES NOTES

THESE NOTES ALONG WITH THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) NARRATIVE ARE INTENDED TO GIVE INFORMATION ON CRITICAL DRAINAGE FEATURES, NATURAL RESOURCES AND CONTRACTOR OPERATIONS THAT MAY IMPACT DRAINAGE AND NATURAL RESOURCES.

1. THE SIZE AND ELEVATION OF CULVERTS, STORM SEWER PIPES, CATCH BASINS, PONDS, INFILTRATION/FILTRATION BASINS, PERMEABLE DITCH BLOCKS AND OVERFLOW DEVICES HAVE BEEN SPECIFICALLY DESIGNED TO CONFORM TO MNDOT DESIGN STANDARDS, MINNESOTA POLLUTION CONTROL AGENCY (MPCA) AND WATERSHED DISTRICT PERMIT REQUIREMENTS. THE DESIGN COMPUTATIONS ARE ON FILE WITH MNDOT METRO WATER RESOURCES. CHANGING THESE ITEMS OR THE DIRECTION OF FLOW FROM WHAT IS SHOWN ON THE PLANS MAY CAUSE PROBLEMS OFF THE PROJECT AND COULD MEAN THE PROJECT IS OUT OF COMPLIANCE WITH APPROVED DRAINAGE PERMITS. ANY CHANGES TO THE SIZE, ELEVATION OR DIRECTION OF FLOW OF THE DRAINAGE SYSTEM MUST BE APPROVED BY THE METRO WATER RESOURCES DESIGNER.

2. SUBSOIL ALL DISTURBED GREEN SPACES EXCEPT AS LISTED IN 2574.3A.2.

3. PERFORM POST INSTALLATION MANDREL TESTING OF ALL PLASTIC PIPE.

4. ANY SUBSURFACE DRAINAGE TILES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED, REPLACED OR REROUTED, AND CONNECTED TO THE EXISTING TILE OR DRAINAGE SYSTEM TO ENSURE THAT EXISTING UPLAND DRAINAGE IS PERPETUATED. THIS SHOULD BE DONE TO THE APPROVAL AND SATISFACTION OF THE ENGINEER.

5. THE FOLLOWING WATER RELATED PERMITS APPLY TO THIS PROJECT:

AGENCY	TYPE OF PERMIT
MINNESOTA POLLUTION CONTROL AGENCY (MPCA)	NPDES CONSTRUCTION PERMIT
WATERSHED DISTRICT	NAME
DEPARTMENT OF NATURAL RESOURCES (DNR)	NAME
ARMY CORP OF ENGINEERS	NAME

REVIEW ALL PERMITS FOR ANY SPECIAL CONDITIONS THAT WILL EFFECT CONSTRUCTION OF THE PROJECT.

TEMPORARY DEWATERING ACTIVITIES MAY BE REQUIRED FOR ROADWAY CONSTRUCTION AND UTILITY WORK. THEREFORE IT IS POSSIBLE THAT A PERMIT FOR THE TEMPORARY APPROPRIATION OF WATERS OF THE STATE, NON-IRRIGATION FROM MNDNR WILL BE REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING THIS PERMIT PRIOR TO COMMENCING DEWATERING ACTIVITIES. ALL TEMPORARY DEWATERING SHALL BE DISCHARGED TO AN APPROVED LOCATION FOR TREATMENT PRIOR TO DISCHARGE TO THE RECEIVING WATER. SUBMIT A SITE MANAGEMENT PLAN TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCING WORK.

POND CONSTRUCTION NOTES

1. DO NOT STOCKPILE MATERIALS OR PARK EQUIPMENT OR VEHICLES IN A CONSTRUCTED POND.

2. WET PONDS MAY BE USED AS TEMPORARY SEDIMENT TRAPS OR TEMPORARY SEDIMENT BASINS. CLEAN OUT ALL PERMANENT STORMWATER BASINS TO THE DESIGN CAPACITY AFTER ALL UPGRADIENT LAND DISTURBING ACTIVITY IS COMPLETED REGARDLESS OF WHETHER USED AS TEMPORARY SEDIMENT BASINS OR TEMPORARY SEDIMENT TRAPS.

3. THE CONTRACTOR MAY NOT DRIVE ANY EQUIPMENT ON FINISHED POND BOTTOMS OR POND CORNERS. IF DISTURBED, POND BOTTOM AND POND CORNERS MUST BE RESTORED TO PRE-EXISTING CONDITIONS WITHIN 24 HOURS. ANY RUTS OR DAMAGED TURF THAT COULD CREATE SEDIMENT DISCHARGE TO POND BOTTOMS MUST BE REPAIRED WITHIN 24 HOURS.

INFILTRATION CONSTRUCTION NOTES

1. DO NOT STOCKPILE MATERIALS OR PARK EQUIPMENT OR VEHICLES IN A PROPOSED OR CONSTRUCTED INFILTRATION AREA. STAKE OFF OR OTHERWISE MARK OFF INFILTRATION AREAS TO PREVENT HEAVY CONSTRUCTION VEHICLES AND EQUIPMENT FROM DRIVING THROUGH.

2. DO NOT FULLY EXCAVATE INFILTRATION BASINS UNTIL ALL UPGRADIENT LAND DISTURBANCE ACTIVITY HAS BEEN COMPLETED AND THE DRAINAGE AREA HAS BEEN STABILIZED. PROVIDE RIGOROUS EROSION PREVENTION AND SEDIMENT CONTROL BMPS, INCLUDING MAINTENANCE OF THEM, IF THE INFILTRATION AREA MUST BE COMPLETELY EXCAVATED PRIOR TO COMPLETION OF GROUND DISTURBING ACTIVITIES.

3. INSTALL SEDIMENT CONTROL BMPS AT THE TOE OF THE ADJACENT SLOPE IMMEDIATELY AFTER PLACEMENT OF AMENDED TOPSOIL.

4. SUBMIT A SITE MANAGEMENT PLAN TO THE ENGINEER FOR THE CONSTRUCTION OF INFILTRATION AREAS.

5. STABILIZE SIDE SLOPES PRIOR TO PLACING ANY AMENDED TOPSOIL IN THE BOTTOM OF THE INFILTRATION AREA.

6. DO NOT DRAIN TURBID OR SEDIMENT LADEN WATER TO THE INFILTRATION AREA.

7. USE ONLY LOW IMPACT TRACKED VEHICLES WITHIN INFILTRATION AREAS.

8. THE CONTRACTOR MAY NOT DRIVE ANY EQUIPMENT ON FINISHED INFILTRATION AREAS OR ADJACENT SIDE SLOPES. RESTORE DISTURBED INFILTRATION AREAS AND ADJACENT SIDE SLOPES TO PRE DISTURBANCE CONDITIONS WITHIN 24 HOURS. ANY RUTS OR DAMAGED TURF THAT COULD CREATE SEDIMENT DISCHARGE TO INFILTRATION AREAS MUST BE REPAIRED WITHIN 24 HOURS. SUBSOIL THE INFILTRATION AREA TO REMOVE ANY COMPACTION CAUSED BY VEHICLE TRAFFIC.

9. EXCAVATE ANY SEDIMENT THAT WASHES INTO INFILTRATION AREAS. REMOVE AND REPLACE ANY AMENDED TOPSOIL THAT HAS SEDIMENT DEPOSITS VISIBLE AT THE SURFACE.

10. REPORT ANY SIGNS OF HIGH WATER TABLE OR COMPACTION OF THE IN PLACE SOILS TO THE ENGINEER.

FILTRATION CONSTRUCTION NOTES

1. DO NOT STOCKPILE MATERIALS OR PARK EQUIPMENT OR VEHICLES IN A CONSTRUCTED FILTRATION AREA. STAKE OFF OR OTHERWISE MARK OFF FILTRATION AREAS TO PREVENT HEAVY CONSTRUCTION VEHICLES AND EQUIPMENT FROM DRIVING THROUGH.

2. DO NOT PLACE FILTER MATERIAL IN FILTRATION BASINS UNTIL ALL UPGRADIENT LAND DISTURBANCE ACTIVITY HAS BEEN COMPLETED AND THE DRAINAGE AREA HAS BEEN STABILIZED. PROVIDE RIGOROUS EROSION PREVENTION AND SEDIMENT CONTROL BMPS IF THE FILTRATION AREA MUST BE COMPLETED PRIOR TO COMPLETION OF GROUND DISTURBING ACTIVITIES.

3. INSTALL SEDIMENT CONTROL BMPS AT THE TOE OF THE ADJACENT SLOPE IMMEDIATELY AFTER PLACEMENT OF AMENDED TOPSOIL.

4. SUBMIT A SITE MANAGEMENT PLAN TO THE ENGINEER FOR THE CONSTRUCTION OF FILTRATION AREAS.

5. DO NOT DRAIN TURBID OR SEDIMENT LADEN WATER TO THE FILTRATION AREA AFTER THE FILTER MATERIAL HAS BEEN INSTALLED.

6. THE CONTRACTOR MAY NOT DRIVE ANY EQUIPMENT ON FINISHED FILTRATION AREAS OR ADJACENT SIDE SLOPES. RESTORE DISTURBED FILTRATION AREAS AND ADJACENT SIDE SLOPES TO PRE DISTURBANCE CONDITIONS WITHIN 24 HOURS. ANY RUTS OR DAMAGED TURF THAT COULD CREATE SEDIMENT DISCHARGE TO FILTRATION AREAS MUST BE REPAIRED WITHIN 24 HOURS.

7. EXCAVATE ANY SEDIMENT THAT WASHES INTO FILTRATION AREAS. REMOVE AND REPLACE ANY AMENDED TOPSOIL THAT HAS SEDIMENT DEPOSITS VISIBLE AT THE SURFACE.

8. REPORT ANY SIGNS OF HIGH WATER TABLE OR COMPACTION OF THE IN PLACE SOILS TO THE ENGINEER.

LANDSCAPE NOTES

1. FILTER LOGS SHALL BE PLACED, AS NEEDED, TO TRAP SEDIMENT ON THE LOWER EDGE OF BEDS OR TREE HOLES. FILTER LOGS WILL BE LEFT TO PHOTO DEGRADE.

2. TILLING FOR BEDS OR TREE HOLES MUST BE PLANTED AND MULCHED WITH WOOD CHIP WITHIN 7 DAYS OR STRAW MULCHED UNTIL PLANTING OPERATIONS CAN BE COMPLETED.

3. ANY POND CORNERS OPENED DUE TO TILLING FOR SHRUB BEDS OR TREE HOLES MUST BE PLANTED AND MULCHED WITH WOOD CHIP WITHIN 24 HOURS OR STRAW MULCHED UNTIL PLANTING OPERATIONS CAN BE COMPLETED.

DISTRICT *: $@DISTRICT@$
IPLOT NAME: $$@IPLOT$NAME@$$
PATH & FILENAME: $$$@PATHF\FILENAME@$$$

WATER RESOURCES NOTES AND STORM WATER POLLUTION PLAN NARRATIVE

DRAWN BY: XXX | CHECKED BY: XXX | CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE _____ | STATE PROJ. NO. XXXX-XX (T.H. XX) | SHEET NO. OF SHEETS

MAPS

STORM WATER POLLUTION PREVENTION PLAN NARRATIVE

DRAWN BY: XXX	CHECKED BY: XXX	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE _____	STATE PROJ. NO. XXXX-XX (T.H. XX)	SHEET NO. OF SHEETS

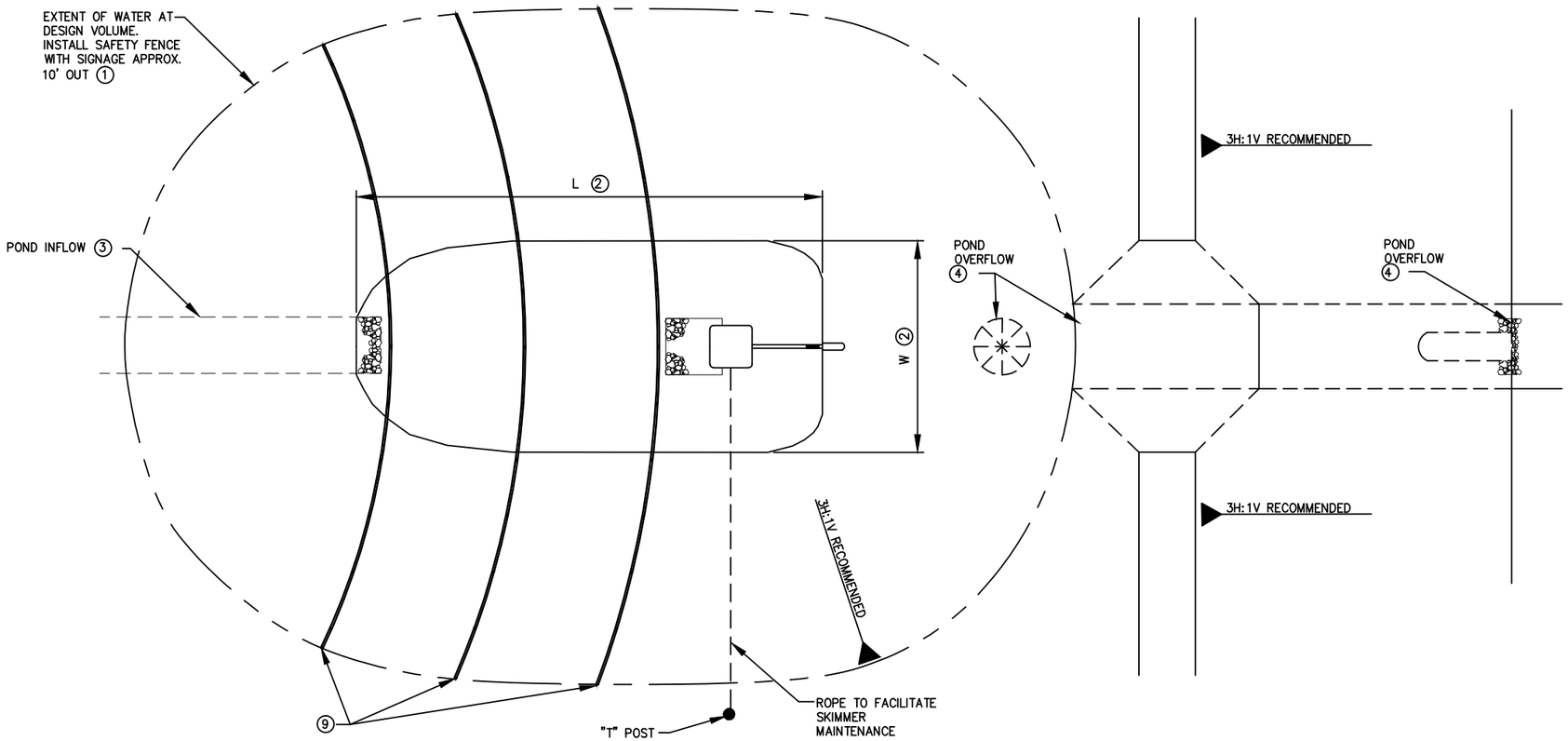
A - This project does/does not have more than 10 acres draining to a common location and therefore a temporary sediment basin is/is not required. Temporary sediment basins shall provide treatment to runoff before it leaves the construction site or enters surface waters. The CONTRACTOR shall comply with the following requirements:

1. Sedimentation basins must provide live storage of runoff resulting from the 2-yr 24-hr rainfall event from each acre drained to the basin with a minimum of 1,800 cf/acre live storage volume. (Where no calculation has been performed, each basin shall provide at least 3,600 CF/acre of live storage.) Sedimentation basins must include a stabilized emergency overflow to prevent basin integrity failure.

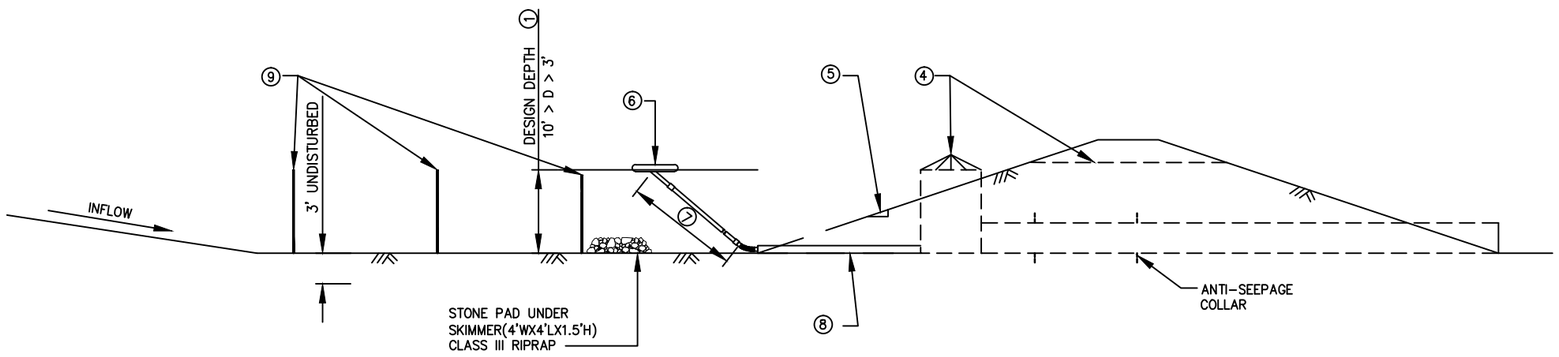
2. Discharge from temporary sedimentation basins will be withdrawn from the surface in order to minimize the discharge of pollutants.

B - Discharge from basin draining shall not adversely affect the receiving water or downstream properties. CONTRACTOR will visually check to ensure adequate treatment has been obtained and that nuisance conditions will not result from the discharge.

C - Any discharge observed to be occurring during the inspection shall be recorded, described, and photographed.



CONSTRUCTION STORM WATER POND – PLAN



CONSTRUCTION STORM WATER POND – SECTION

NOTES:

(1) DESIGN POND VOLUME AT THE DESIGN DEPTH (D) TO HOLD 2.5–INCHES OF WATER OVER THE INFLOW DRAINAGE AREA (SEE POND SIZING CHART BELOW). INSTALL SAFETY FENCE AROUND OUTER EXTENT AND WARNING SIGNS AT ALL FOUR SIDES STATING DROWNING HAZARD .

(2) POND WIDTH (W) SHALL BE APPROXIMATLY HALF THE LENGTH (L).

(3) POND INFLOW MUST BE CONVEYED TO PREVENT EROSION.

(4) POND OVERFLOW MUST BE PROPERLY DESIGNED TO CONVEY STORM WATER IN EXCESS OF THE POND VOLUME TO THE RECEIVING WATERWAY WITHOUT CAUSING EROSION. THIS MAY INCLUDE A RISER PIPE DROP STRUCTURE WITH PIPE THROUGH THE EMBANKMENT WITH SEEPAGE COLLARS AND/OR A POND OVERFLOW SPILLWAY.

(5) POND SIDE SLOPES SHALL BE LINED TO PREVENT EROSION.

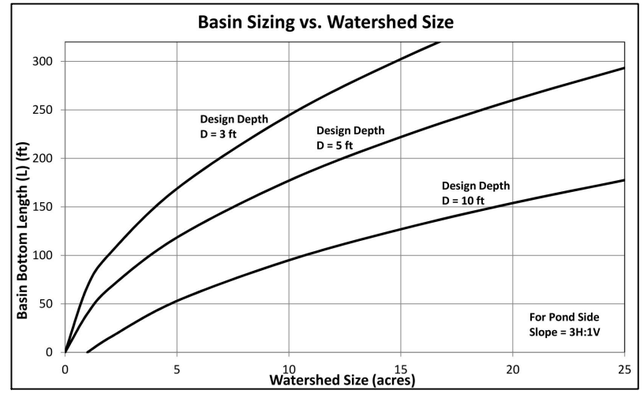
(6) THE POND SKIMMER DEVICE SHALL BE DESIGNED TO SKIM WATER FROM WITHIN 6–INCHES OF THE POND SURFACE AND DRAIN THE DESIGN POND VOLUME OVER A PERIOD OF 72 HOURS WITH A CONSTANT FLOW RATE. SEE SPECIAL PROVISIONS FOR MATERIALS. INSTALL OIL ABSORBENT BOOM AROUND EXTIRE PREIMETER OF SKIMMER.

(7) THE ARM PIPE TO THE SKIMMER SHALL HAVE A LENGTH OF 1.4 TIMES THE DESIGN POND DEPTH (A MINIMUM OF 6 FEET) OR AS RECOMMENED BY MANUFACTURE.

(8) THE BOTTOM OF THE ARM PIPE SHALL BE ATTACHED TO THE RISER STRUCTURE OR DIRECTLY TO A PIPE THROUGH THE EMBANKMENT TO CONVEY SKIMMER WATER DOWNSTREAM. SEE SHEET XX FOR CONNECTION EXAMPLES.

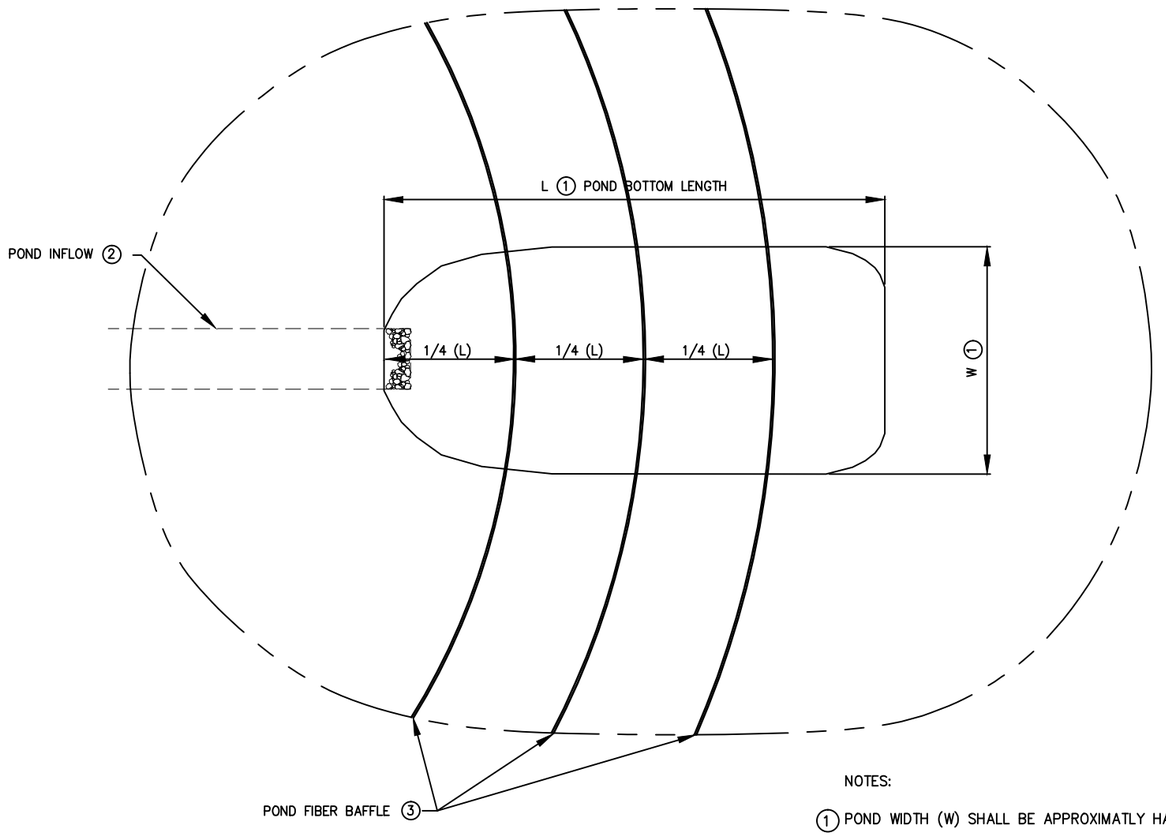
(9) INSTALL THREE POND FIBER BAFFLES IN THE POND FROM THE INFLOW TO THE SKIMMER DEVICE WITH A SPACING OF ONE QUARTER THE BASIN LENGTH (L). TWO POND FIBER BAFFLES MAY BE INSTALLED IN PONDS LESS THAN 20–FEET IN LENGTH WITH A SPACING OF ONE THIRD THE BASIN LENGTH. SEE POND BAFFLE DETAIL.

(10) [redacted]

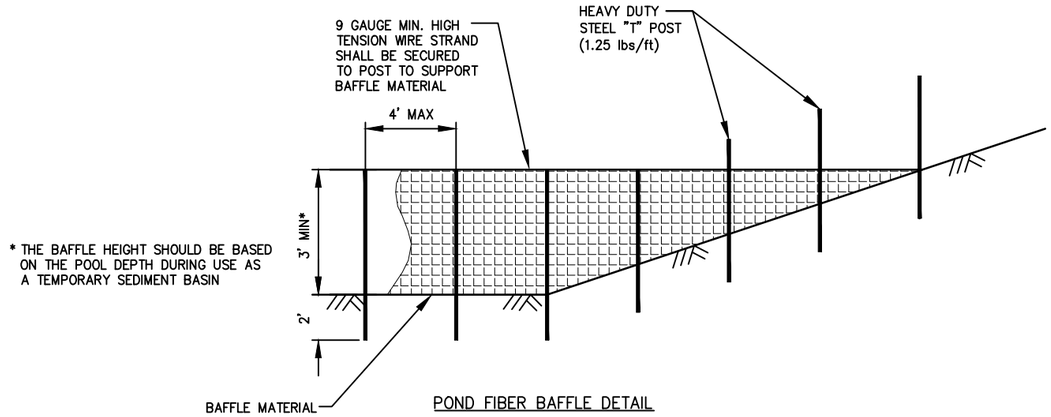


POND SIZING CHART

STANDARD SHEET NO. XXX	TITLE: XXX XXX
STANDARD APPROVED: XXX	
STATE PROJ. NO.	(TH) SHEET NO. OF SHEETS

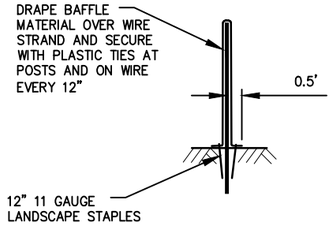


PLAN



* THE BAFFLE HEIGHT SHOULD BE BASED ON THE POOL DEPTH DURING USE AS A TEMPORARY SEDIMENT BASIN

POND FIBER BAFFLE DETAIL



POND FIBER BAFFLE DETAIL

NOTES:

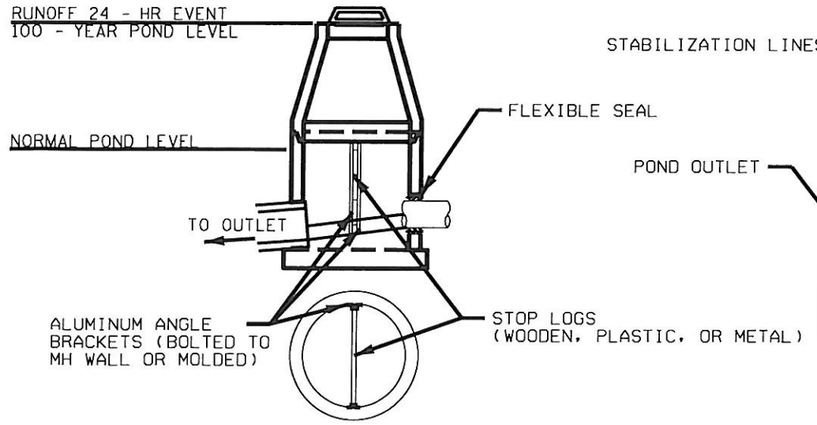
1. POND WIDTH (W) SHALL BE APPROXIMATLY HALF THE LENGTH (L).
2. POND INFLOW MUST BE CONVEYED TO PREVENT EROSION.
3. INSTALL THREE POND FIBER BAFFLES IN THE POND FROM THE INFLOW TO THE SKIMMER DEVICE WITH A SPACING OF ONE QUARTER THE BASIN LENGTH (L). TWO POND FIBER BAFFLES MAY BE INSTALLED IN PONDS LESS THAN 20–FEET IN LENGTH WITH A SPACING OF ONE THIRD THE BASIN LENGTH. SEE POND BAFFLE DETAIL.

STANDARD SHEET NO.	TITLE:
xxx	xxx
STANDARD APPROVED: xxx	xxx

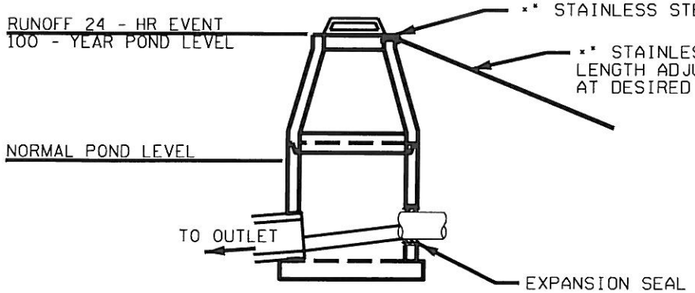
STATE PROJ. NO. (TH) SHEET NO. OF SHEETS

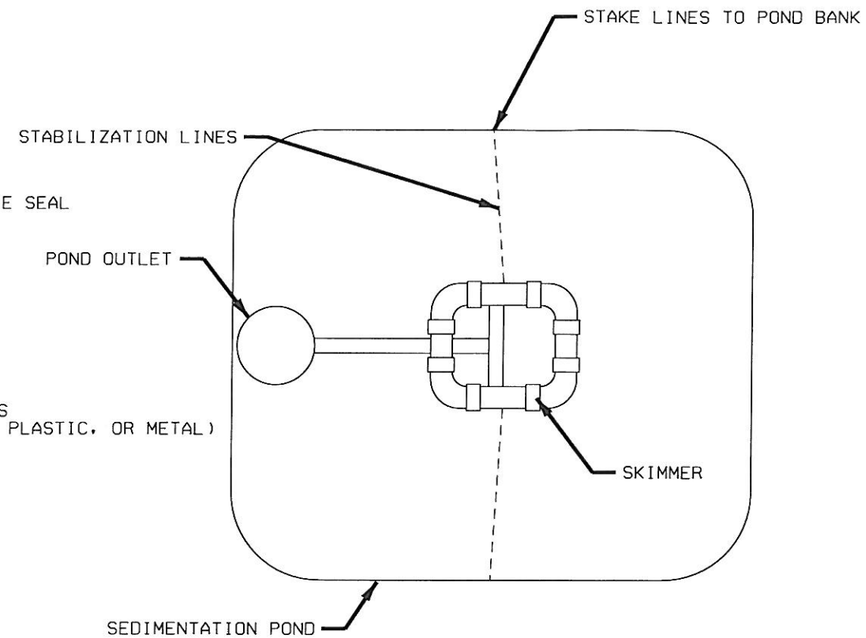
FLOATING HEAD SKIMMER

METHOD 1



METHOD 2



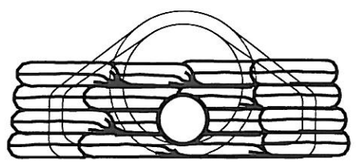


PLAN VIEW OF INSTALLATION

NOTES:

SIZE (DIA)	MAX CAPACITY	
INCHES	CFS	AC-FT/DAY
2	0.04	0.075
2.5	0.06	0.126
3	0.10	0.195
4	0.21	0.419
5	0.38	0.754
6	0.60	1.180

SANDBAG INSTALLATION



END VIEW

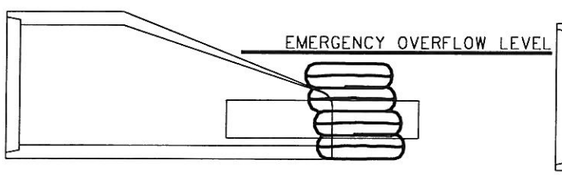
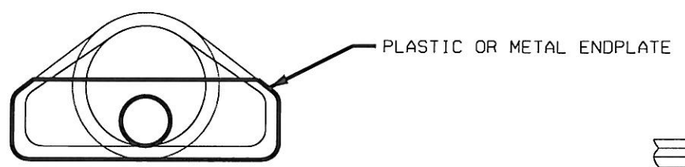
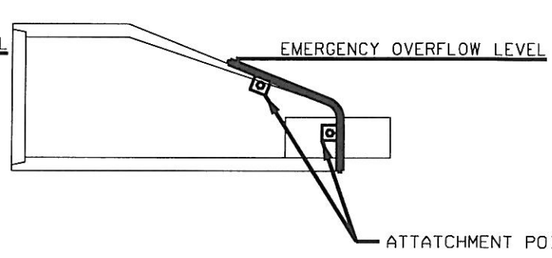


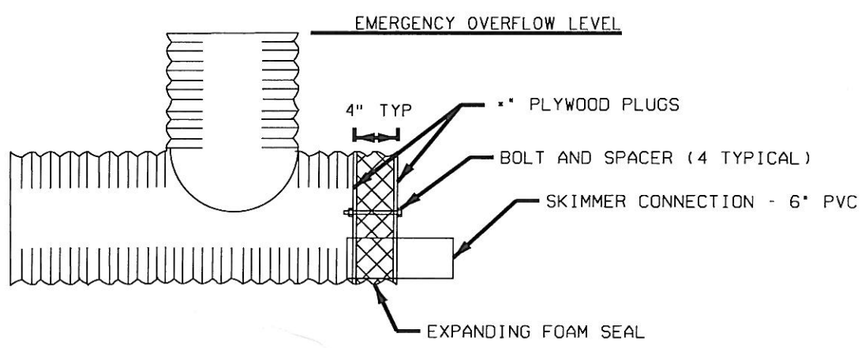
PLATE INSTALLATION



END VIEW



CMP INSTALLATION



STANDARD SHEET NO.	TITLE:
X-XXX.XXX	SEDIMENT CONTROL FLOATING HEAD SKIMMER
STATE PROJ. NO. -	SHEET NO. OF SHEETS

INDEX

PROJECT PLANS

The Plans for this Project, consisting of the sheets tabulated below, were approved by the State Design Engineer.

PROJECT NO.	TYPE OF WORK	TOTAL SHEETS	SHEET NO.	DATE OF APPROVAL
S.P. ##	xxx	##	##	

New or revised sheets were approved as listed below:

PROJECT NO.	SHEET NO.	DATE OF APPROVAL

DIVISION S

S-1 (2573) STORM WATER MANAGEMENT

The provisions of Mn/DOT 2573 are supplemented and/or modified with the following:

S-1.1 The first paragraph of Mn/DOT 2573.3 **A.1 Erosion Control Supervisor**, is revised to read as follows:

The Erosion Control Supervisor shall be a responsible employee of the prime Contractor and/or duly authorized by the prime Contractor to represent the prime Contractor on all matters pertaining to the NPDES construction stormwater permit compliance. The Erosion Control Supervisor shall have authority over all Contractor operations which influence NPDES permit compliance including grading, excavation, bridge construction, culvert installation, utility work, clearing/grubbing, and any other operation that increases the erosion potential on the Project. In addition, the Erosion Control Supervisor shall **implement the Contractor's quality control program and other provisions in accordance with 1717.2 and** be available to be on the Project within 24 hours at all times from initial disturbance to final stabilization as well as perform the following duties:

S-1.2 The first paragraph of Mn/DOT 2573.3 **A.4 Construction of Temporary Sediment Basins and Traps,** is revised to read as follows:

Construct temporary sediment basins per plan for Construction Storm Water Pond concurrently with the start of soil disturbing activities. Direct storm water run off from localized watershed to the basins. Mulch, seed, or both, the exposed side slopes of the basins meeting the requirements of the NPDES permit or within 14 calendar days.

S-1.3 Mn/DOT 2573.3 **G** replace (Blank) with **Pond Fiber Baffle Installation** and add the following:

Install the pond fiber baffle per plan. Use Mn/DOT 3885, Category 5 material.

S-1.4 The first paragraph of Mn/DOT 2573.3 **P.4 Sediment Basins and Traps**, is revised to read as follows:

Inspect the basin after each rainfall event greater than 0.5 inches. Once basin has drained, remove the accumulated sediment if the depth of sediment collected in the basin reaches the top of the rock pad for the pond skimmer. Complete drainage and removal within 72 h of discovery or as soon as field conditions allow access. Remove sediment to the original designed or excavated grade or as necessary to restore the function of the device.

S-1.5 Mn/DOT 2573.4 **I** replace (Blank) with **Pond Fiber Baffle** and add the following:

The Engineer will measure the pond fiber baffle by the length installed.

S-1.6 Mn/DOT 2573.4 Add new section **O Floating Head Skimmer** with the following new paragraph:

The Engineer will measure the float head skimmer by each skimmer provided.

S-1.7 Mn/DOT 2573.5 **E**, **Sediment Traps**, is revised to read as follows:

The Engineer will measure sediment traps (construction storm water ponds) quantities by volume for basin excavation and construction. Items required to install the construction storm water pond per plan not specifically listed here, such as outlet structures and oil boom, are considered incidental to the cost of installing the construction storm water pond. The Engineer will measure excavation by volume of the material in its original position. The Engineer will measure overflow devices separately.

S-1.8 Mn/DOT 2573.5 **I**, **Pay Items**, is revised to adding the following items:

Item No.: 2573.503; Item: Pond Fiber Baffle; Unit: linear foot (meter).
Item No.: 2573.511; Item: Floating Head Skimmer; Unit: each.

S-2 (3875) WATER TREATMENT

The provisions of Mn/DOT 3875.2 are supplemented and/or modified with the following:

S-2.1 Mn/DOT 3875.2 **A.4 Floating Head Skimmer**, is revised to read as follows:

Provide a schedule 40 PVC pipe at least 1.5 in [38 mm] diameter for the floating head skimmer. Use the following skimmers or approved equal: ESC Skimmer, by Erosion Supply Company (http://www.erosionsupply.com/), Faircloth Skimmer, by J.W. Faircloth and Sons Inc. (http://www.fairclothskimmer.com/), IAS Skimmer, by Innovative Applied Solutions, LLC (http://iasllcusa.com/), Marlee Float, by Fee Saver (http://swfeesaver.com/), or Thirsty Duck Buoyant Flow Control Device, by Thirsty Duck (http://thirsty-duck.com/). Use a flocculant with a floating head skimmer in accordance with 3898, "Flocculants," to provide additional treatment if shown on the plans.

INDEX

PROJECT PLANS

The Plans for this Project, consisting of the sheets tabulated below, were approved by the State Design Engineer.

PROJECT NO.	TYPE OF WORK	TOTAL SHEETS	SHEET NO.	DATE OF APPROVAL
S.P. ##	xxx	##	##	

New or revised sheets were approved as listed below:

PROJECT NO.	SHEET NO.	DATE OF APPROVAL

DIVISION S

S-1 (2573) STORM WATER MANAGEMENT

The provisions of Mn/DOT 2573 are supplemented and/or modified with the following:

S-1.1 The first paragraph of Mn/DOT 2573.3 **A.1 Erosion Control Supervisor**, is revised to read as follows:

The Erosion Control Supervisor shall be a responsible employee of the prime Contractor and/or duly authorized by the prime Contractor to represent the prime Contractor on all matters pertaining to the NPDES construction stormwater permit compliance. The Erosion Control Supervisor shall have authority over all Contractor operations which influence NPDES permit compliance including grading, excavation, bridge construction, culvert installation, utility work, clearing/grubbing, and any other operation that increases the erosion potential on the Project. In addition, the Erosion Control Supervisor shall **implement the Contractor's quality control program and other provisions in accordance with 1717.2 and** be available to be on the Project within 24 hours at all times from initial disturbance to final stabilization as well as perform the following duties:

S-1.2 The first paragraph of Mn/DOT 2573.3 **A.4 Construction of Temporary Sediment Basins and Traps,** is revised to read as follows:

Construct temporary sediment basins per plan for Construction Storm Water Pond concurrently with the start of soil disturbing activities. Direct storm water run off from localized watershed to the basins. Mulch, seed, or both, the exposed side slopes of the basins meeting the requirements of the NPDES permit or within 14 calendar days.

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S-2.1 Mn/DOT 3875.2 **A.4 Floating Head Skimmer**, is revised to read as follows:

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APPENDIX D: Kickoff Meeting Notes

Wenck
Engineers • Scientists
Business Professionals

Wenck Associates, Inc.
1802 Wooddale Drive
Suite 100
Woodbury, MN 55125-2937

(651) 294-4580
Fax (651) 228-1969
wenckmp@wenck.com
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MEETING MINUTES

SUBJECT: Pond Skimming Kickoff Meeting

CLIENT: Dwayne Stenlund
Bruce Holdhusen
Minnesota Department of Transportation

PROJECT: Implementation of Floating Weir System for Surface Skimming of Temporary Stormwater Ponds

DATE: January 31st, 2014, 8:00 A.M.

MEETING LOCATION: MnDOT, 395 John Ireland Blvd, St. Paul, MN 55155

MEETING PARTICIPANTS:

Dwayne Stenlund, MnDOT	Joel Toso, Wenck Associates Inc.
Bruce Holdhusen, MnDOT	Ian Peterson, Wenck Associates Inc.

- Review results of pond skimmer technology research.
  - Carolinas house the major proprietors of this technology.
  - Faircloth is the first to enter the market.
  - MnDOT cannot show preference to one technology so the designs must be applicable to any device.
- Discussion of MPCA NPDES general permit.
  - Systems must have equivalent sediment treatment when ponds are not feasible.
  - Stepped ditch system may provide a system to meet that requirement.
  - Potential addition of chemical treatment to improve sediment removal when needed.
  - Need to quantify surface skimming technology removal efficiency in order to determine what equivalent treatment is.
- Modeling task.
  - Will be using HydroCAD and P8 to model the effect of pond skimming technology.
  - Test the reliability of proprietor effluent rate information.
  - Check the effect of orifice flow, pipe flow, and weir flow.
  - Use various configurations and explore configurations that are not available in the marketplace.
  - Identify the effect of soil type on TSS removal for various regions in Minnesota.
  - Use a retention time of 3.25 days to have adequate time for sediment deposition.
- Determine what happens when you have a large watershed and only the space for a small pond.
  - Some construction sites do not have the space to put in a conventional BMP but still need to comply with the general permit.
  - Stepped ditch system with and without skimmers.
  - Rock checks for ponding.
  - May need a flocculent.