Carver County
Water Resource Management
Ordinance and BMP Guidelines
June 18, 2024

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Section 1. Ordinance Guidance

These guidelines have been developed in accordance with the Carver County Water Resource Management Ordinance (Rules) adopted June 28, 2022. This section provides additional guidance on and explanation of rule language. Please note that clarification is not provided for all sections of the ordinance.

A. Submittal Requirements – Erosion and Sediment Control Permit

Related Ordinance Section(s): § 153.42

Yes	No	N/A	Item
			Location Map. A map that shows the site location with property lines in relation to surrounding roads, other geographic features, buildings and other structures
			Drainage Features. Maps including existing and final grades, drainage area boundaries, direction of stormwater flow, all discharge point where stormwater is leaving the site or entering a surface water.
			Topography Map. A topography map showing two-foot contours for the site, invert elevations of existing storm sewer, and/or spot elevations of the conveyance system from drainage discharge points to the nearest receiving water body and for a minimum of 100 feet beyond the site boundary.
			Topography Map. A topography map showing ten-foot contours for subwatersheds upstream and downstream of the project site. Where topography in the region is characteristically flat or hydrologic flow path is undetermined, two-foot contours may be required.
			Vegetation Map. A map for areas where there has been a natural resource or similar inventory, the map shall show the location of trees and vegetation on-site, with identification of those trees and vegetation intended to be retained.
			Landscaping Plan. The plan shall show proposed conditions and shall contain the following: (1) Pervious area identified in square feet or acres; (2) Seed mix(es) or other vegetation type(s) proposed; (3) Note that vegetation must be established to 90% coverage with 100% coverage in areas of concentrated flow.
			Erosion and Sediment Control Plan. The plan shall have both existing and final proposed conditions drawn to scale, shall be consistent with the manual Protecting Water Quality in Urban Areas (Minnesota Pollution Control Agency, 2000) as revised, and shall include the following: (1) Proposed area of grading or other land-disturbing activities and delineation of the limits of disturbance including areas of grubbing, clearing, tree removal, grading, excavation, fill and other disturbance; (2) Quantity of soil or earth material to be removed, placed, stored or otherwise moved on site; (3) Locations and descriptions of proposed runoff control, erosion prevention, sediment control and temporary and permanent soil stabilization measures; (4) A sequence of land alteration activity and corresponding implementation of erosion control practices, monitoring, maintenance and removal of erosion and sediment control measures; and permanent site stabilization measures.

			Prior to commencing activity (following all necessary approvals), the responsible party shall provide the SWCD with a construction schedule which will include approximate dates for the following: (a) Completion of installation of perimeter erosion and sediment controls; (b) Completion of required seeding and mulching activities; (c) Completion of land-disturbing activities and putting into place measures for final soil stabilization and re-vegetation; (d) When the site will be permanently stabilized and re-vegetated; (e) When all temporary erosion and sediment controls will be removed from the site.
			SWPPP. A Stormwater Pollution Prevention Plan (SWPPP) developed for the site to meet National Pollution Discharge Elimination System/State Disposal System (NPDES/SDS) Phase II requirements shall be submitted as part of the application.
			Wetland Protection Plan. The plan shall have both existing and final proposed conditions drawn to scale and shall contain the following: (1) Delineated boundaries of wetlands as determined under the Wetland Conservation Act (WCA); (2) Boundaries of wetland transition setbacks, if applicable per § 153.59 (3) Computations/calculations used to design the wetland transition setback; (4) Locations and descriptions of proposed runoff control, erosion prevention, and sediment control to the wetland transition setback. (5) Upon request, evidence of permits and process required under WCA.
			Monumentation. Plans for sites with buffers including wetland and shoreland setbacks, and sites with dedicated upland preserve areas must include monumentation locations and notes per § 153.64.
			Topsoil Management Plan. The plan shall include the following: (1) Carver County topsoil standard or a site-specific topsoil standard per § 153.62; (2) Note that six inches of topsoil must be restored to all pervious areas; (3) Note regarding the topsoil standard: (a) For sites that have not been previously graded and/or linear reconstruction projects, the note must state that topsoil must meet the Carver County topsoil standard or an approved site-specific topsoil standard. If topsoil does not meet the standard, it must be amended or topsoil meeting the standard must be imported to the site. (b) For sites that have been graded after 2016, the note must state that topsoil must meet the Carver County topsoil standard or a previously approved site-specific standard for the site. If topsoil does not meet the standard, it must be amended or topsoil meeting the standard must be imported to the site. (c) For non-linear sites that were mass-graded before 2016, the note must state that if topsoil does not meet the Carver County topsoil standard, two inches of compost must be added to the soil and tilled to a depth of six inches; (4) Note that subsoil must be de-compacted to a depth of six inches prior to placement of topsoil;

			(5) Location(s) where topsoil is to be reapplied; (6) Quantity of topsoil needed to restore six inches in all pervious areas; (7) Location of stockpile(s), if existing topsoil is to be stockpiled on site; (8) Method of topsoil testing
			Additional information as relevant and necessary to evaluate an application may be required. Requests for additional information shall be submitted in writing to the responsible party and shall specify requirements for submittal to the county.

B. Submittal Requirements – Stormwater Permit

Related Ordinance Section(s): § 153.43

NOTE: All requirements per § 153.42 (items listed in Section 1.A above) and § 153.43 (items listed below) must be submitted.

Yes	No	N/A	Item
			Drainage Features Map. Figure(s) showing existing and proposed sub-watershed boundaries, upstream and downstream hydrologic flow paths drainage patterns, and flow directions.
			Water Resources. Figure showing all on-site water features (including waters of the state).
			Water Resources. Figure showing 100 year and 500 year floodplain areas.
			Water Resources. Figure showing shoreland areas.
			I**mpervious Features Plan**. Figure showing location and amount of existing and proposed impervious area including roads, trails, parking areas, and building areas.
			Stormwater Features Plan. Location, alignment, and elevation of existing and proposed stormwater facilities.
			Construction Plans. Construction plans and specifications for all proposed facilities designed to meet requirements of §§ 153.55 – 153.64.
			Hydrologic Calculations. Hydrologic calculations for runoff volume, velocities, and peak flow rates using Atlas 14 precipitation depths and storm distributions for the 2-year rainfall event; 10-year, 24-hour storm event; 100-year, 24-hour storm event; and 100-year, 10-day snowmelt event for existing and proposed conditions. Please provide both a PDF copy of any summary report(s) for the hydrologic model and a copy of the model in the original software.
			Curve Numbers. Curve numbers used to calculate runoff; Curve numbers used to calculate runoff shall be based on TR 55, Second Edition, June 1986, Table 2 2a with the following changes: (a) Cover type “open space” will be based on the amount of topsoil as well as grass cover. Less than six inches of topsoil equals poor condition; and more than six inches of topsoil equals good condition; (b) Curve numbers used for cover types “urban districts” and “residential districts” assume at least six inches of topsoil and six inches of non-compacted subsoil soil based on the standards in § 153.62 Topsoil management.
			Hydrologic Elevations. Existing and proposed normal water level, high water level, and emergency overflow elevations for the site.
			Professional Engineer. Plans, specifications and computations for stormwater management facilities submitted for review shall be signed by a professional engineer licensed in the State of Minnesota.
			Operation and Maintenance Plan. The operation and maintenance plan shall identify the BMPs constructed as part of the project and shall contain the following: (1) Description of inspection and maintenance activities for the stormwater

			BMPs; (2) Timeline of inspection and maintenance activities for the stormwater BMPs; (3) Contact information for the parties responsible for inspection and maintenance; (4) Signatures of the parties responsible for inspection and maintenance.

C. Submittal Requirements – Stream Crossings Permit

Related Ordinance Section(s): § 153.44

Yes	No	N/A	Item
			Location Map. A map showing the site location with property lines in relation to surrounding roads, other geographic features, buildings and other structures.
			Topography. Topographic map showing two-foot contours for the site, invert elevations of existing storm sewer, and/or spot elevations of the conveyance system from drainage discharge points to the nearest receiving waterbody and for a minimum of 100 feet beyond the site boundary. Topography showing ten-foot contours for subwatersheds upstream and downstream of the project site. Where topography in the region is characteristically flat or hydrologic flow path is undetermined, two-foot contours may be required.
			Project Description. Dimensions, invert elevation(s), and location(s) of the proposed and, if applicable, existing structure(s).
			Nearby Structures. Locations and elevations of existing structures, pipes, or other constructed features upstream and downstream of the site, which have the potential to be impacted by proposed changes in the 2-,10-, and 100-year hydraulic profile of the waterbody. This may be shown on an aerial photograph.
			Erosion and Sediment Control Plan. The plan shall have both existing and final proposed conditions drawn to scale, shall be consistent with the manual Protecting Water Quality in Urban Areas (Minnesota Pollution Control Agency, 2000) as revised, and shall include the following: (5) Proposed area of grading or other land-disturbing activities and delineation of the limits of disturbance including areas of grubbing, clearing, tree removal, grading, excavation, fill and other disturbance; (6) Quantity of soil or earth material to be removed, placed, stored or otherwise moved on site; (7) Locations and descriptions of proposed runoff control, erosion prevention, sediment control and temporary and permanent soil stabilization measures; (8) A sequence of land alteration activity and corresponding implementation of erosion control practices, monitoring, maintenance and removal of erosion and sediment control measures; and permanent site stabilization measures. Prior to commencing activity (following all necessary approvals), the responsible party shall provide the SWCD with a construction schedule which will include approximate dates for the following: (a) Completion of installation of perimeter erosion and sediment controls; (b) Completion of required seeding and mulching activities; (c) Completion of land-disturbing activities and putting into place measures for final soil stabilization and re-vegetation; (d) When the site will be permanently stabilized and re-vegetated; (e) When all temporary erosion and sediment controls will be removed from the site.
			Dewatering Plan. Plan indicating several options for dewatering or by-passing, depending on site conditions at the time of construction. Once the contractor

			has selected a stream diversion option, the SWCD must be notified so that the plan can be reviewed and approved.
			Channel Bottom Information. Information regarding the existing and proposed channel bottom materials. If rip-rap must be used, an explanation of the need should be provided.
			Floodplain. For projects in the FEMA floodway or 100-year floodplain: (a) Quantity of fill within the 100-year floodplain; (b) Existing and proposed 100-year floodplain storage volumes to document that there is no net change to floodplain storage. If fill will be added, a note signed by a professional engineer documenting that the change in storage has no significant impact on the flood elevation. (c) Figure showing the extent of the designated floodway and 100-year flood plain.
			Hydraulic report prepared by a professional engineer, , registered in the state of Minnesota
			Risk assessment form prepared by professional engineer, registered in the state of Minnesota
			Profile showing existing structures and 100- year flow elevation for existing and proposed conditions. Flow elevation in the 2 and 10-year storm events may also be required
			Inundation maps showing existing structures and 100- year flow elevation for existing and proposed conditions. Flow elevation in the 2 and 10-year storm events may also be required.
			Cross sectional flow area at 100-year flow elevation for existing and proposed conditions. For sites with low-lying land, or structures, pipes, or other constructed features at elevations that are at risk of being affected by changes in the 2- and 10-year hydraulic profile, the cross-sectional flow area at the 2- and 10-year flow elevations will also be required
			Changes to water surface elevations between no-bridge, existing, and proposed conditions. This information should be provided for a range of river stations and should encompass, at a minimum, the point upstream and downstream of the structure at which the project results in no change in water surface elevation.
			DNR permit package. For projects on public waters, provide a copy of the permit package submitted to the DNR.
			Construction plan set.
			Additional information as relevant and necessary to evaluate an application may be required. Requests for additional information shall be submitted in writing to the responsible party and shall specify requirements for submittal to the county.

D. Submittal Requirements – Maintenance Permit

Related Ordinance Section(s): § 153.45

Yes	No	N/A	Item
			Completed Maintenance Notification Form, submitted a minimum of ten (10) business days prior to the start of the project.
			Sketches, maps, drawings, and plans relating to the proposed project

E. Erosion and Sediment Control Standards

Related Ordinance Section(s): § 153.55

Minnesota Permit R100001 – The General Permit Authorization to Discharge Storm Water Associated with Construction Activity Under the National Pollutant Discharge Elimination System
2018 NPDES/SDS permit for construction activity-final permit (state.mn.us)

Minnesota Stormwater Manual
Minnesota Stormwater Manual (state.mn.us)

Minnesota Department of Transportation Erosion Control Handbook (2006)
untitled (state.mn.us)

Minnesota Department of Transportation – Erosion Control and Stormwater Management
Erosion Control and Stormwater Management (state.mn.us)

MPCA SWPPP Checklist
wq-strm2-47.doc (live.com)

Minnesota Department of Natural Resources – Best Practices Manual
Best Practices Manual | Minnesota DNR (state.mn.us)

F. Stormwater Management Standards

Related Ordinance Section(s): § 153.56

1. **Treatment Volume Requirements.**

   Calculating the Required TOTAL Treatment Volume for a Site.

   NON-LINEAR
   For non-Linear Projects, the treatment volume must be calculated as 1.0-inch times the sum of new and fully reconstructed impervious surface. Assume a 5-acre commercial site has 75% impervious. Calculate the treatment volume as follows:

   VOLUME REDUCTION calculation:

   Step 1: Calculate the VOLUME to be RETAINED on site (1 inch)

   163,350 ft^2 of impervious x 1 inches x 1 ft/12 inches = **13,613 ft^3**

   Step 1A: If site has qualifying constraint, calculate the VOLUME to be RETAINED on site (0.5 inches)

   163,350 ft^2 of impervious x 0.5 inches x 1ft/12 inches = **6,806 ft^3**

WATER QUALITY calculation:

Step 2: Calculate the volume to be TREATED for WATER QUALITY (0.5 inches)

13,613 ft^3 – 6,806 ft^3 = **6,807 ft^3**

LINEAR

For Linear projects, the treatment volume must be calculated as the larger of 1.0-inch times the new impervious surface or 0.5-inch times the sum of the new and fully reconstructed impervious surface. Assume a linear project of 4 acres of new impervious and 1 acre of reconstructed impervious. Calculate the treatment volume as follows:

VOLUME REDUCTION calculation:

Step 1: calculate the VOLUME to be RETAINED on site (1.0-inch times the new impervious surface or 0.5-inch times the sum of the new and fully reconstructed impervious surface)

174,240 ft^2 of impervious x 1 inches x 1 ft/12 inches = **14,520 ft^3**
OR
217,800 ft^2 of impervious x 0.5 inches x 1 ft/12 inches = **9,075 ft^3**

14,520 is > 9,075 so VOLUME to be RETAINED = **14,520 ft^3**

Step 1A: If site has qualifying constraint, calculate the VOLUME to be RETAINED on site (0.5-inch times the new impervious surface or 0.25-inch times the sum of the new and fully reconstructed impervious surface)

174,240 ft^2 of impervious x 0.5 inches x 1 ft/12 inches = **9,075 ft^3**
OR
217,800 ft^2 of impervious x 0.25 inches x 1 ft/12 inches = **4,537 ft^3**

14,520 is > 9,075 so VOLUME to be RETAINED = **9,075 ft^3**

WATER QUALITY calculation:

Step 2: calculate the volume to be TREATED for WATER QUALITY (1.0-inch times the new impervious surface or 0.5-inch times the sum of the new and fully reconstructed impervious surface)

174,240 ft^2 of impervious x 1 inches x 1 ft/12 inches = **14,520 ft^3**
OR
217,800 ft^2 of impervious x 0.5 inches x 1 ft/12 inches = **9,075 ft^3**

Step 1a:
14,520 is > 9,075 VOLUME to be RETAINED = **14,520 ft^3**

Select BMPs to demonstrate that Volume, TP and TSS Removal Requirements Have Been Met.
Section 2, Best Management Practice (BMP) Guidance can be used on how to identify potential BMPs for volume control and water quality treatment for your site, and how to calculate the volume treated and pollutant removal percentages. A calculator is available on the Carver County website for use in demonstrating that the requirements have been met and is further described in Section 2.A.

Link to WMO Calculator for non-linear projects: <insert updated link when updated calculator is posted>
Link to WMO Calculator for linear projects: <insert updated link when updated calculator is posted>

2. Alternative Compliance Options.

Purpose
If specific site conditions may make water quality treatment and/or volume control treatment difficult, undesirable, or impossible AND offsite treatment is not feasible, an applicant may submit a request to the County for alternative compliance treatment. Alternative compliance options are only available after following the sequencing steps listed below for siting offsite treatment. Options for providing offsite treatment in the locations described below must be explored prior to utilizing other alternative compliance options:

a) To a location that yields benefits to the same receiving water that receives runoff from the original construction activity.
b) Within the same DNR catchment area as the impact.
c) In the next adjacent DNR catchment area upstream.
d) Any feasible location within the CCWMO.

Alternative Compliance Options

a) **Banked Credits.** Water quality treatment and volume reduction credits may be purchased from a qualifying bank. To qualify, the bank must be within the CCWMO and must be reviewed and approved by the County per the water rules in place at the time of approval. Banked credit locations will be reviewed by the County according to the order of preference for alternative compliance treatment locations. Applicants shall submit a letter to the County outlining the conditions of the transfer and confirming the volume of the transfer. The County must review and approve all credit transfers.

b) **In-Lieu Fee.** If sequencing allows, the applicant may pay into the County's Stormwater Treatment In-Lieu Fund to cover the cost of implementing equivalent stormwater treatment elsewhere in the CCWMO.
    i. The required amount to contribute to the In-Lieu Fund shall be based on the cost of planning, designing, constructing, and maintaining stormwater BMP(s) that provide the required water quality treatment and/or volume reduction credit. This amount shall be calculated as 80% of the estimated cost provided by the applicant, provided as an itemized list, and as reviewed and approved by the County.

ii. Money contributed to the Stormwater Treatment In-Lieu Fund shall be allocated to water quality treatment and/or volume reduction projects by the county according to the Water Plan, local Stormwater Management Plans, and the county's list of stormwater improvements as updated from time to time. The treatment achieved by these projects will offset the treatment that was not achieved on the permitted development.

Process & Submittal Requirements

Applicants requesting alternative compliance shall include the following in the stormwater management report or memo:

a) Narrative describing the treatment location sequencing steps
b) Narrative and maps or other supporting information describing the specific site conditions and limitations present
c) Narrative and maps or other supporting information describing the proposed method of alternative compliance
d) The County may request site-specific information, such as soils data, local water table data, and correspondence from parties affected by the project when deciding on alternative compliance eligibility.

Establishing a Stormwater Credit Bank

Credit Banking. Water quality treatment credit and volume reduction credit provided in excess of the treatment requirement may be banked for use on another project. Excess banked credit amounts shall not exceed stormwater credit awarded for the BMP by the county. The county must review and approve all banking credits generated.

An LGU applicant can apply to establish a stormwater credit bank that can be used by other entities, both private and public. It will be the responsibility of the LGU to establish the cost for each credit being offered. Once established, it is the responsibility of the LGU to track the use of credits, with the WMO reviewing all applications for credit withdrawal.

To apply, the LGU must submit the following items:

- Site Plan
- Stormwater Management Plan and Details
- Hydrologic, Hydraulic, and Water Quality Computations
- Regional plan for usage
- Credit Bank Spreadsheet

Eligible BMPs

BMPs with a documented excess of either water quality or volume credit may be eligible for a stormwater credit bank.

Credit Utilization

Once a credit bank has been established, the LGU has the authority to release credits. Volume credits are eligible to be used only within the same major subwatershed. Water Quality credits are eligible to be used in the following ratios based on location:

1:1 credit when used within the same receiving waterbody as the Credit Bank
0.5:1 credit when used outside the receiving waterbody.

3. Requirements for Maintenance and Access.

General requirements for maintenance access

Unless otherwise identified by City or Township Ordinance (etc.), the maintenance access shall be a minimum of 20 feet wide and must be properly maintained in perpetuity to ensure continued access. The maintenance access shall not interfere with setbacks such as wetland, bluff, surface water, shoreland or floodplain.

General requirements for Operation and Maintenance plan

Declaration. A Maintenance Declaration shall be provided when the responsible party for the project does not fall under an approved MS4 permit. An example maintenance declaration has been provided in Section 3, Appendix, A. Example Operation & Maintenance Plan.

Operation and Maintenance Plan. An Operation and Maintenance Plan must be provided when the responsible party for the project does not fall under an approved MS4 permit. Draft operation and maintenance plans will be accepted prior to approval of a project. The final operation and maintenance plan must be submitted prior to release of surety for the project. An example Operation and Maintenance Plan has been provided in Section 3, Appendix, A. Example Operation & Maintenance Plan.

Plans shall contain the following:

a. Legal description and location map of project site;
b. Project description and purpose;
c. Contact information for the party responsible;
d. List of BMPs constructed on the project site
e. Plans with site-specific details for each BMP to be maintained; and
f. Inspection form and maintenance task for each BMP.

G. Surface Water Protection and Setback Standards

Related Ordinance Section(s): § 153.59

Purpose

To establish or preserve an unmanicured, vegetated, transition setback adjacent and contiguous to wetlands, lakes, streams, rivers, and public and private ditches. For projects where the construction activity does not occupy the full parcel, the requirement for setbacks applies only to the portion of the parcel where construction activity is taking place.

Requirements

a. Reference Point. The reference point for measuring the setback width is described below for each type of surface water.
    i. Wetlands
        1. The delineated wetland edge
        2. For wetlands without an approved wetland boundary and type, the wetland boundary shall be determined based on aerial review. NWI mapping may be used if aerial photography is not available.
    ii. Streams & Rivers: the top of bank
    iii. Lakes
        1. The ordinary high-water level (OHWL)
        2. For lakes without an approved OHWL, the water's edge as determined based on aerial review shall be used.

b. Base Width.
    i. Wetlands: 20 feet
    ii. Lakes & Streams: 30 feet

c. Minimum Width.
    i. 30 feet for lakes and streams
    ii. 30 feet for wetlands that receive a ranking of "High" value in the Carver County Wetland Function and Value Assessment or an equivalent wetland function and value assessment.
    iii. 20 feet for wetlands that receive a ranking of "Medium" value or lower in the Carver County Wetland Function and Value Assessment or an equivalent wetland function and value assessment.

d. Applied Width. The setback width shall be adjusted to reflect site conditions based on the criteria below. The maximum applied width is 50 feet.
    i. Stormwater treatment. The base width must be increased by 10 feet in areas where untreated stormwater runoff from impervious surfaces is directed to the surface water and not stormwater BMPs.
    ii. Slopes. For every 5 percent increase in average setback slope from 5 percent, the base width must be increased 5 feet in the area where the slope increase exists.

Average Setback Slope	Increase in Setback Width
0-5% slope	No increase

5-10% slope	Add 5 feet to Base Width
10-15% slope	Add 10 feet to Base Width
>15% slope	Add 15 feet to Base Width

e. Monumentation. The setback shall be indicated by permanent, free-standing markers at the setback's upland edge. See Section 1.J for additional guidance on monumentation.

f. Pre-treatment. Water quality treatment must be provided prior to discharging stormwater runoff to a receiving waterbody. If it is not feasible to provide full water quality treatment prior to discharge to a receiving waterbody, structural treatment for TSS removal must be provided at a minimum. Full water quality treatment shall then be provided at a 2:1 ratio at a discharge point to a different receiving waterbody within the project area.

g. Wetland Hydrologic impacts. The standard for evaluating impacts to wetland hydrology is a greater than 20 percent change in volume to the wetlnd from existing to proposed conditions for the 2- and 10-year event. If the percent change is greater than 20% this demonstrates a significant secondary impact, and one of the following options shall be applied:
    i. Re-direct flow to maintain hydrology,
    ii. Provide mitigation to all impacted wetlands, or
    iii. Establish a monitoring plan that meets the requirements of the Minnesota Wetland Conservation Act.

Accepted Wetland Function and Value Assessments

a. Carver County Wetland Function and Values Assessment. The County completed a wetland function and values assessment in 2001. Data is available on the Carver County Property Information mapping application (https://gis.co.carver.mn.us/publicparcel/) or from Planning and Water Management Staff.

b. BWSRs Agricultural Wetland Evaluation Tool. This wetland functional assessment tool was developed for use in evaluating agricultural wetlands. It is based on the latest version of the Minnesota Routine Assessment Method (MnRAM) for evaluating wetland functions, a BWSR-approved wetland functional assessment. See the links below for additional information.

    Guidance Document (http://www.bwsr.state.mn.us/wetlands/wetlandbanking/agbanking/Agricultural_Wetland_Evaluation_Tool_6-26-13.pdf)

    Web Calculator (http://apps.bwsr.state.mn.us/agbank/)

c. Full or modified Minnesota Routine Assessment Method (MnRAM). Applicants may propose to use the full or a modified version of MnRAM to classify wetlands. If using a modified version of MnRAM, please submit information on proposed modifications to the full MnRAM assessment to Planning and Water Management Staff prior to completing the assessment.

    MnRAM 3.4 (http://www.bwsr.state.mn.us/wetlands/mnram/index.html)

H. Topsoil Management Standards

Related Ordinance Section(s): § 153.62

Purpose

The goal of Topsoil Management is to preserve the structure of undisturbed soils on site and/or maintain comparable to existing quality and permeability of disturbed soils once mass grading is completed and infrastructure is installed.

Carver County Topsoil Standard

Table 1. Carver County Topsoil Standard

Requirement	Range	Test Method
Material Passing the ¾ in [19 mm]	100 %	ASTM D 422
Material passing No 4 in [4.75 mm]	≥ 85%	-
Clay	5% – 33%	ASTM D 422
Silt	5% - 35%	ASTM D 422
Sand	30% - 75%	ASTM D 422
Organic matter	2.5% – 15%	ASTM D 2974
pH	6.1 – 8.0	ASTM G 51
Compaction	- 1,400 kilopascals (kPa) / 200 pounds per square inch (psi) in the upper 12 inches of soil, or - bulk density of less than 1.4 grams per cubic centimeter (g/cm3) in the upper 12 inches of soil	Field test

Matching Existing Soils

For sites that have not been previously graded, a site-specific topsoil standard can be developed using one of the methods described below.

Method 1 Soil Survey Data

A site-specific topsoil standard can be developed using information on physical soil properties from the Natural Resource Conservation Service's Web Soil Survey for Carver County. A site-specific standard shall be developed using a weighted average of the physical soil properties for the top 12 inches of soil map units identified within the project area.

Method 2 Onsite Testing

Non-linear Projects. One (1) sample shall be collected of the top 12 inches of soil from each soil map unit within the disturbed area of the project. Alternatively, a minimum of (2) samples can be collected per 5 acres disturbed, from locations that characterize the site overall or from which topsoil will be stripped and stockpiled. Samples shall be collected and analyzed for percent clay, percent sand, percent silt, organic matter

content, and pH. A site-specific standard shall then be developed using a weighted average of the samples collected on site.

Linear projects. One (1) composite sample shall be collected in select areas where grading and topsoil replacement are proposed, or at a density of approximately one sample per mile. Each composite sample will be comprised of eight individual samples collected of the top 12 inches of soil. Samples shall be collected and analyzed for percent clay, percent sand, percent silt, organic matter content, and pH. A site-specific standard shall then be developed using a weighted average of the samples collected on site.

Site Specific Standard Guidance

Clay, Sand Silt Standards. To develop a site-specific topsoil standard for clay, sand, and silt:

i) (i) Calculate the weighted average for each parameter.
ii) (ii) Round to the nearest whole number.
iii) (iii) When the rounded average matches the lower end of the standard range, subtract 3% from the low end of the CCWMO standard range to establish the lower end of the site-specific standard.
iv) (iv) When the rounded average matches the upper end of the standard range, add 3% to the high end of the CCWMO standard range to establish the upper end of the site-specific standard.
v) (v) When the rounded average falls below the CCWMO standard range, subtract 3% from the rounded average and use that value as the lower end of the site-specific standard.
vi) (vi) When the rounded average falls above the CCWMO standard range, add 3% from the rounded average and use that value as the high end of the site-specific standard.
vii) (vii) If the weighted average falls within the CCWMO standard range, use the CCWMO standard range.

Organic Matter, pH, and Compaction Standards. All site-specific topsoil standards shall include the ranges described in the Carver County Topsoil Standard for organic matter, pH, and compaction. The ranges for organic matter, pH, and compaction may not be changed for the site-specific topsoil standard.

Previously Graded Sites. Non-linear sites that were mass-graded before 2016 are not eligible to create a site-specific topsoil standard. For these sites, if topsoil does not meet the Carver County topsoil standard, two inches of compost must be added to the soil and tilled to a depth of six inches. No further amendment will be required.

Stockpile Testing Requirements

One composite sample shall be collected, tested, and submitted per 2,500 cubic yards of stockpile. For sites with stockpiles less than 2,500 cubic yards, a minimum of one composite sample shall be collected, tested, and submitted.

Stockpile Sampling Procedures

1. One sample shall be collected per 2,500 cubic meters of stockpile (a minimum of one sample shall be taken if stockpiles are less than 2,500 cubic meters).
2. The Contractor/Supplier shall form a face for the full height of the stockpile at four locations.
3. A loader bucket or similar equipment shall then be filled by channeling the full height of the stockpile face, from the bottom to the top, in one operation.
4. The bucket shall then be lowered and emptied by rotation to form a small pile at each sampling location.
5. The sampler shall place a shovel full of soil from each pile into a large container. The soil shall be thoroughly mixed and a sufficient amount of mixed topsoil shall be taken to fill a standard topsoil sampling container.
6. Samples shall be submitted for analysis to lab qualified to use the following test methods: ASTM D 422, ASTM D 2974, and ASTM G 51. Samples shall be analyzed for clay, silt, sand, organic matter, and pH.
7. Additional topsoil shall not be added to the stockpile after sampling.
8. Sample results shall be submitted to the County for review. Test results are valid for 6 months.

In place (ungraded) Topsoil Sampling Procedures

1. The sampling procedure for in place (ungraded) topsoil shall consist of the preparation of one composite sample for each soil map unit within the project area.
2. Each composite sample shall represent full depth topsoil from not fewer than ten individual locations per soil map unit. If the full depth is unknown, a sample from the top 6 inches of soil shall be obtained at each location.
3. The sampler shall place a shovel full of soil from each area into a large container. The soil shall be thoroughly mixed, and a sufficient amount of mixed topsoil shall be taken to fill a standard topsoil sampling container.
4. Samples shall be submitted for analysis to lab qualified to use the following test methods: ASTM D 422, ASTM D 2974, and ASTM G 51. Samples shall be analyzed for clay, silt, sand, organic matter, and pH.
5. Sample results shall be submitted to the County for review.

Subsoil Preparation Methods

Perform subsoil preparation before placing topsoil. Perform subsoil preparation in one direction on the contours perpendicular to the flow of water and slopes flatter than 1:2 (V:H). Scarify/loosen the subsoil to a depth of 6 inches. Subsoil areas shall be loosened to less than 200 psi [1400 kPa]. For saturated soil, delay subsoil preparation until soil dries to at least field capacity.

The following areas do not require subsoil preparation:

- Areas within the dripline of existing trees,
- Over utilities within 30 in of the surface,
- Where trenching or drainage lines are installed,
- Where compaction is required by design (abutments, footings, or inslopes), and
- Inaccessible slopes.

Soil Bed Preparation Methods

Prepare the soil surface to provide a smooth, moist, and evenly textured foundation before sowing seed or placing sod. Complete the tilling after applying soil amendments to the soil. Use cultivating equipment such as disks, harrows, field diggers, or tillers capable of loosening the soil to a depth of at least 6 in on all areas except for slopes steeper than 1:2 (V:H). Till the soil surface to remove track imprints from wheeled or tracked equipment. Operate cultivating equipment on slopes at right angles to the direction of surface drainage. Soil clods, lumps, and tillage ridges 3 in [75 mm] high may remain in place for seeding operations. Soil clods, lumps and tillage ridges 1.5-inch (40 mm) high may remain in place for sodding operations. Multiple passes of the equipment may be needed to meet these requirements

Submittal Requirements

The Topsoil Management Plan shall include the following information:

(1) Topsoil Standard. This section will identify the topsoil standard being utilized for the project.

(2) Topsoil Stripping and Stockpiling Methods. This section shall include the following:
   (a) Estimated quantity of topsoil available on the site.
   (b) Quantity of topsoil needed to restore green space areas.
   (c) Estimated depth of topsoil available on the site.
   (d) Description of equipment used to strip topsoil.
   (e) Temporary methods of erosion control for topsoil stockpile (silt fence or similar).
   (f) Permanent methods of erosion control for topsoil stockpile (establishment of vegetation) if stockpile will remain in place for longer than 6 months.

(3) Topsoil Stockpile Sampling Methods. This section shall include a description of the number of samples to be collected and the process for collecting samples from the stockpile(s). One composite sample shall be collected, tested, and submitted per 2,500 cubic yards of stockpile. For sites with stockpiles less than 2,500 cubic yards, a minimum of one composite sample shall be collected, tested, and submitted.

(4) Topsoil Re-application Procedures. This section shall include the following:
   (a) Method for decompacting subsoil prior to reapplication of topsoil.
   (b) Method for re-applying stockpiled topsoil prior.
   (c) General description of method(s) for amending topsoil to meet specification provided in Table 2, if testing shows stockpiles do not meet specification.

(5) Construction Schedule and Phasing. Construction sequencing shall include:
   (a) Timing for stockpiling topsoil.
   (b) Timing for preparing subsoil and replacing topsoil in common areas.
   (c) Timing for preparing subsoil and replacing topsoil on individual lots.

(6) Plan Sheet(s) showing:
   (a) Quantity of topsoil needed.
   (b) Total green space area including outlots, common areas, boulevards, residential front, rear, and side lots, etc. Green space area shall be shown on plan sheet and calculation of total area shall also be provided.
   (c) Location and size of stockpile(s).

(d) Location(s) where topsoil is to be reapplied.
(e) Note that topsoil must be reapplied at a depth of 6 inches and must meet the specification in Table 2.
(f) Note that topsoil quality and depth must be verified by County or City staff prior to seeding or placement of sod.

I. Upstream and Downstream Impact Standards

Related Ordinance Section(s): § 153.63

Purpose

Development of land can cause significant changes to the surrounding hydrology and nearby properties. The CCWMO may request additional information for individual developments regarding how changes to a site may impact adjacent properties whether upstream or downstream of the project area. Any changes occurring within the project area must minimize impacts adjacent properties.

Required Information

Upstream:

Impacts occurring upstream of a project site may include impoundment of water or changing flowpaths due to changes to topography or drainage pipes. To investigate potential impacts, the CCWMO may request the following information:

- Plans showing offsite location and elevations of known tiles and intakes
- Locations and elevations of culverts under roads or farm accesses
- Location and bottom floor elevation of structures
- Perimeter swales or diversions along property lines shall be identified
- Hydrological model indicating no net increase in surface ponding or impediments within a stormwater system, which includes drain tiles.

Downstream:

Impacts occurring downstream of a project site may include an increase in volume or erosion issues. Extreme events can exacerbate downstream impacts. Projects triggering a stormwater permit are required to maintain or lessen existing rates, however, to investigate the potential of offsite impacts, the applicant may be required to do the following:

- Identify the downstream flowpath to the next receiving water body (wetland, stream, pond, etc.)
- Show the drainage capacity for the EOF flowpath (if different from the typical discharge flowpath)
- Hydrological model indicating no net increase in surface ponding or impediments within a stormwater system, which includes drain tiles.
- Show downstream channel capacity (calculate HWLs, etc.) using the site's discharge pipe(s) one- or two-year event and at full flow. These full flow rates may be higher than the modeled rates, however it allows for review of offsite system capacity at maximum flows.
- Document the downstream culvert or stormwater conveyance capacity.
- Document road overflow elevations
- Document structure elevations

In summary, the County will review the effect of additional volume and extreme events on downstream systems. The Carver Soil and Water Conservation District is available to assist with adjacent agricultural landowners. The proposed development shall not create berms or show other grading that inhibits existing drainage patterns or causes water to pond offsite.

J. Conservation Area Monumentation Standards

Related Ordinance Section(s): § 153.64

Signage at the boundary of conservation areas must comply with the following specifications:

- Posts must be placed at each corner, angle point, approximately every 500 feet along a tangent (straight line segment) and at each intersection between the Easement boundary and existing property lines (i.e. at each lot line), or as prescribed in the approved construction plans. An exception to this specification may be for easement boundaries that are described as abutting and following a meandering riparian edge where permanent monumentation would be impracticable.
- Posts must consist of steel "U" channel posts, minimum length of seventy-two (72) inches, with a minimum weight of 1.12 lbs. per foot.
- An appropriate, approved Easement boundary sign must be attached to the top of each post. Easement boundary signs must be no smaller than 6 inches by 9 inches in size.
- The WMO supplies conservation easement signs and posts in exchange for the cost of materials. The standard sign provided by the WMO is shown below.

Carver County WMO Conservation Area Signage. Dimensions: 6 in x 9 in.

Section 2. Best Management Practice (BMP) Guidance

A. CCWMO Calculator Guidance

The CCWMO Calculators (http://www.co.carver.mn.us/home/showdocument?id=5871) were developed to help guide applicants in determining if proposed BMPs will meet the requirements of Carver County Water Management Organization for treating stormwater. Due to the different requirements for a linear project and a non-linear project, two distinct calculators have been created in Microsoft Excel. These Calculators are also a useful tool in sizing BMPs and for comparing different options that can be used on site. Instructions on how to use the calculator are also available in the calculator.

Each calculator has a number of distinct BMPs that can be chosen from the "Select BMP" dropdown lists. For each BMP, the BMP Details (total volume for the practice or the square footage) must be entered by the applicant. The associated volume reduction, TP treatment, and TSS treatment are calculated from these inputs. For stormwater reuse, BMP details are automatically entered. The table below summarizes the BMPs included in the calculator along with their associated volume reduction, TP reduction, and TSS reduction credit.

BMPs Included in the Calculator

Practice	Volume Reduction Credit	TP Reduction Credit	TSS Reduction Credit
Amended Soils	0.5 inches over area	NA	NA
Bioretention < 3' Separation	NA	75 % of the ponded volume	90% of the ponded volume
Bioretention >3' Separation	40% of the ponded volume	75% of the ponded volume	90% of the ponded volume
Bioretention Swale	40% of the ponded volume	75% of the ponded volume	90% of the ponded volume
Disconnecting Impervious Surface	0.5 inches over amended area	45% of the area equal to the area of impervious discharging	75% of the area equal to the area of impervious discharging
Hydrodynamic Separator	NA	NA	50% of the area equal to the area of impervious discharging
Infiltration	80% of the ponded volume	100% of volume naturally infiltrating	100% of volume naturally infiltrating

Iron Enhanced Sand Filter with <3' Separation	NA	90% of the ponded volume	90% of the ponded volume
Iron Enhanced Sand Filter with >3' Separation	40% of the ponded volume	90% of the ponded volume	90% of the ponded volume
Rock Trench with >3' Separation	50% of the total rock volume below tile invert elevation	NA	NA
Pervious Pavement	50% of the total rock volume below tile invert elevation	90% of the filtration volume designed at 1.5 times larger than WQ volume	90% of the filtration volume designed at 1.5 times larger than WQ volume
Stormwater Reuse	Volume credit is based upon three limiting factors calculated in Reuse Calculations tab	NA	NA
Underground Retention Basin	50% of the total rock volume below storage pipe invert elevation	90% of the filtration volume designed at 1.5 times larger than WQ volume	90% of the filtration volume designed at 1.5 times larger than WQ volume
Upland Vegetation	- 0.25 inches over floodplain grassland preserved or restored - 0.5 inches over upland prairie restored or preserved or floodplain forest preserved of restored. - 1.0 inches over upland woodland and savanna restored or preserved.	NA	NA
NURP Pond	NA	60% of the ponded volume	80% of the ponded volume
NURP Pond with Filtration	NA	90% of the ponded and filtered volume	90% of the ponded and filtered volume
MN SW Manual Pond	NA	40% of the ponded volume	65% of the ponded volume
MN SW Manual Pond with Filtration	NA	75% of the ponded volume	80% of the ponded volume

NA = No credit given

B. BMP Design Guidance

The following construction details and design guidance are included here for reference. **BMPs must be built to the standards described in Section 2.B BMP Design Guidance and Section 2.C BMP Construction Details to qualify for the water quality and volume credits described in the Rules.** Carver County Staff must inspect BMPs following construction.

Alternative designs may be approved if, upon review, the county determines the design will provide treatment equal to or greater than the practices described in this appendix. Applicants wishing to utilize an alternative design must submit plans and specifications for the proposed design along with calculations showing compliance with the stormwater standards of Carver County Ordinance Chapter 153. Calculations should be generated using industry standard models.

Construction details and/or design guidance is provided for the following BMPs:

Section 2.B: Design Guidance	Section 2.C: Construction Details

• Amended Soils
• Pretreatment
• Bioretention
  ○ Basin
  ○ Bench/Shelf
  ○ Iron-Enhanced Sand Filter
  ○ Swale
  ○ Trench
• Disconnected Impervious
• Green Roof
• Hydrodynamic Separators
• Infiltration
• Stormwater Reuse
• Preservation
  ○ Upland
  ○ Floodplain
• Underground Retention Basin
• Wet Pond
  ○ NURP
  ○ MN SW Manual
	• Amended Soils
	• Bioretention
	  ○ Basin
	  ○ Bench/Shelf
	  ○ Iron-Enhanced Sand Filter
	  ○ Offline Basin
	  ○ Swale
	  ○ Trench
	• Modified Rip Rap to Channel Configuration
	• Outlet Structure
	• Permeable Pavement
	• Porous Pavement
	• Stilling Basin
	• Underground Retention Basin

Amended Soil Design Guidance

Purpose
The purpose of amending soil is to decrease the volume and rate of runoff by enhancing soil absorption and plant uptake capacity. A secondary benefit of amending soils with compost is that it reduces or eliminates the need to fertilize turf.

Calculation Method
Water quality. This practice is not eligible for water quality credit.

Volume control. Volume control credit is calculated using a maximum of 0.5 inches over the amended area, or 4.17% of the square footage. When using the WMO Credit Calculator, select "Amended Soil" from the drop-down menu and enter the square footage of the area amended in the 'BMP Details' cell.

Areas Not Eligible for Credit
Areas of active green space (yards, playing fields, etc.) are not eligible. Areas within defined setbacks, either by County or LGU Ordinance are not eligible. Areas with slopes steeper than 3:1, are also not eligible for credit.

Design Detail
Please see the following detail for additional information:

- Detail 4 Pretreatment

Design Guidance
Recommended References

BMPs must be built to the standards described above and defined in the corresponding Construction Details, Section 2.C, in order to qualify for the water quality and volume credits described in the Rules. Additional reference material: Minnesota Stormwater Manual, EPA office of Research and Development, and existing MNDOT specifications.

Approved Construction Materials

- Compost: Mature compost from yard waste is preferred over manure compost for increasing soil infiltration rates. MnDOT Grade 2 compost (See specification 3890), is the recommended compost quality.
- Topsoil: Imported topsoil should meet the CCWMO Topsoil Standard.

Construction Methods

Amended soils can be achieved either by modifying existing soil and/or importing equivalent. Soil testing may be necessary to document the qualities of the amendment. The use of on-site topsoil, or offsite borrow without providing testing results prior to spreading is prohibited.

a. Undisturbed soils.
    i. Step A: Till existing topsoil to a depth of 12 inches using rip-type tillage equipment. During tilling, installation must stop if smearing and compaction is occurring.
    ii. Step B: Apply 2-3 inches of compost to existing topsoil and till to a depth of 8 inches.

b. Disturbed soils.

i. Step A: Before replacement of topsoil, apply 1 inch of compost over subsoil. Till to a minimum depth of 12 inches using rip-type tillage equipment.
ii. Step B: Incorporate compost in the replaced topsoil at a rate of 2 inches of compost per 6 inches total of topsoil. Topsoil should meet CCWMO Topsoil Specs.

Submittal Requirements

Amended Soils Work Plan

Contractor on site shall submit an Amended Soils Work Plan at the preconstruction meeting. This plan outlines the specific steps that the contractor will use to construct these areas. Final approval of this BMP will not be granted without a satisfactory amended soils work plan. Within the plan, the following information will need to be provided:

- Construction plans should include detail of soil amendment methods chosen for site (see details section for example soil amendment detail).
- Construction plans should clearly show the location to be amended and should refer to detail chosen for the site.
- Include the type of equipment to be used for deep ripping, application of compost, and tillage of compost and topsoil.
- Indicate what the detailed phasing of installation of amended soils will be.
- Include name and contact information of the restoration subcontractor.
- Vegetation establishment plan, include a plan that provide vegetation type and rate of establishment.
- Any other site-specific information relevant to ensuring the goal of the amended soils will be met.

Pretreatment Design Guidance

Purpose
Pre-treatment settles out coarse sediment and dissipates energy from stormwater runoff. Pre-treatment reduces maintenance and prolongs the lifespan of stormwater BMPs.

Design Detail
Please see the following detail for additional information:

- Detail 4 Pretreatment

Calculation Method
Pretreatment is not eligible for water quality or volume control credit.

Design Guidance
Pre-treatment prior is required prior to any bioretention, iron-enhanced sand filter, and infiltration practice. Unless runoff passes through a pond first, stormwater shall be routed to a pre-treatment forebay that settles out coarse sediment and dissipates energy. Pre-treatment forebays shall be sized to 10% of the water quality volume routed to the associated BMP. Other methods of pretreatment may be approved by the WMO upon review.

Submittal Requirements

- Calculations that document 10% of the water quality volume is provided in the forebay.

Bioretention Basin Design Guidance

Purpose

In combination with a Bioretention Trench or Iron Enhanced Sand Filter, a bioretention basin collects and treats stormwater through both filtration and plant uptake.

Calculation Method

Water quality. Stormwater routed to a bioretention basin receives a 75% TP reduction and a 90% TSS reduction if paired with a Bioretention Trench. If the practice has an Iron Enhanced Sand Filter, TP reduction is increased to 90%. The amount of stormwater receiving credit is the ponded volume within the basin, with the basin sized to the watershed draining to the practice. When using the WMO Credit Calculator, select the appropriate type of bioretention from the drop-down menu and enter the ponded volume of the bioretention basin in the 'BMP Details' cell.

Volume control.

- Bioretention practices that have **less than 3 feet** of vertical separation from a nearby waterbody are not eligible for volume control credit. Nearby waterbodies include the seasonally high water table, immediately adjacent wet ponds and/or bioretention practices controlled by the same outlet as a wet pond (e.g., bioretention shelves or benches).
- For practices with **3 or more feet** of vertical separation, a 2-foot deep, 3 feet wide rock reservoir must be constructed below the tile to receive volume credit. If the basin is vegetated, 40% of the ponded volume is eligible for volume control credit. If no vegetation is provided, then volume is calculated as 50% of the rock volume below the tile within the rock reservoir.

WMO Calculator. When using the WMO Credit Calculator, select the appropriate type of bioretention from the down-down menu and enter the ponded volume of the bioretention basin in the 'BMP Details' cell.

Design Details

Please see the following details, as needed, for additional information:

- Detail 5 Iron Enhanced Sand Filter
- Detail 6 Bioretention Trench
- Detail 7 MnDOT Irone Enhanced Sand Filter
- Detail 8 MnDOT Bioretention Trench
- Detail 9 Offline Basin
- Detail 12 Outlet Structure

Design Guidance

- Depth of the basin can range from 0.5 feet to 1.5 feet, with a structure to establish a fixed depth.
- A 48-hour drawdown is required for the basin. This is measured from the constructed outlet to the bottom of the basin and is achieved through proper calculation of tile length. Use a filtration rate of 8 cubic feet per square foot of trench surface area. Alternatively, HydroCAD can be used to show drawdown using an exfiltration rate of 2 in/hr.
- Bounce in the 10-year storm event shall not exceed 2.5 feet above the constructed outlet.

- The basin will have a 90%/10% sand compost mix throughout the whole basin bottom to a depth of one foot.
- Orifices shall be at least 6 inches for all BMPs with an underdrain. This includes orifices in weir walls.
- All pipes, including tile lines, must have a positive slope of 0.5% to the outlet.
- A non-perforated pipe shall be used from the trench to an outlet or is daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.
- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.
- Pre-treatment prior to any iron enhanced filtration practice is required. Unless runoff passes through a pond first, stormwater shall be routed to a pre-treatment feature that settles out coarse sediment and dissipates energy. Pre-treatment shall be sized to 10% of the water quality volume routed to the associated BMP.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.
- To establish High Water Level (HWL), the starting elevation shall be set at the constructed outlet elevation, excluding drain tile.

Submittal Requirements

- Drain tile profile for each filtration trench with site specific invert elevations and elevations for each media used.
- Cross section detail for each filtration trench with site specific invert elevation and elevations for each media used.
- Outlet control structure (OCS) detail with site specific invert elevations.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Bioretention Bench or Bioretention Shelf Design Guidance

Purpose
The purpose of a filtration bench or shelf is to increase the TP and TSS treatment of a NURP Pond or MN Stormwater Manual Pond.

Calculation Method
Water quality.

- Stormwater routed to a NURP pond when paired with a Bioretention Bench or Shelf receives a 90% TP reduction and a 90% TSS reduction credit. The water quality volume is calculated as the volume between the normal water level of the pond and 0.5 ft below the normal water level, or, the total volume of 1 inch off impervious surfaces routed to the pond.
- Stormwater routed to a MN Stormwater Manual when paired with a Bioretention Bench or Shelf receives a 75% TP reduction and 80% TSS reduction.
- Iron enhanced sand cannot be added to a bioretention bench or shelf due to frequent inundation.
- When using the WMO Credit Calculator, select “Bioretention <3’ separation” from the drop-down menu, and enter the storage volume between the normal water level of the pond and 0.5 ft below the normal water level in the ‘BMP Details’ cell.

Volume control. This practice is not eligible for volume control credit.

Design Details
Please see the following details, as needed, for additional information:

- Detail 3 Bioretention Bench
- Detail 6 Bioretention Trench
- Detail 8 MnDOT Bioretention Trench
- Detail 12 Outlet Structure

Design Guidance

- The system should be designed for a 0.5-foot drawdown from the Normal Water Level. This volume should be equal or greater than the volume generated from 1 inch off impervious surfaces routed to the pond.
- A 48-hour drawdown is required for the basin. This is measured from the constructed outlet to the bottom of the basin and is achieved through proper calculation of tile length. Use a filtration rate of 8 cubic feet per square foot of trench surface area. Alternatively, HydroCAD can be used to show drawdown using an exfiltration rate of 2 in/hr. The minimum length is 50 linear feet for a 3-foot-wide trench or a minimum of 150 square feet of trench.
- A bench shall be constructed with a minimum 3-foot-wide trench.
- The bench will have a 90%/10% sand compost mix throughout the whole bench bottom to a depth of one foot.
- Orifices shall be at least 6 inches for all BMPs with an underdrain. This includes orifices in weir walls.

- A non-perforated pipe shall be used from the bench or shelf to an outlet or daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- All pipes, including tile lines, need to have a positive slope of 0.5% to the outlet.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.
- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.

Submittal Requirements

- Drain tile profile for each filtration bench/shelf with site specific invert elevations and elevations for each media used.
- Cross section detail for each filtration bench/shelf with site specific invert elevation and elevations for each media used.
- Outlet control structure (OCS) detail with site specific invert elevations.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Iron Enhanced Sand Filter Design Guidance

Purpose

The Iron Enhanced Sand Filter (IESF) is an alternative design to the Bioretention Trench. Adding iron to the filter increases TP removal.

Calculation Method

Water quality. Stormwater filtered through the IESF receives a 90% TP reduction and 90% TSS removal. The amount of stormwater receiving credit is the ponded volume within the basin, with the basin sized to the watershed draining to the practice. When using the WMO Credit Calculator, enter the total volume of the ponded volume in the basin in the 'BMP Details' cell.

Volume reduction.

- To receive volume reduction credits, a rock reservoir below the tile within the Iron Enhanced Trench is required and the BMP must meet vertical separation requirements from nearby ponds, waterbodies, and/or groundwater (3 ft of vertical elevation from the invert of the tile to a downstream pond/waterbody/groundwater). Credit for volume is 40% of the ponded volume, if the basin is vegetated. When using the WMO Credit Calculator, enter the total volume of the ponded volume in the basin in the 'BMP Details' cell.
- If no vegetation is provided, then volume is calculated as 50% of the rock volume below the tile within the rock reservoir. The rock reservoir can be increased beyond what is shown in the standard detail to provide additional volume control. When using the WMO Credit Calculator, select "Rock Trench" from the Select BMP drop-down menu and enter the total rock volume in the "BMP Details" cell on the "Overall Volume Reduction" tab.

Design Details

Please see the following details, as needed, for additional information:

- Detail 4 Pretreatment
- Detail 5 Iron Enhanced Sand Filter
- Detail 7 MnDOT Iron Enhanced Sand Filter
- Detail 12 Outlet Structure

Design Guidance

- The trench must have 2 feet of sand with 5% iron filings by weight, 0.25 feet of washed "buckshot" rock, and 0.75 feet of washed rock that is embedded with a perforated drain tile. Sand and iron shall be mixed evenly prior to installation, mixing can occur offsite.
- The trench shall be a minimum of 3-feet wide.
- If the practice requires volume reduction credit, a minimum of 2 feet of wash rock is required below the drain tile. Adequate vertical separation between filtration practices and downstream NWL, groundwater, etc. must also be provided. Draintile invert(s) of the practice must be 3 feet or more above downstream NWL or groundwater. If following the standard detail, the basin bottom would be 5 feet above downstream NWL or groundwater.
- A 48-hour drawdown is required for the basin. This is measured from the constructed outlet to the bottom of the basin and is achieved through proper calculation of tile length. Use a filtration rate of 8 cubic feet per square foot of trench surface area. Alternatively, HydroCAD can be used to show drawdown using an exfiltration rate of 2 in/hr.

- Bounce in the 10-year storm event shall not exceed 2.5 feet above the constructed outlet.
- Orifices shall be at least 6 inches for all BMPs with an underdrain. This includes orifices in weir walls.
- All pipes, including tile lines, need to have a positive slope of 0.5% to the outlet.
- A non-perforated pipe shall be used from the trench to an outlet or is daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.
- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.
- Pre-treatment prior to any iron enhanced filtration practice is required. Unless runoff passes through a pond first, stormwater shall be routed to a pre-treatment feature that settles out coarse sediment and dissipates energy. Pre-treatment shall be sized to 10% of the water quality volume routed to the associated BMP.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.
- To establish High Water Level (HWL), the starting elevation shall be set at the constructed outlet elevation, excluding drain tile.

Submittal Requirements

- Drain tile profile for each filtration trench with site specific invert elevations and elevations for each media used.
- Cross section detail for each filtration trench with site specific invert elevation and elevations for each media used.
- Outlet control structure (OCS) detail with site specific invert elevations.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Bioretention Swale Design Guidance

Purpose

In combination with a Bioretention Trench or Iron Enhanced Sand Filter, the swale collects and treats stormwater through both filtration and plant uptake.

Calculation Method

Water quality. If designed to CCWMO standards, stormwater routed to a swale using a bioretention trench receives a 75% TP reduction and a 90% TSS reduction. If the practice has an Iron Enhanced Sand Filter trench, TP reduction is increased to 90%. The amount of stormwater receiving credit is the ponded volume within the swale, with the swale sized to the watershed draining to the practice.

Volume control. To receive volume control credits, a rock reservoir below the tile within the Bioretention Trench or Iron Enhanced Sand Filter is required. Credit for volume is 40% of the ponded volume, if it is vegetated. If no vegetation is provided, then volume is calculated as 50% of the rock volume below the tile within the rock reservoir.

WMO Calculator. When using the WMO Credit Calculator, select the appropriate type of bioretention from the drop-down menu and enter the ponded volume in the 'BMP Details' cell.

Design Details

Please see the following details, as needed, for additional information:

- Detail 4 Pretreatment
- Detail 5 Iron Enhanced Sand Filter
- Detail 6 Bioretention Trench
- Detail 7 MnDOT Iron Enhanced Sand Filter
- Detail 8 MnDOT Bioretention Trench
- Detail 12 Outlet Structure

Design Guidance

- The basin will have a 90%/10% sand compost mix throughout the whole basin bottom to a depth of one foot.
- Trench areas, either Bioretention Trench or Iron Enhanced Sand Filter, must be designed according to the details and design guidance outlined within this document. The length of the tile shall extend throughout the entire ponded distance.
- Depth of ponded water can range from 0.5 feet to 1.5 feet.
- A non-perforated pipe shall be used from the trench to an outlet or is daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- All pipes, including tile lines, must have a positive slope of 0.5% to the outlet.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.
- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.

- Pretreatment of stormwater routed to the swale is required. Pretreatment must settle out coarse sediment and dissipate energy. Options include, but are not limited, to 10-foot curb cuts, Rain Guardian © or equivalent, or 10-foot vegetated buffer.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.

Submittal Requirements

- Drain tile profile for each filtration trench with site specific invert elevations and elevations for each media used.
- Cross section detail for each filtration trench with site specific invert elevation and elevations for each media used.
- Outlet control structure (OCS) detail with site specific invert elevations.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Bioretention Trench Design Guidance

Purpose

In combination with a bioretention basin, the trench filters stormwater through a sand compost mix to a drain tile allowing for filtration, storage, and stormwater water uptake by vegetation.

Calculation Method

Water quality credit. Stormwater filtered through the trench receives water quality credit of 75% TP reduction and 90% TSS removal for the volume of water ponded above the trench. The amount of stormwater receiving credit is the ponded volume within the basin, with the basin sized to the watershed draining to the practice. When using the WMO Credit Calculator, enter the ponded volume of the bioretention basin in the 'BMP Details' cell.

Volume credit. If the bioretention practice is designed to CCWMO standards, it receives volume reduction credit for 40% of the ponded volume. Volume credit will be given for bioretention practices that meet the following criteria:

- Basin bottom has greater than or equal to 3 feet of vertical separation from the seasonally high groundwater table or nearby normal water level of a pond, stream, etc.
- Separate basins sited immediately downstream of wet ponds and/or bioretention practices controlled by the same outlet as a wet pond.
- 2-foot deep, 3 feet wide rock reservoir must be constructed below the tile. .
- If no vegetation is provided, then volume is calculated as 50% of the rock volume below the tile within the rock reservoir.

WMO Calculator. When using the WMO Credit Calculator, select the appropriate type of bioretention feature and enter the ponded volume of the bioretention basin in the 'BMP Details' cell.

Design Details

Please see the following details, as needed, for additional information:

- Detail 4 Pretreatment
- Detail 6 Bioretention Trench
- Detail 8 MnDOT Bioretention Trench
- Detail 12 Outlet Structure

Design Guidance

- Pre-treatment prior to any bioretention practice is required. Unless runoff passes through a pond first, stormwater shall be routed to a pre-treatment facility that settles out coarse sediment and dissipates energy. Pre-treatment shall be sized to 10% of the water quality volume routed to the associated BMP.
- Trench
    - The trench shall be a minimum of 3 feet wide.
    - The trench will have 1 foot of 10% compost/90% sand mix, 0.25 feet of washed "buckshot" rock, and 0.75 feet of washed rock that is embedded with a perforated drain tile.
- Volume control criteria. To be eligible for volume control credit, the following are required:
    - A minimum of 2 feet of washed rock is required below the drain tile.

    - Adequate vertical separation between filtration practices and downstream NWL, groundwater, etc. must be provided. Draintile invert(s) of the practice must be 3 feet or more above downstream NWL or groundwater. If following the standard detail, the basin bottom would be 5 feet above downstream NWL or groundwater.
- A 48-hour drawdown is required for the basin. This is measured from the constructed outlet to the bottom of the basin and is achieved through proper calculation of tile length. Use a filtration rate of 8 cubic feet per square foot of trench surface area. Alternatively, HydroCAD can be used to show drawdown using an exfiltration rate of 2 in/hr.
- Bounce in the 10-year storm event shall not exceed 2.5 feet above the constructed outlet.
- Orifices shall be at least 6 inches for all BMPs with an underdrain. This includes orifices in weir walls.
- A non-perforated pipe shall be used from the trench to an outlet or is daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- All pipes, including tile lines, need to have a positive slope of 0.5% to the outlet.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.
- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.
- To establish High Water Level (HWL), the starting elevation shall be set at the constructed outlet elevation, excluding drain tile.

Submittal Requirements

- Drain tile profile for each filtration trench with site specific invert elevations and elevations for each media used.
- Cross section detail for each filtration trench with site specific invert elevation and elevations for each media used.
- Outlet control structure (OCS) detail with site specific invert elevations.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Disconnecting Impervious Surface Design Guidance

Purpose
Disconnecting impervious surfaces, or routing stormwater to vegetation, allows for sheet flow to be treated by vegetation.

Calculation Method
Water quality. This practice is eligible for 45% TP reduction and 75% TSS reduction with a maximum area equal to the area of impervious area discharging to the disconnected area. Discharge must be uniform sheet flow with a maximum flow path of 100 feet.

Volume control. If the pervious area is amended soils, then the disconnected/amended area is also eligible for a volume reduction credit of 0.5 inches over the amended soils equal to the area of impervious surface draining to the area.

WMO Calculator. When using the WMO Credit Calculator, enter the square footage of the disconnected area in the 'BMP Details' cell.

Areas Not Eligible for Credit
The following areas are not eligible for disconnected impervious credit:

- Areas of active green space (yards, playing fields, etc.) are not eligible.
- Areas within defined setbacks, either in County or LGU Ordinance are not eligible.
- Areas with slopes steeper than 3:1, are not eligible for credit.
- Credit will not be given on residential private property.

Design Guidance
Credit for both water quality and volume reduction is based upon a 1:1 ratio, meaning that the maximum area for disconnected impervious surface credit is equal to the area of the impervious area discharging to the vegetated area. Flow paths over impervious surfaces cannot be greater than 100 feet must be uniform sheet flow. For areas utilizing credit in rear backyards, treatment must start at the lot line, outside of private residential property. It is recommended that native plantings be used for these areas.

Submittal Requirements

- A site plan that clearly demonstrates locations and sizes (acres or square feet) of disconnected impervious areas.
- WMO Credit calculator showing the total disconnected impervious area proposed for credit in each subwatershed.

Green Roof Design Guidance

Purpose
In addition to the removal of the roof area from total impervious calculations, green roofs provide stormwater rate control and increase the energy efficiency of the building. For sites with limited space, a green roof can provide stormwater treatment without taking away physical space for other needs.

Calculation Method
The area of the green roof is excluded from the total impervious calculation, thereby reducing the total treatment volume required.

Design Guidance
Please see the Minnesota Stormwater Manual for information on designing a green roof:
http://stormwater.pca.state.mn.us/index.php/Green_roofs

Submittal Requirements
Please contact WMO staff to discuss submittal requirements.

Hydrodynamic Separator Design Guidance

Purpose

Hydrodynamic separators are eligible for use in situations when other BMPs cannot be located in a subwatershed draining directly to a water body. These devices remove particles from stormwater, reducing TSS loading to downstream water bodies.

Calculation Method

Water quality. This practice is eligible for TSS reduction of 50% of the watershed being treated by the device. This BMP is not eligible for TP credit.

Volume control. This BMP is not eligible for volume control credit.

WMO Calculator. When using the WMO Credit Calculator, select the square footage of the area routed to the hydrodynamic separator is to be entered in the 'BMP Details' cell.

Design Guidance

Submit design information showing the structure is sized for a 100-micron particle and for the inflow pipe. At a minimum the device should be sized for 12-inch pipe capacity or 2-year event flow.

Submittal Requirements

- Manufacturer specification of the proprietary device.
- Modeling using the software Sizing Hydrodynamic Separators and Manholes (SHSAM).
- Cross section detail with site specific elevations per each device.
- Outlet control structure (OCS) detail with site specific invert elevations, if necessary.
- The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Infiltration Design Guidance

Purpose

Infiltration practices allow runoff to naturally infiltrate based on the pre-existing conditions found on site.

Calculation Method

Water Quality. 100% TP and 100% TSS removal can be assumed for the volume naturally infiltrating. When using the WMO Credit Calculator, enter the ponded volume of the infiltration basin in the 'BMP Details' cell.

Volume control. 80% of the ponded volume is eligible for volume control credit. For an infiltration practice to receive either volume control credit or water quality credit, infiltration testing is required as outlined below.

Design Guidance

- Pre-treatment prior to any infiltration practice is required. Unless runoff passes through a pond first, stormwater shall be routed to a pre-treatment facility that settles out coarse sediment and dissipates energy. Pre-treatment shall be sized to 10% of the water quality volume routed to the associated BMP.
- Bounce in the 10-year storm event shall not exceed 2.5 feet above the constructed outlet.
- Infiltration tests and soil borings must be provided. Tests must be provided in accordance with approved methods.
    - **Testing requirements.** Unfrozen conditions testing using the methodology in the Minnesota Stormwater Manual is required to determine infiltration rates. Please provide the following:
        - Follow MN Stormwater Manual recommendations for number of test pits (1 per basin). Testing shall occur at the designed basin depth and follow correct testing procedures.
        - Staff from CCWMO or Carver County SWCD will be required to be onsite during these tests.
        - Results must be documented, signed, and submitted by PE/PG.
    - **Infiltration Modeling.** For design purposes, permittees must divide field measured infiltration rates by 2 as a safety factor or permittees can use soil-boring results with the infiltration rate chart in the Minnesota Stormwater Manual to determine design infiltration rates.
    - **Infiltration Depth.** For the infiltration basins, the maximum depth is determined based on the volume of water that can draw-down in 48 hours using the modeled infiltration rate.
- Soil borings do not constitute infiltration testing. Geotechnical surveys provide information to determine the soils load-bearing capabilities, water table and/or chemical contamination.
- An emergency overflow (EOF) is required. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.
- Field infiltration rates above 8.3 in/hr shall be amended in accordance with guidance from the Minnesota Stormwater Manual.

Submittal Requirements

- Results of infiltration testing
- Cross section detail with site specific elevations.
- Outlet control structure (OCS) detail with site specific invert elevations.

Permeable Pavement

Purpose
In addition to the removal of the parking area from total impervious calculations, permeable pavement provides stormwater rate control. For sites with limited space, permeable pavement can provide stormwater treatment without taking away physical space for other needs.

Calculation Method
The area of the permeable pavement is excluded from the total impervious calculation, thereby reducing the total treatment volume required.

Design Details
Please see the following detail, as needed, for additional information:

- Detail 14 Porous Pavement Example

Design Guidance
Further design considerations, please see the Minnesota Stormwater Manual for information on designing a green roof: https://stormwater.pca.state.mn.us/index.php?title=Permeable_pavement

Submittal Requirements
Please contact WMO staff to discuss submittal requirements.

Stormwater Reuse Design Guidance

Purpose

The purpose of stormwater reuse is to utilize collected stormwater as a source for irrigation. A secondary benefit of using stormwater for irrigation is the reduction in potable water being used as a water source for turf grass.

Calculation Methods

To use stormwater reuse to meet the volume requirement, the volume retained (0.5 inches from the site impervious area) must be utilized on site once per week for a period of 20 weeks during the growing season.

Design Guidance

Irrigation Rate. The accepted irrigation rate is a maximum of 2 inches per week for a period of 20 weeks during the growing season (May through September).

Irrigation Area. Acceptable irrigation areas include those that are outside of any LGU Ordinance defined setbacks for sensitive areas, including steep slope setbacks and wetland setbacks. Side slopes of ponds are not eligible to be considered within the irrigation area.

Credit. Credit given will be limited based upon the irrigation area, irrigation rate, amount of impervious area draining to the storage area, and storage limits.

- If the irrigation area is less than the impervious area draining to the storage area, then the credit will be the irrigation rate times the irrigation area.
- If the irrigation area is more than the impervious area, then credit is equal to 0.5 inches over the impervious area.
- The maximum credit given will be 4-week storage volume of the pond or 1-week storage volume of an underground system.
- Irrigation areas cannot be overlapped with other volume BMPs, such as irrigating amended soils or in Upland Vegetation.

Usage Meter. The applicant shall install a usage meter for monitoring water usage. The meter shall be in an area accessible to CCWMO staff.

Stormwater Reuse Plan Sheet. Applicants shall submit a stormwater reuse plan sheet with the following information:

a. Area to be irrigated
b. Area draining to storage structure
c. Location of reuse system components
    - Location of pump
    - Location of intake from pond
    - Location of usage meter
    - Location of potable connection (if using)
    - Location of backflow prevention devices (if using)
    - Location and type of filters (if using)
    - Location of debris collection sumps (if using)
d. Narrative describing operation of system

e. Location of access for maintenance activities
f. Drawdown elevation of pond
g. Water schedule
h. Volume reduction and/or water quality calculation
i. Other information relevant to the reuse system

Pond Calculations. Pond volumes must be submitted to verify a minimum depth of 3 feet remains after irrigation quantity is used. The pond shall provide for the storage of at least 4 times the credit received. Pond storage is the volume between the "off" elevation and either the normal water level or the drawdown level of a filtration shelf or trench. The stormwater reuse plan sheet shall also include a cross section or otherwise indicate what the drawdown elevation will be for the pond. Identify the 'ON' elevation at an elevation that provides for one complete irrigation cycle per required volume. To provide a tolerance for the equipment, this elevation should be at least 0.5 feet above 'OFF' elevation.

Maintenance. A maintenance plan and inspection checklist for the stormwater reuse system shall be developed and incorporated into the maintenance plan for the site. The maintenance plan for the reuse system shall include, but is not limited to, the following:

1. Contact information for the entity responsible for maintaining the reuse system.
2. Acknowledgement that the stormwater reuse system must remain in place in perpetuity or equivalent water quality and volume reduction treatment must be provided if it is to be replaced or if its use is to be discontinued.
3. Inspection schedule with the following activities:
   - Inspect entire collection system and clean winter debris accumulation at start of spring snowmelt
   - Inspect entire collection system and clean accumulated debris in fall prior to winter operations or seasonal shut-down
   - Conduct additional inspections and cleaning of filters as recommended by manufacturer
   - Other activities as appropriate for the system
4. A copy of the Stormwater Reuse Plan Sheet (see above for additional information).
5. Pump manufacturer and maintenance information.

Review of Stormwater Reuse System Design. Prior to selecting a contractor for the construction of the irrigation/stormwater reuse system, the CCWMO must review and approve the design specs for the reuse system. This is to ensure that the designed system is capable of distributing enough water to meet the volume reduction requirement for the site. Below are submittal requirements for review.

1. Provide a system text summary, (typically in cover letter) and includes
   a. Volume required
   b. Area
   c. Inches per week applied (typically 1" per week)
2. A site plan that shows storage location, the pipe network and irrigation reuse areas, pump location and electrical source
   a. Show the contributing area has sufficient runoff to fill the pond or tank
3. Pond or Tank Storage
   a. Pond volume can be taken from HydroCAD model
   b. Pond should hold a minimum volume equivalent to 4 weeks of irrigation
   c. Provide pond cross section with water level elevations (max drawdown level must leave 4' of water in the pond)
   d. Tank manufacturer and dimensions needed

        i. Storage volume is reduced by sediment storage
        ii. Tank should hold a minimum volume equivalent to 1 week of irrigation.
4. Provide a distribution plan
    a. Show number of heads
        i. Provide the spec for individual heads
    b. Show and label irrigation zones.
    c. Watering schedule
5. Pump
    a. Submit pump manufacturer, model number, and pump curve
    b. Power requirements
    c. Operating pressure
    d. Pump on/pump off elevations
6. Backup Supply
    a. Water meter size, service main size and flow and pressure available.
    b. Backflow preventer
    c. Separate water meter from the pump supply meter
    d. Letter of approval from the City that they will allow a stormwater reuse system to connect "touch" the municipal supply. Not all municipalities have code that allow this.

Additional Resources. Review the Metropolitan Council's Stormwater Reuse Guide for information on designing a reuse system:
http://www.metrocouncil.org/environment/WaterSupply/STORMWATER%20REUSE%20GUIDE_2012.zip

Preservation or Restoration of Upland Vegetation Design Guidance

Purpose

The purpose of preserving or restoring upland areas (prairie, woodland, forest) is to decrease the volume and rate of runoff by preserving soil absorption and plant uptake. Recorded conservation easements are required to ensure the permanent protection of these areas.

Calculation Method

See the table below for a summary of the volume credit given to different types of vegetation. No TP or TSS credit is available for this BMP. When using the WMO calculator, select the appropriate upland preservation BMP type and enter in the square footage of the upland preservation area in the 'BMP Details' cell.

Vegetation Type	Volume Credit (*n* inches x area preserved or restored)	TP/TSS Credit
Preserved or restored prairie	0.5 in	NA
Preserved or restored prairie (in floodplain)	0.25 in	NA
Preserved or restored woodland/savanna	1.0 in	NA
Preserved or restored woodland (in floodplain)	0.5 in	NA

Areas Not Eligible for Credit

The following areas are not eligible for upland preservation credit:

- Areas that are within steep slope setbacks with no disturbance.
- Areas within a wetland setback.
- Areas with slopes greater than 3:1.
- Areas less than 10 feet in width and less than 500 square feet.
- Credit will not be given if applied in the same area as other volume BMPs, such as Stormwater Reuse or Amended Soils.
- If areas proposed are adjacent to stormwater facilities, credit will not be given for any areas below the 100-year high water level, emergency overflow locations, or maintenance access trails.

Design Guidance

Upland Preservation or Restoration

The area to be preserved should consist of existing trees or predominantly native vegetation. Areas to be restored must be restored to predominantly native vegetation. Areas near stormwater BMPs must be above the HWL to receive credit. A vegetation establishment and maintenance plan must be submitted for review, see Submittal Requirements for more information.

Woodland Preservation or Restoration

The area(s) to be preserved should consist of either an existing wooded area that is a contiguous area of land which has trees that are confirmed to be of a desirable species, healthy and mature, 20 years or older, deciduous, or evergreen trees with a minimum height of ten feet. The canopy cover is mostly

interrupted to continuous with 50-100% cover in the summer months. Areas proposed for woodland restoration must submit an establishment plan see Submittal Requirements for more information.

Submittal Requirements

Establishment/Construction Plan. The following information must be submitted if restoration of a prairie or woodland community is proposed.

Upland Prairie

a. A figure clearly showing the location and size of the upland preserve area.
b. Detailed seeding establishment plan including:
    - Seed mix and application rate (recommend referencing the MnDOT Seeding Manual 2014 Edition).
    - Seed application method.

Upland Woodland

a. A figure clearly showing the location and size of the upland preserve area.
b. Tree planting establishment plan that includes a minimum of 170 trees per acre.
c. The woodland preservation sheet must specify the tree species to be used. No more than 10% of any one species, 20% of any one genus, or 30% of any family (Urban Tree Planting Rule)
    - Shrubs can be included as part of the wooded area(s).
    - Species selected for planting should reflect the natural range of variability in species composition and the greatest genetic diversity of individuals to foster adaptation to current and future climatic conditions. For a list of possible tree species options please see Appendix Item B.
d. 1'' of water needs to be provided per week for the first growing season, a watering plan needs to be provided that includes how this requirement will be achieved.
e. If planting on a slope, a tree planting sectional detail must be provided.

Maintenance Plan. A maintenance plan must be submitted for all vegetation types.

Upland Prairie

a. Contact information for the entity responsible for maintaining the preserved area.
b. A re-seeding plan for areas that do not establish within the first year.
c. A maintenance schedule that includes detailed information/guidance on how/when prairie management strategies will be initiated (scheduled burns, mowing, etc.)

Upland Woodland

a. Contact information for the entity responsible for maintaining the preserved area.
b. A tree replacement plan must be included in the maintenance plan with language that addresses rate of tree replacement should ≥ 50% of the canopy cover of the preserved area die-off. The replacement plan should address species type, planting type (plug, root ball, etc.), and rate of replacement.
c. Tree replacement plan for trees that do not survive first transplant.
d. Trees need to be protected and marked for maintenance.
e. Maintenance plan that includes details of how the preserve will be maintained to provide quality habitat in the extended future.

Conservation Easement Template

The area to be preserved must be placed under easement to ensure that it continues to provide treatment in perpetuity. See Section 3, Appendix B for an example conservation easement template.

Underground Retention Basin Design Guidance

Purpose

Underground treatment is becoming more common in the CCWMO as redevelopment and in-fill development takes place.

The underground system shall be two (at a minimum), physically separate cells in series to maximize treatment and allow for monitoring and maintenance. The primary cell shall be pretreatment and rate control (and volume if applicable) and the secondary cell(s) shall be for water quality.

Calculation Method

Water quality. For underground treatment systems designed to meet CCWMO standards, 90% TP reduction and an 90% TSS reduction can be assumed for the volume of water directed to the water quality cell(s) at a 1.5 multiplier. This translates to achieving the full 90% TP and 90% TSS credit by designing the amount of filtration volume to be 1.5 times greater than the Water Quality Volume draining to the BMP System. The amount of stormwater receiving water quality credit is the filtration volume within all cells below the lowest controlling outlet. When using the WMO Credit Calculator to enter an Underground Retention Basin, the BMP will be entered on one line. Select the appropriate BMP type and enter the filtration volume of all cells below the lowest controlling outlet.

Volume control. The same above ground BMP approach will be used for volume credit, so no volume credit will be given for underground systems with less than 3 feet of vertical separation from a nearby groundwater elevation or sited immediately adjacent to wet ponds and/or bioretention practices controlled by the same outlet as a wet pond (e.g., bioretention shelves or benches). To receive volume reduction credits, a rock reservoir can be constructed below the primary cell or secondary cell. Credit for volume is calculated per the CCWMO detail as 50% of the rock volume within the rock reservoir below the tile invert. When using the WMO Credit Calculator, select 'Rock Trench' and enter the rock volume of the rock reservoir in the 'BMP Details' cell.

Design Detail

Please see Detail 17 Underground Filtration Schematic for additional information.

Design Guidance

- No iron enhanced sand will be allowed in underground treatment systems.
- To be eligible for volume reduction credit, 3 feet or more of vertical separation between underground system and downstream NWL, groundwater, etc. must be provided.
- Pre-treatment prior to any underground system is required. Pretreatment can be provided in the form of header rows.
- The system must draw-down in 48-hours.
- Orifices shall be at least 6 inches, including orifices in weir walls.
- All pipes, including tile lines, must have a positive slope of 0.5% to the outlet.
- A non-perforated pipe shall be used from the secondary cell(s) to an outlet or is daylighted. If routed to an outlet, the last 10 feet of pipe shall be Schedule 40 or equivalent going into the structure.
- If the tile outlet is tied into a structure, a minimum of 6 inches is required above the OCS outlet invert.

- Outlet pipe invert must be a minimum of 6 inches above the bottom of the OCS structure.
- A minimum 1-foot drop is required when daylighting an outlet pipe to the downstream conveyance system to allow for free-flowing discharge.
- All daylit outlet pipes shall have a corresponding rodent guard, trash guard or similar device, and a tile marker post identifying location of outlet.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL.
- Access: Long term monitoring and maintenance is critical to provide treatment as required by the rules. Water quality cell(s) must be accessible for the purposes listed below. Multiple access locations may be necessary.
    - visual observation,
    - human access, and
    - equipment access.
- Maintenance. A maintenance plan and inspection checklist for the underground system shall be developed and incorporated into the maintenance plan for the site. The maintenance plan for the underground system shall include, but is not limited to, the following:
    - Contact information for the entity responsible for maintaining the system.
    - Acknowledgement that the underground system must remain in place in perpetuity or equivalent water quality and volume reduction treatment must be provided if it is to be replaced or if its use is to be discontinued.
    - A map of the site with access locations clearly called out.
    - A calculation sheet to enable field staff to determine the standing water level from the access locations based on measurement from the rim elevation to standing water. Sheet should include a note stating rim elevations and calculation sheet will need to be updated following construction with as-built elevations.
    - Inspection schedule with the following activities:
        - Inspect entire system and clean winter debris accumulation at start of spring snowmelt
        - Inspect entire collection system and clean accumulated debris in fall prior to winter operations or seasonal shut-down
        - Conduct additional inspections and cleaning of filters as recommended by manufacturer
        - Other activities as appropriate for the system

Submittal Requirements

a. Manufacturer specifications of the underground system.
b. Cross section detail with site specific invert elevations for both cells.
c. Outlet control structure (OCS) detail with site specific invert elevations.
d. The normal water elevation of the downstream receiving waterbody shall be included in the plans.

Stormwater Detention Ponds - NURP Design Guidance

Purpose

Stormwater ponds capture, control, and provide sedimentation of impervious runoff. When enhanced with plantings, they can increase plant uptake of excess nutrients. In combination with a Bioretention Bench or Shelf, the basin collects and treats stormwater through both filtration and plant uptake.

Calculation Method

Water quality.

- For stormwater ponds designed to meet NURP design criteria, 60% TP removal and 80% TSS removal can be assumed for the ponded volume. When using the WMO Credit Calculator, select the appropriate BMP type from the drop-down menu and enter the volume of water below the normal water level of the pond.
- For ponds designed to meet NURP criteria that include either a filtration bench or filtration shelf, 90% TP removal and 90% TSS removal can be assumed for the ponded volume and filtered volume. When using the WMO Credit Calculator to enter a NURP pond with filtration select the appropriate BMP type from the drop-down menu and enter the volume of water below the normal water level of the pond.

Volume control. This practice is not eligible for volume control credit.

Design Details

Please see the following details, as needed, for additional information:

- Detail 6 Bioretention Trench
- Detail 8 MnDOT Bioretention Trench
- Detail 12 Outlet Structure

Design Guidance

- Stormwater ponds designed to meet NURP design criteria shall size ponds to provide 2.5 inches over the entire watershed draining to the pond as dead storage.
- Ponds must hold the 100-year event.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap will not be an acceptable method for EOF reinforcement.
- Rim elevations on OCS structures shall be at or above the 100-year high water level.

Submittal Requirements

a. Construction plans showing normal water elevations, 100-year high water elevations, and outlet invert elevation.
b. Outlet control structure (OCS) detail with site specific invert elevations.
c. The normal water elevation of the downstream receiving waterbody shall be noted in the plans.

Stormwater Detention Ponds – MN Stormwater Manual Design Guidance

Purpose
Stormwater ponds capture, control, and allow for settling of sediment carried in runoff from impervious surfaces. In combination with a vegetated Bioretention Bench or Shelf, the basin collects and treats stormwater through both filtration and plant uptake.

Calculation Method
For stormwater ponds designed to meet criteria outlined in the MN Stormwater Manual, 40% TP removal and 65% TSS removal can be assumed for the ponded volume. When using the WMO Credit Calculator, select the appropriate BMP type from the drop-down menu and enter the volume of water below the normal water level of the pond.

For ponds designed to MN Stormwater Manual criteria that include either a filtration bench or filtration shelf, 75% TP removal and 80% TSS removal can be assumed for the ponded volume. When using the WMO Credit Calculator, select the appropriate BMP type from the drop-down menu and enter the volume of water below the normal water level of the pond.

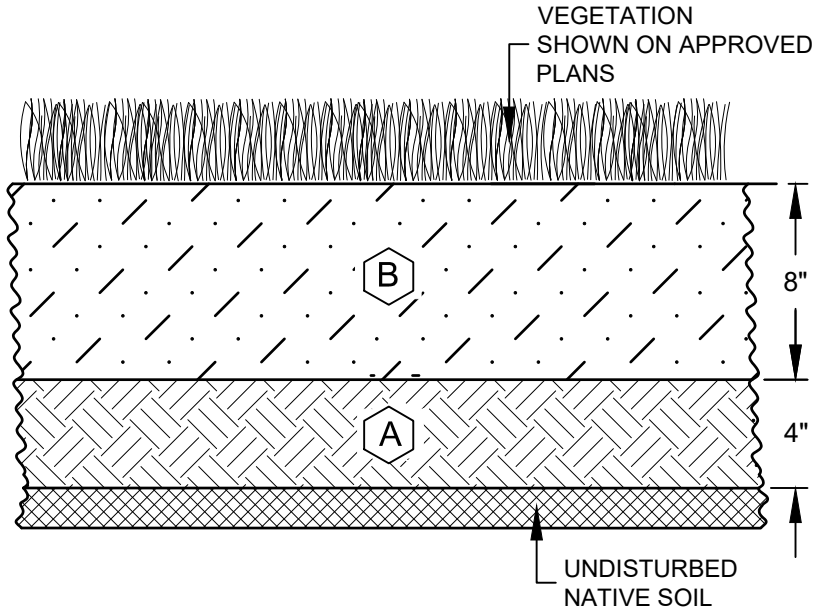
Design Details
Please see the following details, as needed, for additional information:
- Detail 6 Bioretention Trench
- Detail 8 MnDOT Bioretention Trench
- Detail 12 Outlet Structure

Design Guidance
- Per the MN Stormwater Manual, the required minimum permanent pool volume, or dead storage, is 1800 cubic feet of storage below the outlet pipe for each acre that drains to the pond.
- Ponds must hold the 100-year event.
- An emergency overflow (EOF) is also required in addition to the structure outlined above. EOFs must be a minimum of 0.5 feet above the associated HWL. EOFs must be reinforced with turf reinforcement matting (TRM), or similar. Rip rap is not an acceptable method for EOF reinforcement.
- Rim elevations on OCS structures shall be at or above the 100-year high water level.

Submittal Requirements
a. Construction plans showing normal water elevations, 100-year high water elevations, and outlet invert elevation.
b. Outlet control structure (OCS) detail with site specific invert elevations.
c. The normal water elevation of the downstream receiving waterbody shall be noted in the plans.

C. BMP Construction Details

UNDISTURBED SOILS



A TILL OR RIP SOIL TO A DEPTH OF 12 INCHES USING RIP-TYPE TILLAGE EQUIPMENT. DURING TILLING, INSTALLATION MUST STOP IF SMEARING AND COMPACTION IS OCCURRING.

B APPLY 2 TO 3 INCHES OF MNDOT GRADE 2 COMPOST TO EXISTING TOPSOIL AND RE-TILL TO A DEPTH OF 8 INCHES

CALCULATIONS TO MEET RULES

VOLUME:

1. VOLUME REDUCTION IS CALCULATED USING 0.5 INCHES OVER THE AMENDED AREA.

NOTE: CONTRACTOR SHALL SUBMIT AN AMENDED SOILS WORK PLAN TO WMO REPRESENTATIVE AT PRECONSTRUCTION MEETING. AMENDED SOILS WORK PLAN SHALL INCLUDE INFORMATION ON METHOD, EQUIPMENT TO BE USED, PHASING, NAME OF RESTORATION SUBCONTRACTOR, AND OTHER INFORMATION RELEVANT TO ENSURING THE GOAL OF THE AMENDED SOILS WILL BE MET. FINAL APPROVAL WILL NOT BE GRANTED WITHOUT SATISFACTORY AMENDED SOILS WORK PLAN.

CARVER COUNTY	Stantec	AMENDED SOILS	JUNE 2023
			DETAIL 1

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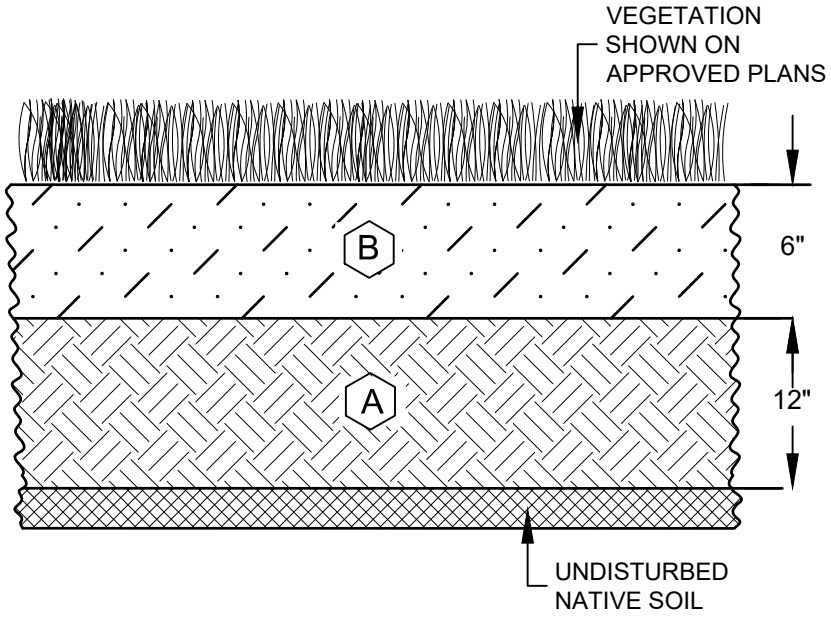
DISTURBED SOILS



A BEFORE REPLACEMENT OF ANY TOPSOIL, APPLY 1 INCH OF MNDOT GRADE 2 COMPOST OVER SUBSOIL. TILL TO A MINIMUM DEPTH OF 12 INCHES USING RIP-TYPE TILLAGE EQUIPMENT. DURING TILLING, INSTALLATION MUST STOP IF SMEARING AND COMPACTION IS OCCURRING.

B INCORPORATE MNDOT GRADE 2 COMPOST IN THE TOPSOIL AT A RATE OF 2 INCHES OF COMPOST PER 6 INCHES TOTAL OF TOPSOIL. ALL TOPSOIL SHOULD MEET CARVER COUNTY SPEC.

CALCULATIONS TO MEET RULES

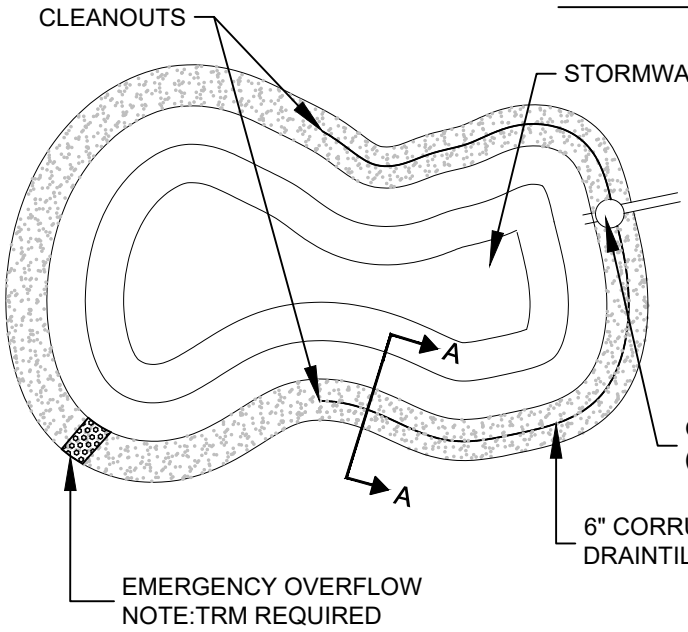
VOLUME:

1. VOLUME REDUCTION IS CALCULATED USING 0.5 INCHES OVER THE AMENDED AREA.

NOTE: CONTRACTOR SHALL SUBMIT AN AMENDED SOILS WORK PLAN TO WMO REPRESENTATIVE AT PRECONSTRUCTION MEETING. AMENDED SOILS WORK PLAN SHALL INCLUDE INFORMATION ON METHOD, EQUIPMENT TO BE USED, PHASING, NAME OF RESTORATION SUBCONTRACTOR, AND OTHER INFORMATION RELEVANT TO ENSURING THE GOAL OF THE AMENDED SOILS WILL BE MET. FINAL APPROVAL WILL NOT BE GRANTED WITHOUT SATISFACTORY AMENDED SOILS WORK PLAN.

CARVER COUNTY	Stantec	AMENDED SOILS	JUNE 2023
			DETAIL 2

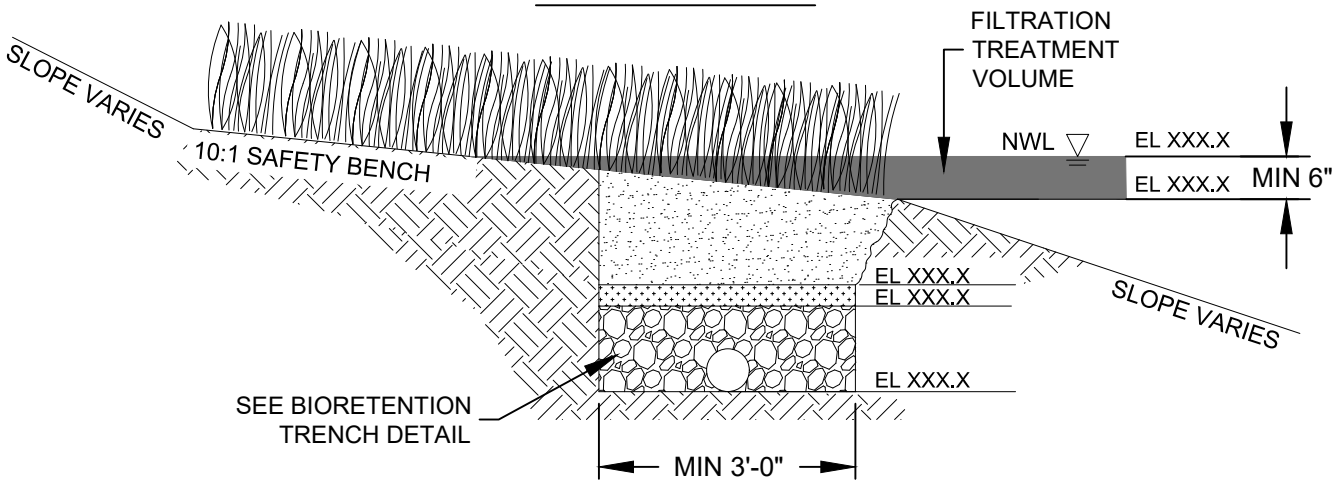
PLAN VIEW



QUANTITIES

FOOTPRINT	_____	SF
MEDIA	_____	CY
TILE	_____	LF

SECTION A - A



CALCULATIONS TO MEET RULES

VOLUME:

1. NO VOLUME REDUCTION IS GIVEN FOR BIORETENTION BENCH.

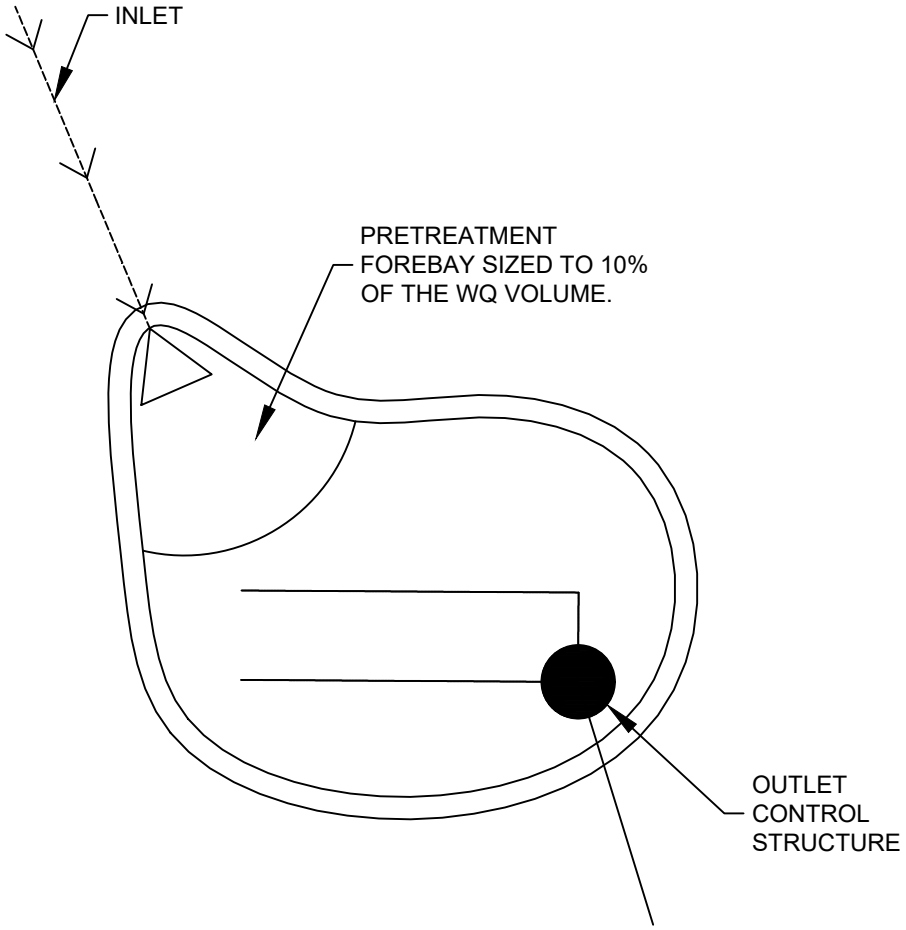
WATER QUALITY:

1. PAIRED WITH A NURP POND VOLUME, BIORETENTION BENCHES RECEIVE 90% TP REDUCTION AND 90% TSS REDUCTION. PAIRED WITH A MN STORMWATER MANUAL POND VOLUME, BIORETENTION BENCHES RECEIVE 75% TP AND 80% TSS REDUCTION.

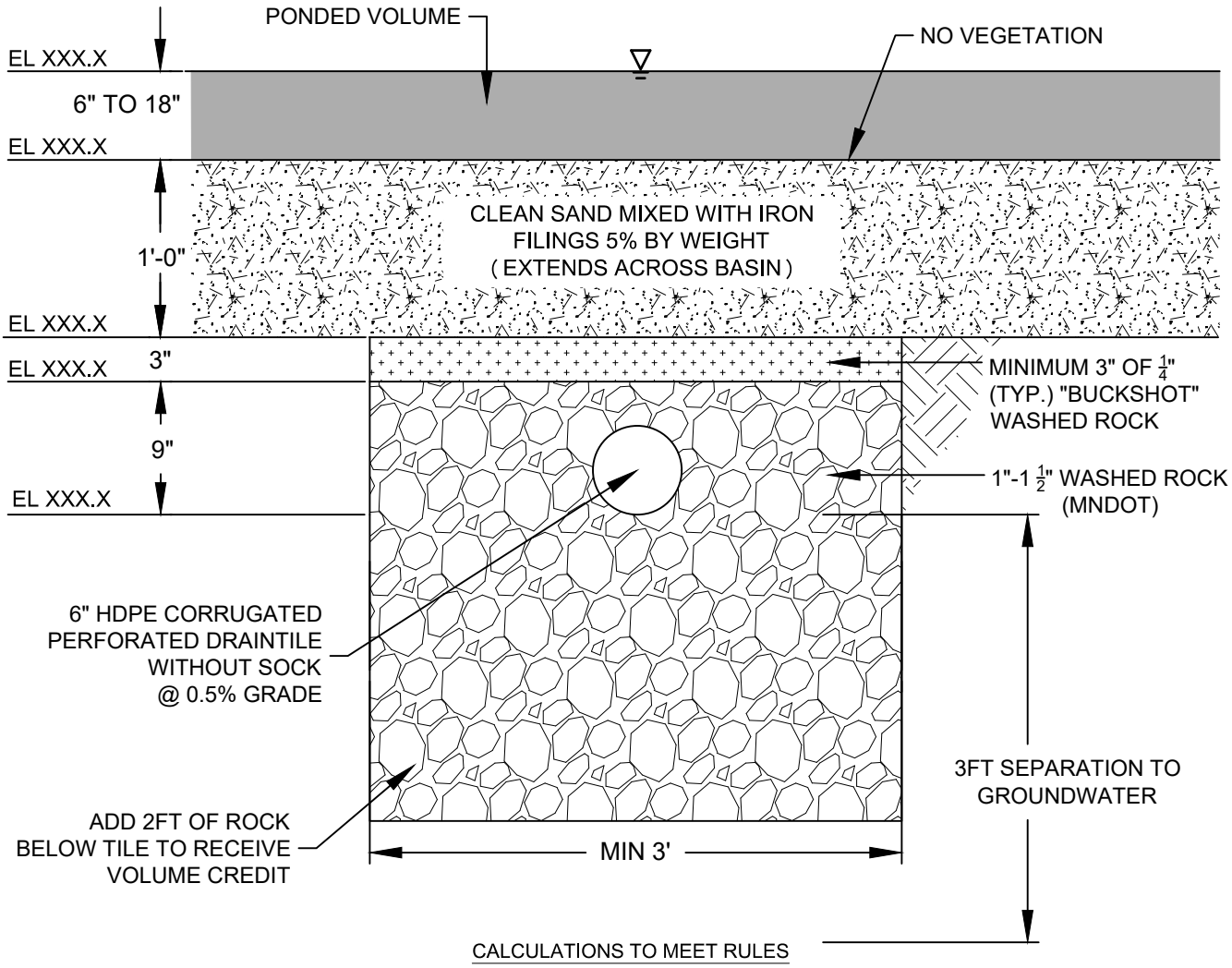
PERFORMANCE REQUIREMENTS:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA.
2. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.
3. WHEN PAIRED WITH A STORMWATER REUSE PRACTICE, NATIVE SOILS TO BE COMPACTED PRIOR TO ROCK/TILE INSTALLATION.

CARVER COUNTY	Stantec	BIORETENTION BENCH	JUNE 2023
			DETAIL 3



CARVER COUNTY	Stantec	PRETREATMENT	JUNE 2023 DETAIL 4



CALCULATIONS TO MEET RULES

VOLUME:

1. TO RECEIVE VOLUME CREDIT, 2FT OF ROCK MUST BE ADDED BELOW TILE PER DETAIL. TILE INVERT MUST BE 3FT ABOVE DOWNSTREAM NWL, GROUNDWATER, BEDROCK, ETC.
2. VOLUME REDUCTION IS CALCULATED AS 50% OF ROCK VOLUME BELOW TILE.

WATER QUALITY:

1. IRON ENHANCED FILTRATION IS CALCULATED AS 90% TP REMOVAL AND 90% TSS REMOVAL.

PERFORMANCE REQUIREMENTS:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA.
2. BOUNCE IN THE 10-YEAR STORM EVENT SHALL NOT EXCEED 2.5 FEET ABOVE CONSTRUCTED OUTLET.
3. UNLESS RUNOFF PASSES THROUGH A POND FIRST, STORMWATER SHALL BE ROUTED TO A PRE-TREATMENT FOREBAY. PRE-TREATMENT SHALL BE SIZED TO 10% OF THE WATER QUALITY VOLUME ROUTED TO THE ASSOCIATED BMP.
4. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.

IRON FILINGS:

1. AMOUNT OF FILINGS CAN BE DETERMINED BY CALCULATING TOTAL SAND NEEDED TO FILL THE TRENCH, AND MULTIPLYING BY 5%.
2. SAND IRON NEEDS TO BE PRE-MIXED PRIOR TO INSTALLATION. CAN OCCUR OFF SITE.
3. IRON FILINGS MUST BE CLEANED AND WASHED. PROVIDE SUPPLIER INFORMATION TO WMO. NO OIL OR GREASE ALLOWED.

CARVER COUNTY	Stantec	IRON ENHANCED SAND FILTER	JUNE 2023
			DETAIL 5

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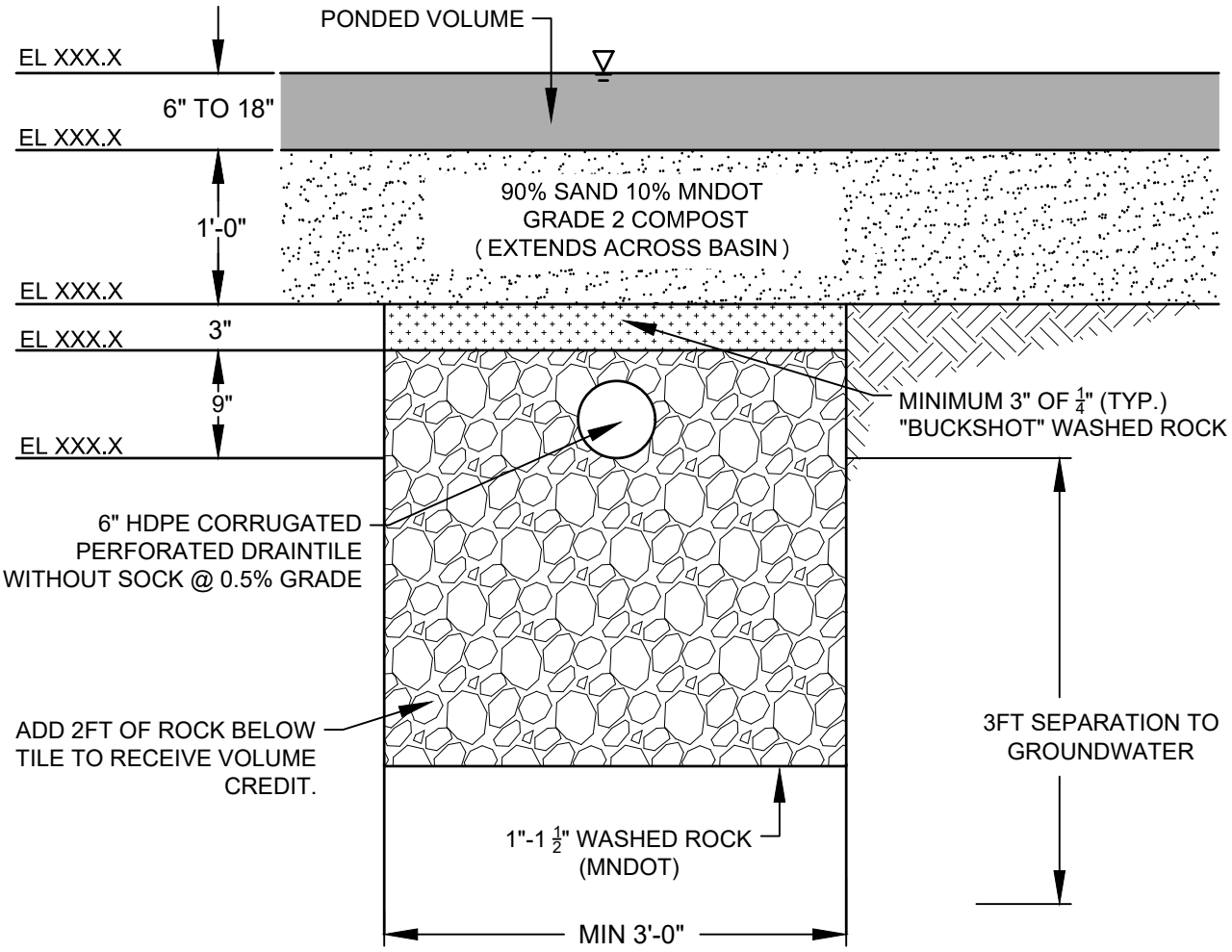

CALCULATIONS TO MEET RULES

VOLUME:

1. TO RECEIVE VOLUME CREDIT, 2FT OF ROCK MUST BE ADDED BELOW THE TILE PER DETAIL. TILE INVERT MUST BE 3FT ABOVE DOWNSTREAM NWL, GROUNDWATER, BEDROCK, ETC.
2. VOLUME REDUCTION IS CALCULATED AS 40% OF PONDED VOLUME.
3. IF NO VEGETATION IS PROVIDED, THE VOLUME CALCULATION IS REDUCED TO 50% OF ROCK VOLUME BELOW TILE.

WATER QUALITY:

1. FILTRATION IS CALCULATED AS 75% TP REMOVAL AND 90% TSS REMOVAL.

PERFORMANCE REQUIREMENTS:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA.
2. BOUNCE IN THE 10-YEAR STORM EVENT SHALL NOT EXCEED 2.5 FEET ABOVE CONSTRUCTED OUTLET.
3. UNLESS RUNOFF PASSES THROUGH A POND FIRST STORMWATER SHALL BE ROUTED TO A PRE-TREATMENT FACILITY. PRE-TREATMENT SHALL BE SIZED TO 10% OF THE WATER QUALITY VOLUME ROUTED TO THE ASSOCIATED BMP.
4. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.

CARVER COUNTY	Stantec	BIORETENTION TRENCH	JUNE 2023 DETAIL 6

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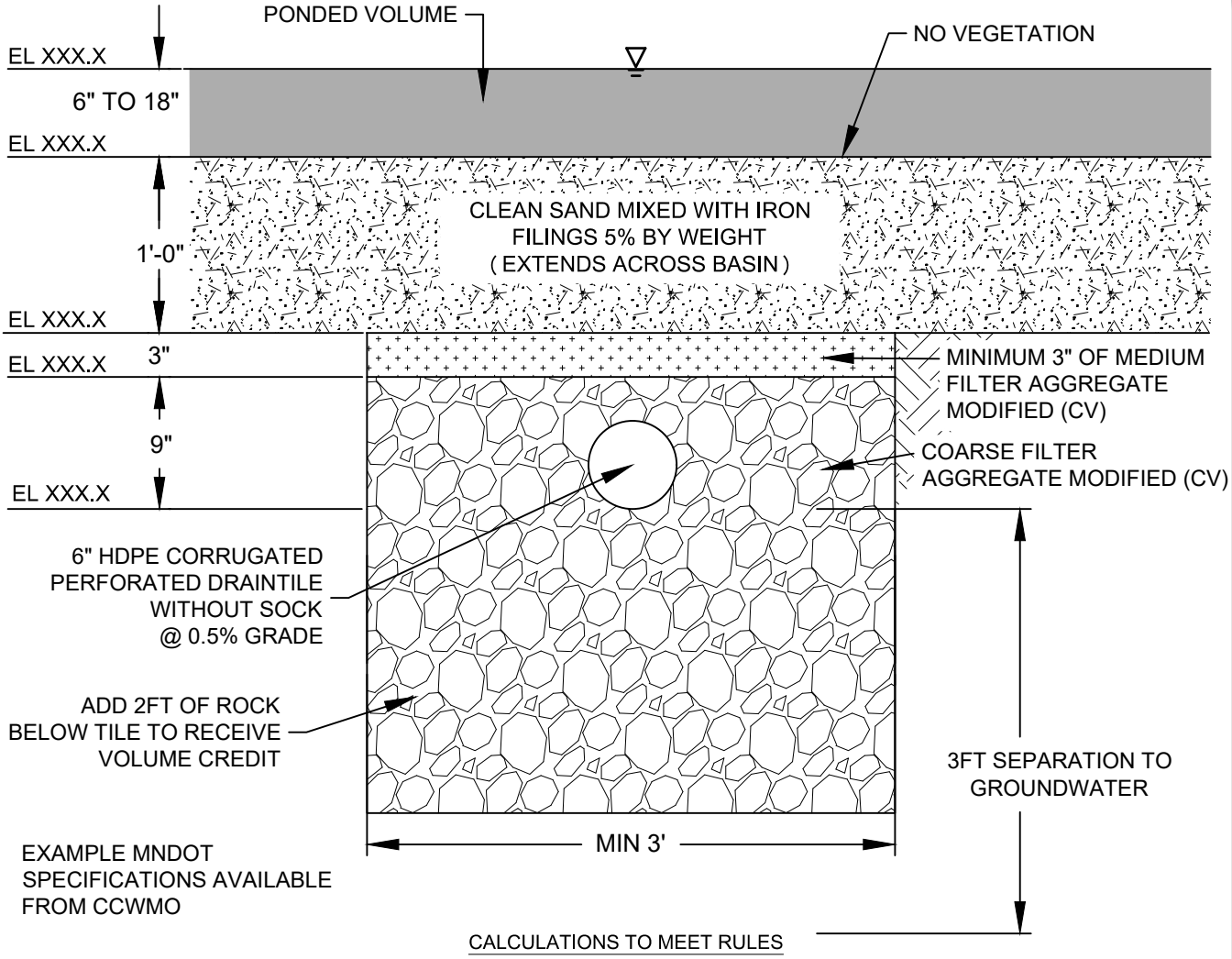


CALCULATIONS TO MEET RULES

VOLUME:

1. TO RECEIVE VOLUME CREDIT, 2FT OF ROCK MUST BE ADDED BELOW TILE PER DETAIL. TILE INVERT MUST BE 3FT ABOVE DOWNSTREAM NWL, GROUNDWATER, BEDROCK, ETC.
2. VOLUME REDUCTION IS CALCULATED AS 50% OF ROCK VOLUME BELOW TILE.

WATER QUALITY:

1. IRON ENHANCED FILTRATION IS CALCULATED AS 90% TP REMOVAL AND 90% TSS REMOVAL.

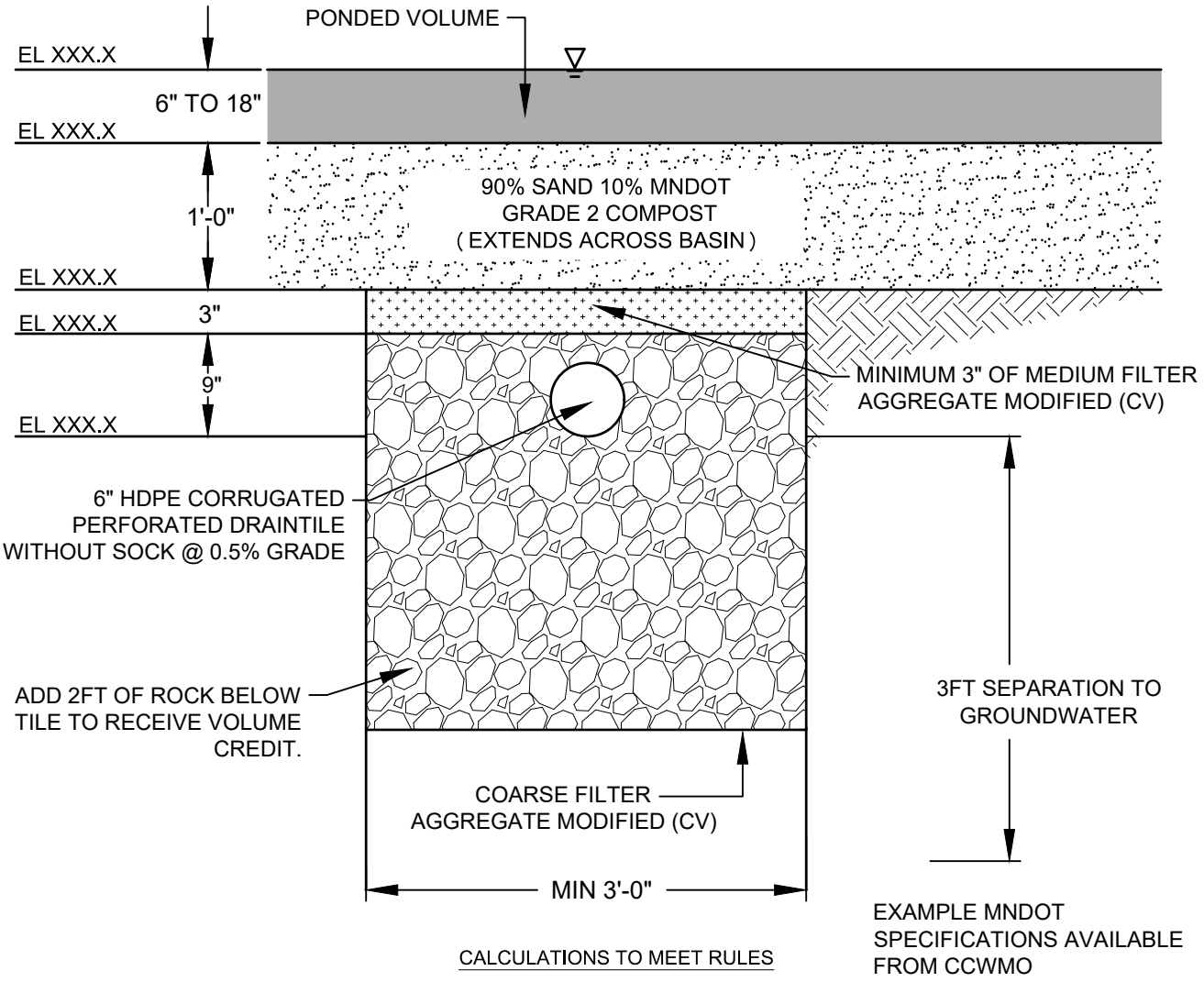
PERFORMANCE REQUIREMENTS:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA.
2. BOUNCE IN THE 10-YEAR STORM EVENT SHALL NOT EXCEED 2.5 FEET ABOVE CONSTRUCTED OUTLET.
3. UNLESS RUNOFF PASSES THROUGH A POND FIRST, STORMWATER SHALL BE ROUTED TO A PRE-TREATMENT FOREBAY. PRE-TREATMENT SHALL BE SIZED TO 10% OF THE WATER QUALITY VOLUME ROUTED TO THE ASSOCIATED BMP.
4. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.

IRON FILINGS:

1. AMOUNT OF FILINGS CAN BE DETERMINED BY CALCULATING TOTAL SAND NEEDED TO FILL THE TRENCH, AND MULTIPLYING BY 5%.
2. SAND IRON NEEDS TO BE PRE-MIXED PRIOR TO INSTALLATION. CAN OCCUR OFF SITE.
3. IRON FILINGS MUST BE CLEANED AND WASHED. PROVIDE SUPPLIER INFORMATION TO WMO. NO OIL OR GREASE ALLOWED.

CARVER COUNTY	Stantec	MNDOT IRON ENHANCED SAND FILTER	JUNE 2023
			DETAIL 7



CALCULATIONS TO MEET RULES

EXAMPLE MNDOT SPECIFICATIONS AVAILABLE FROM CCWMO

VOLUME:

1. TO RECEIVE VOLUME CREDIT, 2FT OF ROCK MUST BE ADDED BELOW THE TILE PER DETAIL. TILE INVERT MUST BE 3FT ABOVE DOWNSTREAM NWL, GROUNDWATER, BEDROCK, ETC.
2. VOLUME REDUCTION IS CALCULATED AS 40% OF PONDED VOLUME.
3. IF NO VEGETATION IS PROVIDED, THE VOLUME CALCULATION IS REDUCED TO 50% OF ROCK VOLUME BELOW TILE.

WATER QUALITY:

1. FILTRATION IS CALCULATED AS 75% TP REMOVAL AND 90% TSS REMOVAL.

PERFORMANCE REQUIREMENTS:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA.
2. BOUNCE IN THE 10-YEAR STORM EVENT SHALL NOT EXCEED 2.5 FEET ABOVE CONSTRUCTED OUTLET.
3. UNLESS RUNOFF PASSES THROUGH A POND FIRST STORMWATER SHALL BE ROUTED TO A PRE-TREATMENT FACILITY. PRE-TREATMENT SHALL BE SIZED TO 10% OF THE WATER QUALITY VOLUME ROUTED TO THE ASSOCIATED BMP.
4. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.

CARVER COUNTY	Stantec	MNDOT BIORETENTION TRENCH	JUNE 2023
			DETAIL 8

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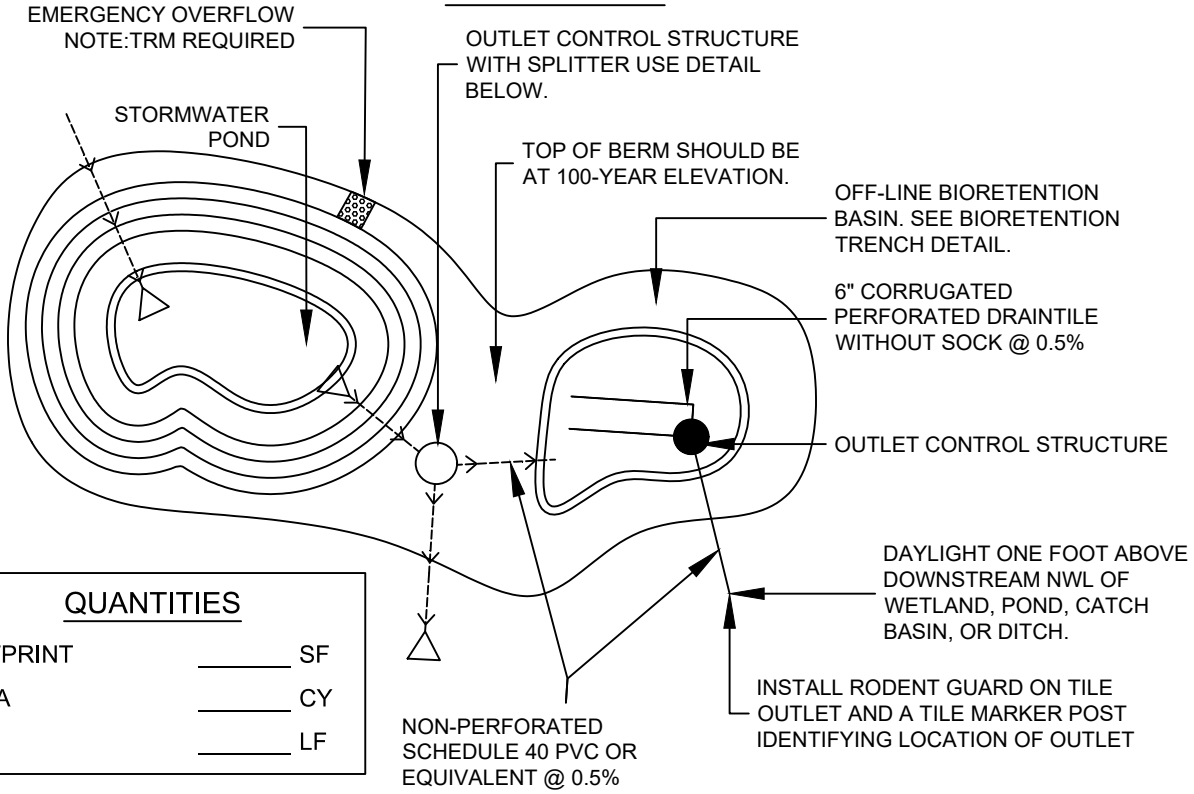
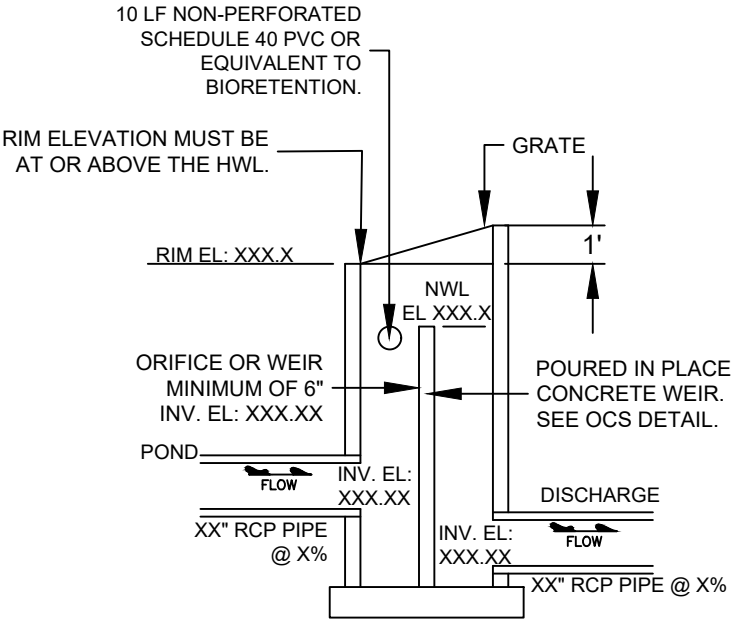
PLAN VIEW



QUANTITIES

FOOTPRINT	_____	SF
MEDIA	_____	CY
TILE	_____	LF

SECTION VIEW



A OCS DETAIL

CARVER COUNTY	Stantec	OFF-LINE FILTRATION BASIN	JUNE 2023
			DETAIL 9

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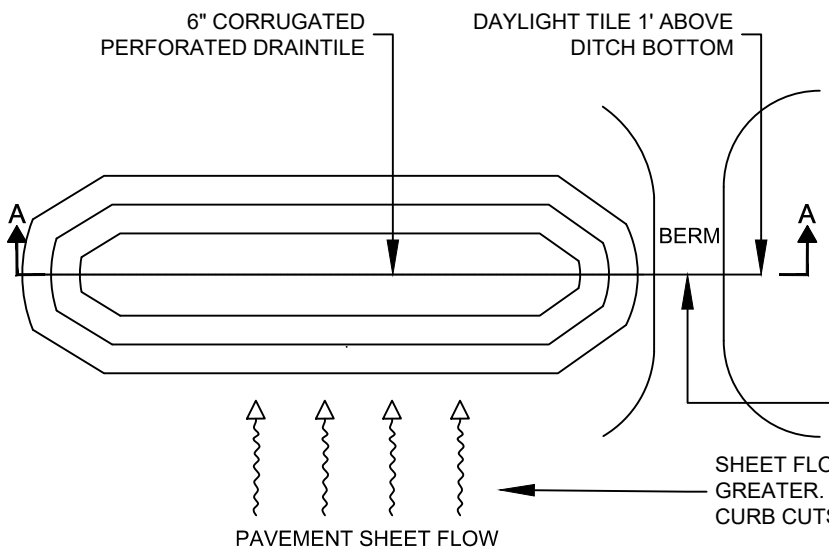
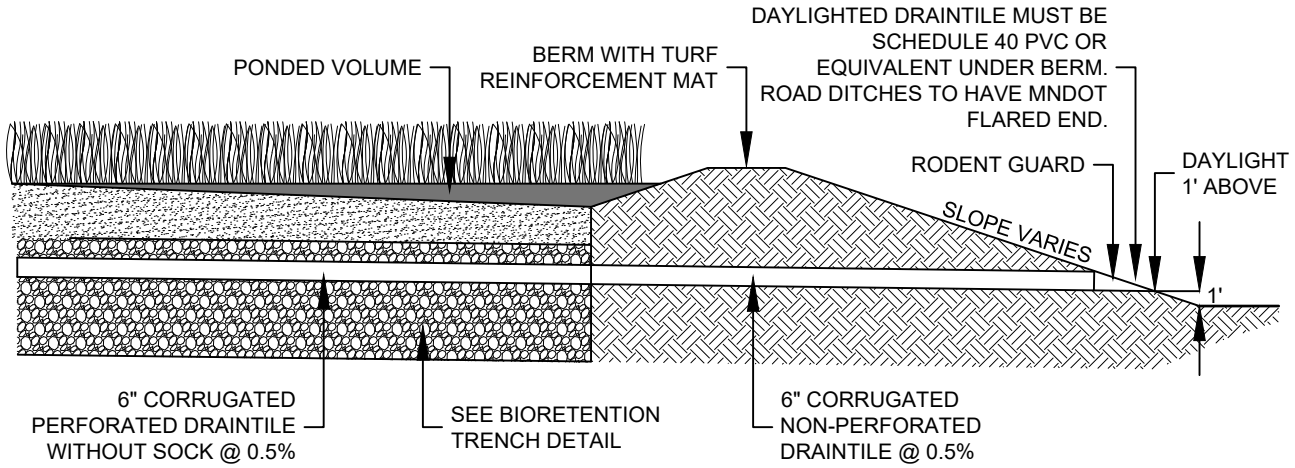
PLAN VIEW



QUANTITIES

FOOTPRINT	_____	SF
MEDIA	_____	CY
TILE	_____	LF

SECTION A - A



CALCULATIONS TO MEET RULES

VOLUME:

1. TO RECEIVE VOLUME CREDIT, 2 FEET OF ROCK MUST BE ADDED BELOW TILE PER DETAIL (TRENCH DETAIL#6). TILE INVERT MUST BE 3 FEET ABOVE DOWNSTREAM NWL, GROUNDWATER, BEDROCK, ETC.
2. VOLUME REDUCTION IS CALCULATED AS 40% OF PONDED VOLUME.
3. IF NO VEGETATION IS PROVIDED, THE VOLUME CALCULATION IS LOWERED TO 50% OF ROCK VOLUME BELOW TILE.

WATER QUALITY:

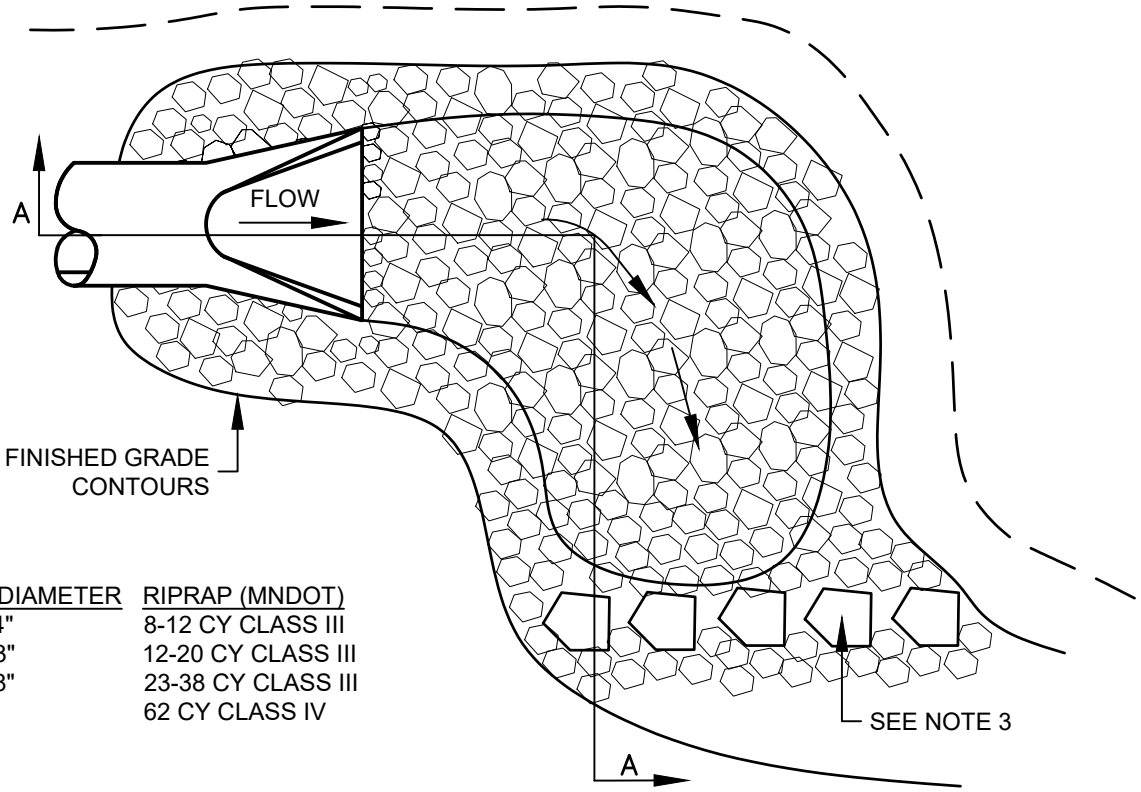
1. FILTRATION IS CALCULATED AS 75% TP REMOVAL AND 90% TSS REMOVAL.

PERFORMANCE REQUIREMENT:

1. 48 HOUR DRAWDOWN OF BMPS IS REQUIRED. TO DETERMINE SURFACE AREA NEEDED, USE FILTRATION RATE OF 8 CF OF PONDED VOLUME PER SF OF SURFACE AREA. RETROFITS USE MINIMUM 150 SF.
2. BOUNCE IN THE 10-YEAR STORM EVENT SHALL NOT EXCEED 2.5 FEET ABOVE CONSTRUCTED OUTLET FOR 10-YEAR EVENT.
3. AN EMERGENCY OVERFLOW (EOF) IS REQUIRED. EOFS MUST BE A MINIMUM OF 6 INCHES ABOVE THE ASSOCIATED HWL. EOFS MUST BE REINFORCED WITH TURF REINFORCEMENT MATTING (TRM) RIP RAP IS NOT AN ACCEPTABLE EOF REINFORCEMENT METHOD.

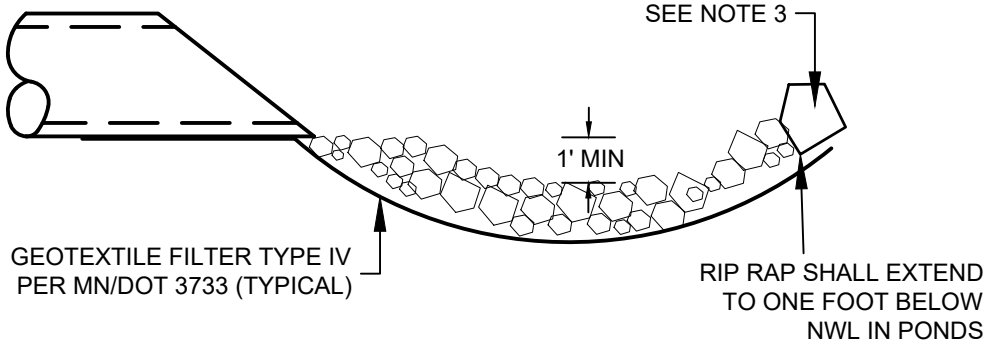
CARVER COUNTY	Stantec	BIORETENTION SWALE	JUNE 2023
			DETAIL 10

PLAN VIEW



PIPE DIAMETER	RIPRAP (MNDOT)
12"-24"	8-12 CY CLASS III
27"-33"	12-20 CY CLASS III
36"-48"	23-38 CY CLASS III
>54"	62 CY CLASS IV

SECTION A-A

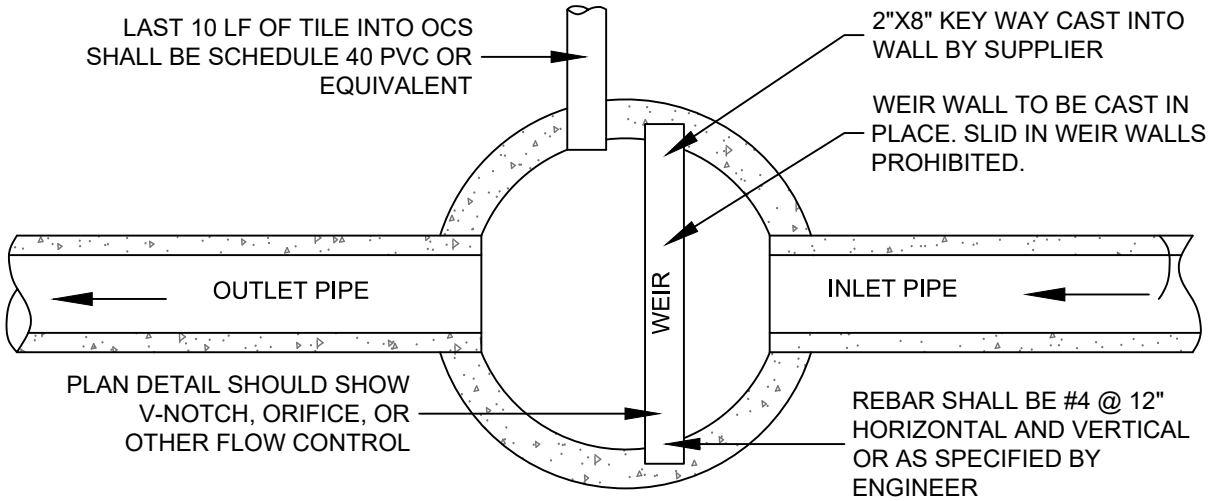


NOTES

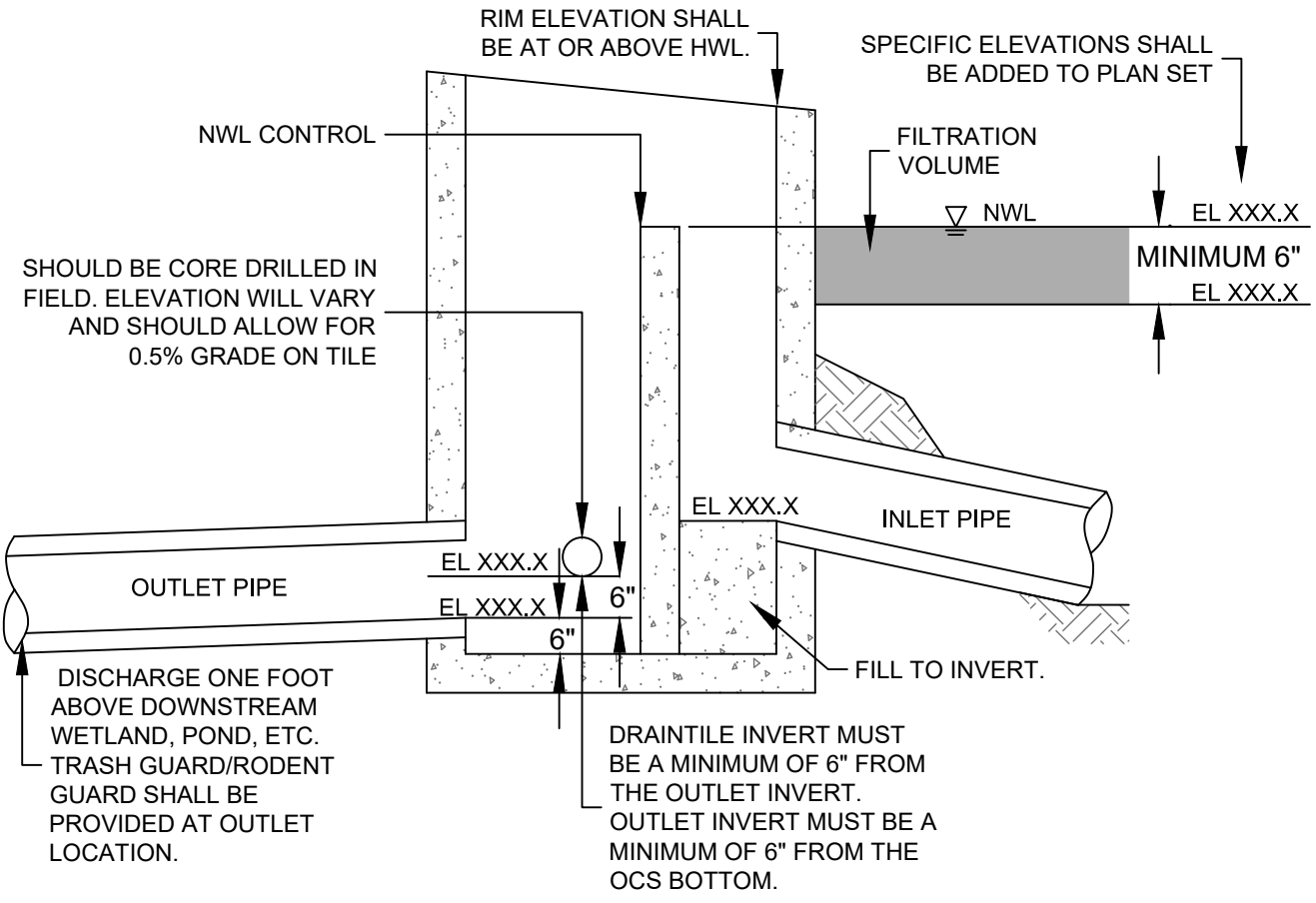
1. REVIEW RIP RAP LAYOUT WITH COUNTY STAFF IN FIELD PRIOR TO INSTALLATION.
2. CONFORM RIP RAP TO EXISTING SLOPES AND FLOWPATH, OR AS DIRECTED BY COUNTY STAFF. RIP RAP SHALL EXTEND TO MEET 1 FOOT OR1/2 DIAMETER ABOVE INVERT ON OUTSIDE CONTOUR.
3. ENERGY DISSIPATION ROCKS SHALL BE ANGULAR STONE TWICE THE PIPE DIAMETER UP TO A MAXIMUM 36" DIAMETER
4. LENGTH OF RIP RAP SHALL BE A MINIMUM LENGTH OF 5 PIPE DIAMETERS.

CARVER COUNTY	Stantec	MODIFIED RIPRAP TO CHANNEL CONFIGURATION	JUNE 2023 DETAIL 11

PLAN VIEW



SECTION



CARVER COUNTY	Stantec	OUTLET STRUCTURE	JUNE 2023 DETAIL 12

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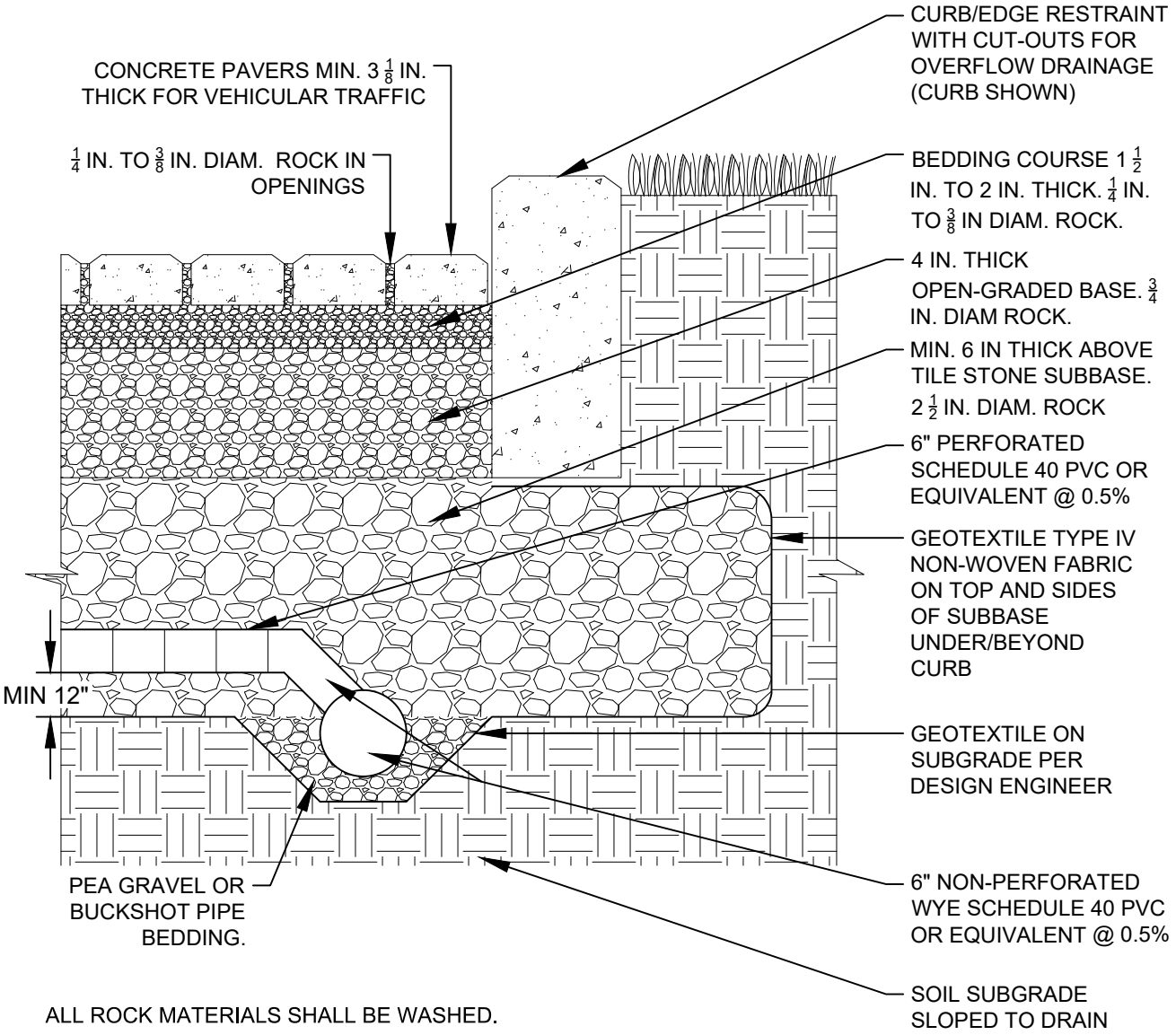


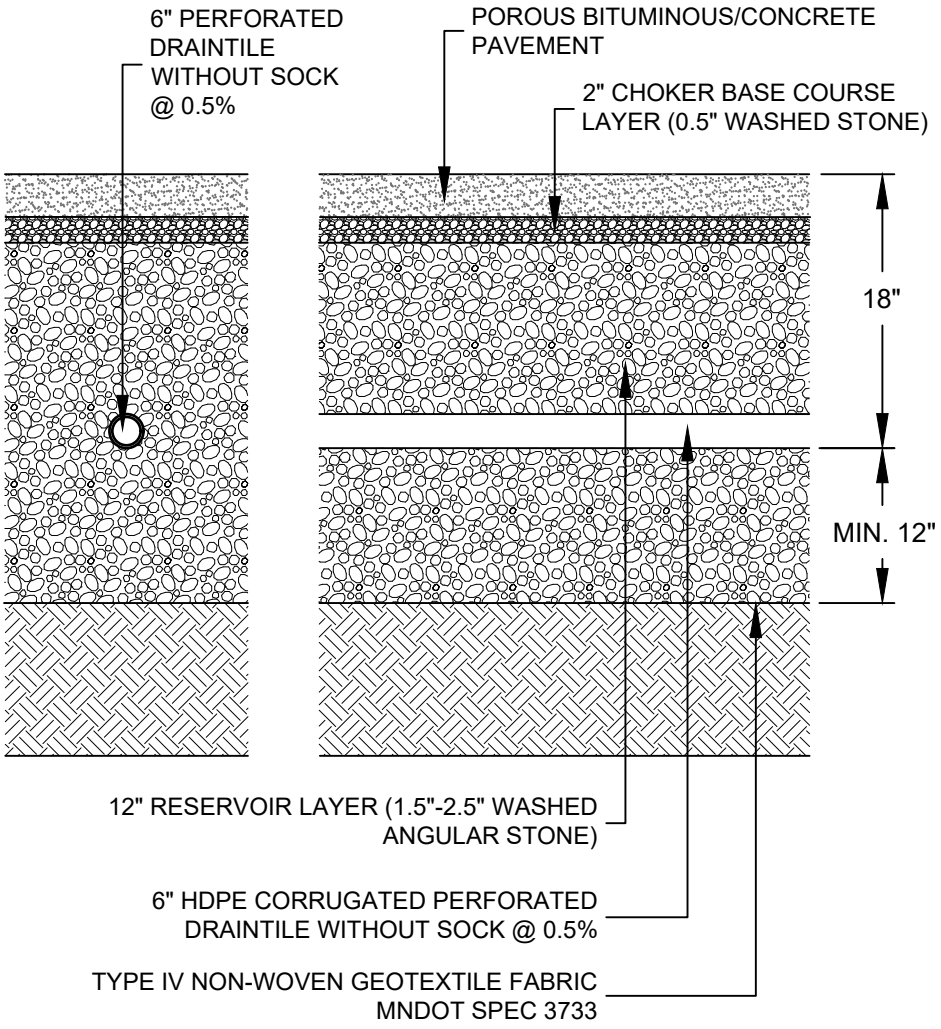
ALL ROCK MATERIALS SHALL BE WASHED.

NOTES:

1. 2 3/8 IN. THICK PAVERS MAY BE USED IN PEDESTRIAN AND RESIDENTIAL APPLICATIONS.
2. VOLUME REDUCTION IS CALCULATED AS 50% OF TOTAL ROCK VOLUME BELOW TILE INVERT.
3. NO WATER QUALITY CREDIT PROVIDED.

CARVER COUNTY	Stantec	PERMEABLE PAVEMENT EXAMPLE	JUNE 2023 DETAIL 13

\\us0242-ppfss01\shared_projects\227704851\drafting\Standard Detail Plates\May 2022 Details\13-PERMEABLE PAVEMENT WITH EXFILTRATION.dwg



NOTES:

1. EDGE CONSTRAINT ON ALL BOUNDARIES, CONCRETE CURBING, OR STEEL EDGES ARE PREFERRED.

CALCULATIONS TO MEET RULES

VOLUME:

1. VOLUME REDUCTION IS CALCULATED AS 50% OF TOTAL ROCK VOLUME BELOW TILE INVERT.
2. NO WATER QUALITY CREDIT PROVIDED

CARVER COUNTY	Stantec	POROUS PAVEMENT EXAMPLE	JUNE 2023
			DETAIL 14

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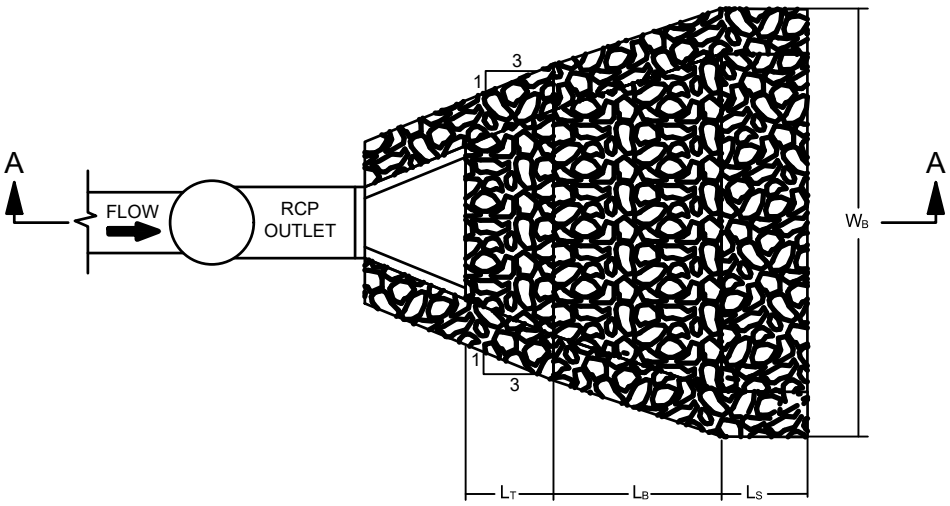
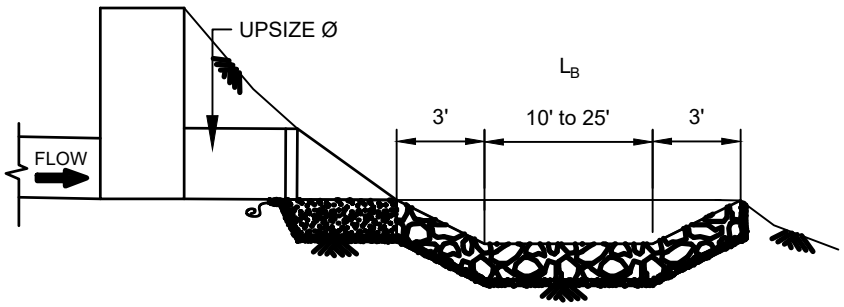
TABLE OF QUANTITIES

INLET	UPSIZE	BASIN LENGTH	BASIN WIDTH	MATERIAL QUANTITIES				
DIA. OF ROUND PIPE	DIA. OF ROUND PIPE	LB	WB	GEOTEXTILE FILTER	GRANULAR FILTER UNDER APRON	RIPRAP 12" DEPTH	RIPRAP 18" DEPTH	RIPRAP 24" DEPTH
(IN.)	(IN.)	(FT)	(FT)	(SQ YD)	(CU YD)	(CU YD)	(CU YD)	(CU YD)
15 & 18	30	10	6	1	1	3	-	-
24	36	10	8	1	1	-	8	-
36	48	20	8	3	3	-	-	20
48	72	25	10	3	3	-	-	25



SECTION A-A



CARVER COUNTY

Stantec

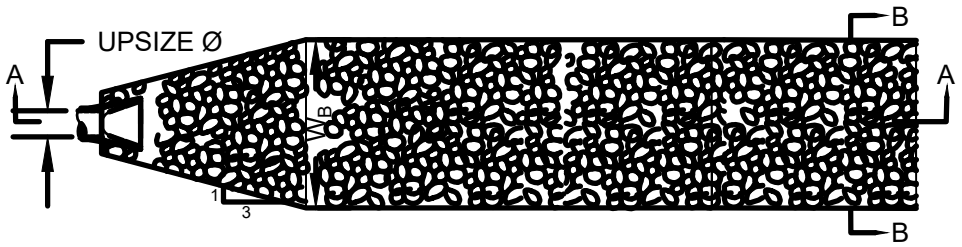
STILLING BASIN

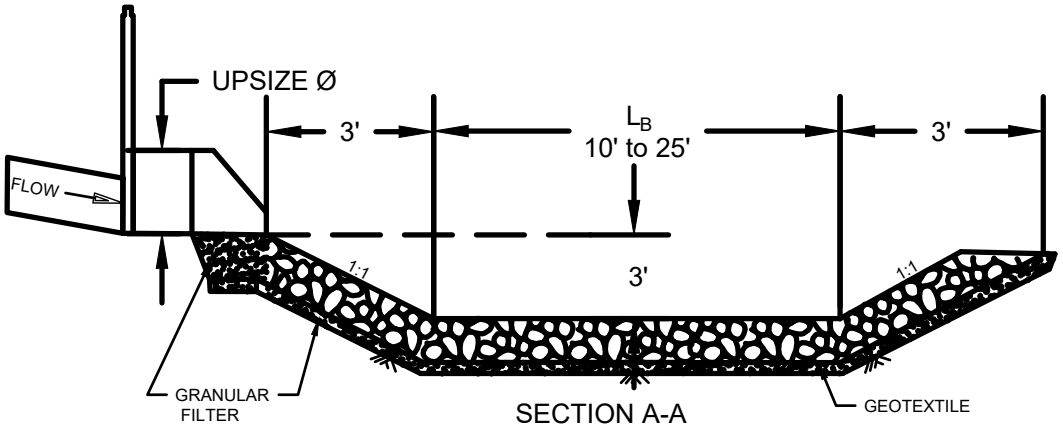
JUNE 2023

DETAIL 15

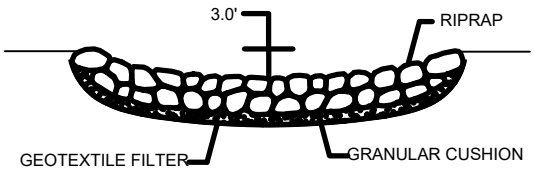
TABLE OF QUANTITIES

INLET	UPSIZE	BASIN LENGTH	BASIN WIDTH	MATERIAL QUANTITIES				
DIA. OF ROUND PIPE	DIA. OF ROUND PIPE	LB	WB	GEOTEXTILE FILTER	GRANULAR FILTER UNDER APRON	RIPRAP 12" DEPTH	RIPRAP 18" DEPTH	RIPRAP 24" DEPTH
(IN.)	(IN.)	(FT)	(FT)	(SQ YD)	(CU YD)	(CU YD)	(CU YD)	(CU YD)
15 & 18	30	10	6	1	1	3	-	-
24	36	10	8	1	1	-	8	-
36	48	20	8	3	3	-	-	20
48	72	25	10	3	3	-	-	25





SECTION A-A



SECTION B-B

CARVER COUNTY	Stantec	RAVINE EXAMPLE STILLING BASIN	JUNE 2023
			DETAIL 16

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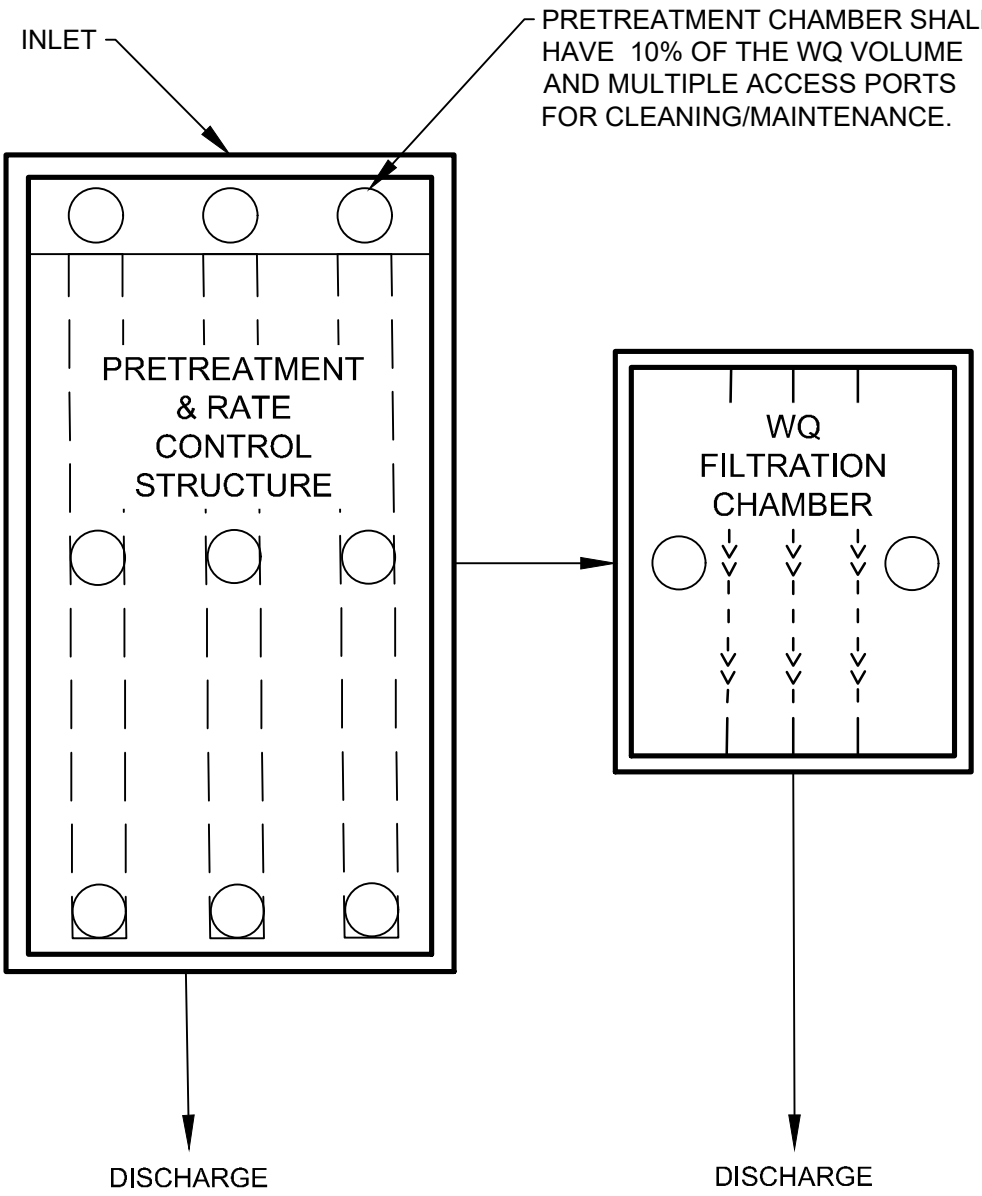


NOTES:

1. MINIMUM OF TWO SEPARATE STRUCTURES TO OBTAIN CCWMO APPROVAL.
2. IF THE REQUIRED WATER QUALITY VOLUME IS MULTIPLIED BY 1.5, UNDERGROUND FILTRATION IS CALCULATED AS 90%TP REMOVAL AND 90% TSS REMOVAL. IF NOT MULTIPLIED IT IS CALCULATED AS 60% TP REMOVAL AND 80% TSS REMOVAL.
3. SEPARATION OF 3FT FROM TILE INVERT TO GROUNDWATER IS REQUIRED TO RECEIVE VOLUME CREDIT.

CARVER COUNTY	Stantec	UNDERGROUND FILTRATION SCHEMATIC	JUNE 2023 DETAIL 17

Section 3. Appendices

A. Example Operations & Maintenance Plan

Sample: Maintenance Declaration, Operations & Maintenance Plan, and Inspection Checklists

Prepared by:

Carver County Water Management Organization
in cooperation with Carver Soil and Water Conservation district

CARVER COUNTY

Carver County Water Management Organization

CARVER SWCD

CONTENTS

Declaration for Maintenance of Stormwater Facilities: Porous Paving + Biofiltration

DECLARATION FOR MAINTENANCE
of
STORMWATER FACILITIES

THIS DECLARATION is made this 31st day of March, 2014, by Carver County Facilities Department at 600 E 4th St, Chaska MN 55318 ("Declarant"), in favor of the Carver County Watershed Management Organization, a body with powers pursuant to Minnesota Chapters 103B and 103D ("CCWMO").

WHEREAS, Declarant(s) hold(s) fee interest in real property within the City of Chaska, Carver County, Minnesota, platted and legally described as:

Lot 1, Block 1, and Outlot A. COURTHOUSE CAMPUS TWO. PID# 301490010

WHEREAS, no one other than Declarant(s) possess(es) any right, title or interest in the Property;

WHEREAS, the facilities on or to be located on the Property to which the maintenance requirements in the Declaration apply as labeled on the scaled site plan located in the Operations and Maintenance Plan are as follows (the Facilities):

Porous Paving w/ underdrain

Planted Biofiltration w/ underdrain

WHEREAS, Declarant desires to subject the Property to certain conditions and restrictions imposed by the CCWMO as a condition to issuance of CCWMO Permit # WP20080039 for the mutual benefit of the CCWMO and Declarant.

NOW THEREFORE Declarant makes this declaration and hereby declares that this declaration shall constitute covenants to run with the Property, and further declares that the Property shall be owned, used, occupied, and conveyed subject to the covenants and restrictions set forth in this declaration, all of which shall be binding in perpetuity on all persons owning or acquiring any right, title or interest in the Property, and their heirs, successors, personal representatives and assigns, but only during the period of ownership of that right, title or interest.

1. Declarant will inspect the Facilities at least annually.

2. Declarant will maintain and repair all facilities, as necessary to preserve the integrity and intended function of the facility:

    a) In the case of basins and other facilities where sediment collects, to preserve storage or capacity at or above the design volume or, where no design storage volume or capacity is incorporated into the permit, the volume or capacity recommended by the manufacturer, including regular cleaning of pretreatment devices.

    b) In the case of conveyances and other structures, to preserve design hydraulic capacity.

    c) In the case of facilities relying on soils and vegetation for stormwater management or treatment, to preserve healthy vegetation and design soil permeability.

    d) In the case of facilities where stormwater is to be reused for irrigation purposes, as necessary to preserve the capacity of the system to distribute the design volume.

    e) In the case of filtration systems including porous pavement, to preserve the permeability or capacity at or above the designed infiltration rate.

3. Declarant will submit annually, a report to include inspection dates, facility conditions, and corrective actions taken.

4. If Declarant fails to perform required maintenance to stormwater facilities resulting in deviation from the designed treatment performance or efficiency, the CCWMO may notify Declarant of this deficiency. If Declarant has not completed or scheduled corrective action within 60 days of receipt of notification, the CCWMO may perform any action deemed necessary to return full design function and treatment performance to the stormwater treatment facility. The Declarant shall be responsible for reimbursement of all costs incurred from such activity including but not limited to administrative overhead and attorney's fees.

5. Any notice under this declaration shall be sent by certified mail, return receipt requested, or delivered to the following address:

Facilities Services Department
c/o Kevin Maas
600 E 4th St
Chaska MN 55318

Declarant may change this address by a certified letter to the CCWMO referencing the permit number.

6. If Declarant, its successors or assigns, materially changes use of the Property so that the Facilities which are the subject of this Declaration are rendered unnecessary, or are replaced by other Facilities approved by the CCWMO, its successors or assigns, this Declaration shall become void and of no further force or effect.

7. An executed copy of this declaration shall be filed with Carver County Registrar or Carver County Recorder, filing cost to be borne by the Declarant. This declaration will be unlimited in duration without being re-recorded.

Kevin Maas
DECLARANT

_____

The foregoing instrument was acknowledged before me this 31st day of March, 2014 by

John Doe.

Notary

This instrument was drafted by:

Carver County Watershed Management Organization
400 East 4th Street
Chaska, MN 55318
1/21/2014

Operations and Maintenance Plan Carver county Courthouse Porous Paving + Biofiltration

Legal Description: Lot 1, Block 1, and Outlot A. COURTHOUSE CAMPUS TWO. PID# 301490010

Contact: Kevin Maas (952) - 361-1557
600 E 4th St
Chaska, MN 55318

Project Description/ Purpose: This project was installed during the fall of 2008 as a demonstration site for the use of porous paving and planted filtration trench within Carver County. The project serves to treat the stormwater prior to entering into the adjacent East Chaska Creek. The approximate drainage area is ~ 37,000 sq ft. Maintenance is necessary to the functionality and long-term success of the project. Features include:

- Porous bituminous pavement w/ underdrain
- Planted Biofiltration w/ underdrain

All underdrains are connected to adjacent catch basin w/ manhole. Inspections of the connection into the catch basin will indicate that the underdrain is functioning.

Maintenance Tasks – Courthouse Porous Paving + Biofiltration

Timeline	Task	Personnel
February	➢ Schedule porous pavement sweeper for April, July and October	➢ Facilities Dept. Manager
April	➢ Remove dead plant material (if not completed in the fall) ➢ Sweep porous pavement with a regenerative air vacuum sweeper ➢ Replace and dead plants w/ new plugs or transplants	➢ Facilities Dept. Staff ➢ Contracted Services & Facilities Dept. Manager
May	➢ Add mulch swale as needed ➢ Mow grass buffer around swale	➢ Facilities Dept. Staff ➢ Contracted Services & Facilities Dept. Manager
June	➢ Mow grass buffer around swale ➢ Weed swale	➢ Contracted Services & Facilities Dept. Manager ➢ Facilities Dept. Staff (Planning & Water Mngt staff are available to assist with plant identification)
July	➢ Weed swale ➢ Mow grass buffer around swale ➢ Sweep porous pavement with a regenerative air vacuum sweeper	➢ Facilities Dept. Staff (PWM staff available to assist) ➢ Contracted Services & Facilities Dept. Manager ➢ Contracted Services & Facilities Dept. Manager
August	➢ Mow grass buffer around swale ➢ Weed swale	➢ Contracted Services & Facilities Dept. Manager ➢ Facilities Dept. Staff (PWM staff are available to assist with plant identification)
September	➢ Mow grass buffer around swale	➢ Contracted Services & Facilities Dept. Manager
October	➢ Mowing & fixing any erosion/gullying formed during season	➢ Facilities Dept. Staff
Early November	➢ Remove dead plant material (could also wait until spring) ➢ Sweep porous pavement with a regenerative air vacuum sweeper	➢ Facilities Dept. Staff ➢ Contracted Services & Facilities Dept. Manager
Additional	No sand (de-icing) is to be used at any time on or around the porous pavement. Salt use for de-icing should follow the guidelines laid out by the Minnesota Pollution Control Agency.	

Location Map

Site aerial

East Chaska Creek

22' - 12" @ 1.82%

CB 1
RIM = 718.0
INV. = 714.0
SIZE = 30" ID
CASTING = NEENAH R-2561 A

MH 102
RIM = 718.7
INV. = 713.60
RECONSTRUCT AS REQUIRED
CASTING = NEENAH R 2501 G

INV. = 714.0

2 - 6" DIAMETER DRAIN TILE

CONNECT 1 - 6" DT TO STRUCTURE AT INV. = 714.0

CONNECT DT PROVIDE SOLID PIPE (1) FROM THIS POINT TO CONNECTION AT STRUCTURE

INV. = 714.0

Approximate Drainage = 37,000 sq ft

MH-STORM
Rim=720.39
NW.Inv.=714.79
SE.Inv.=711.59
W.Inv.=711.69

garage slab elev.=721.55

first floor elev.=723.01

first floor elev.=723.12

EXISTING BUILDING

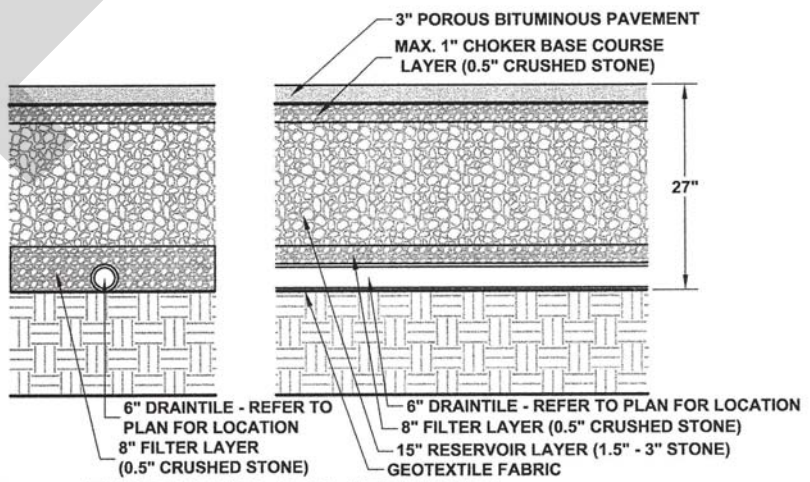
Trunk Sewer per Doc. No.

1
C4.1

UTILITY PLAN - BASE BID

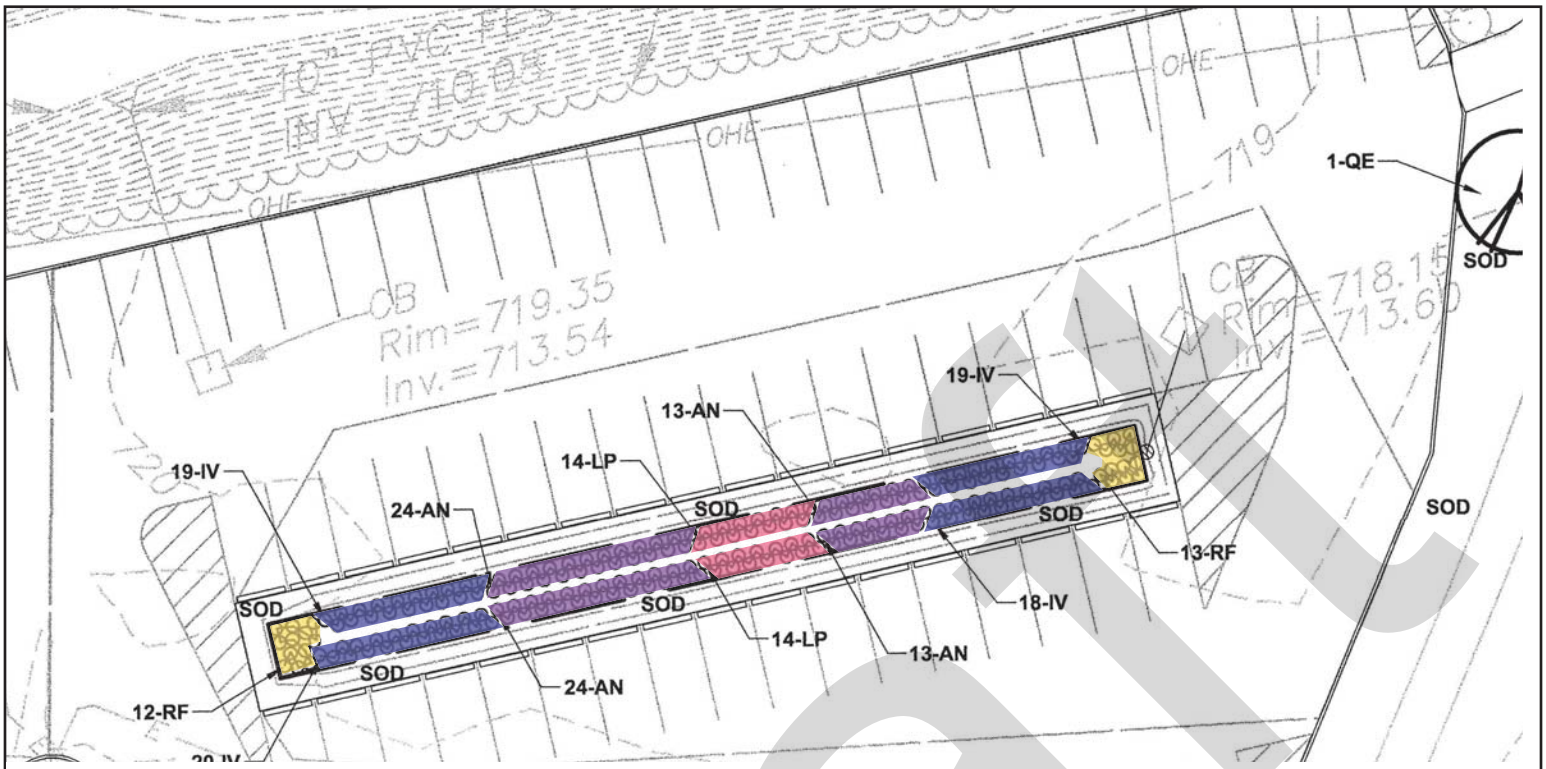
Looking East-Northeast from point A

Porous Bituminous



15
C5.1

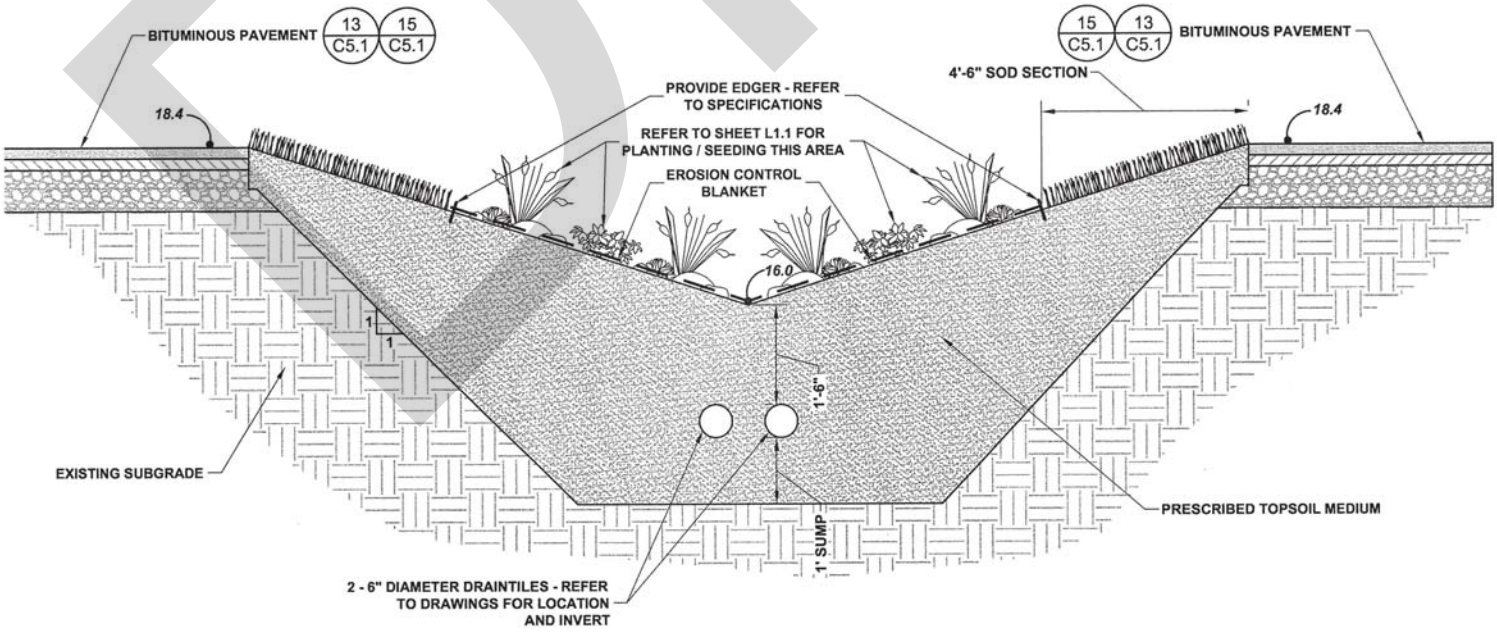
POROUS PAVEMENT (ALTERNATE NO. 4)



INFILTRATION BASIN PLANTINGS

	Common Name	Scientific Name	QTY.
AN	New England Aster	Aster novae-angliae	74
IV	Blue Flag Iris	Iris versicolor	76
LP	Prairie Blazingstar	Liatris pychnostachya	28
RF	Black Eyed Susan	Rudbeckia hirta	25

1 / L1.1 **LANDSCAPE PLAN**



20 / C5.1 **SECTION THRU INFILTRATION BASIN**

	Flower	Leaf	Juvenile
AN New England Aster			
IV Blue Flag Iris			
LP Prairie Blazingstar			
RF Black Eyed Susan			

Biofiltration (Rain Garden) Maintenance Inspection Checklist

Inspector:
Date:
Time:
Weather: Rainfall over previous 2-3 days? Reading from closest NOAA reporting station:_____"
Rain Garden Location:

Mark items in the table below using the following key:

- **X** Needs immediate attention
- **–** Not Applicable
- ✓ Okay
- **?** Clarification Required.

Rain Garden Components:

Items Inspected	Checked		Maintenance Needed		Inspection Frequency
DEBRIS CLEANOUT	Y	N	Y	N	**M**
1. Rain gardens and contributing areas clean of debris					
2. No dumping of yard wastes into rain garden					
3. Litter (trash, debris, etc.) have been removed					
VEGETATION					**M**
4. No evidence of erosion					
5. Is plant composition still according to approved plans					
6. No placement of inappropriate plants					
DEWATERING AND SEDIMENTATION					**A,AMS**
7. Rain garden dewaters between storms					
8. No evidence of standing water					
9. No evidence of surface clogging					
10. Sediments should not be greater than 20% of swale design depth					
OUTLETS/OVERFLOW SPILLWAY					**A, AMS**
11. Good condition, no need for repair					
12. No evidence of erosion					
13. No evidence of any blockages					
INTEGRITY OF BIOFILTER					**M**
14. Raingarden has not been blocked or filled inappropriately					
15. Mulch layer is still in place (depth of at least 3")					
16. Noxious plants or weeds removed					

Inspection Frequency Key **A= Annual, M= Monthly, AMS= After Major Storm**

Comments:

OVERALL CONDITION OF FACILITY:

In accordance with approved design plans? Y / N In accordance with As Built plans? Y / N

Dimension on as built:

Field Verified Dimension:

Maintenance required as detailed above? Y / N Compliance with other consent conditions? Y / N

Comments:_____

_____

Dates by which maintenance must be completed: _____/___/_____

Dates by which outstanding information as per consent conditions is required by: :_____/___ /_____

Inspector's signature:_____

Consent Holder/Engineer/Agent's signature:_____

Consent Holder/Engineer/Agent's name printed:_____

Porous Paving Maintenance Inspection Checklist

Inspector:
Date:
Time:
Weather: Rainfall over previous 2-3 days? Site Conditions:

Mark items in the table below using the following key:

- **X** Needs immediate attention
- – Not Applicable
- ✓ Okay
- **?** Clarification Required.

Porous Paving Components:

Items Inspected	Checked		Maintenance Needed		Inspection Frequency
PAVEMENT SURFACE	Y	N	Y	N	M
1. Signs of clogging (e.g. standing water)?					
2. Debris accumulation (mulch, sticks, trash)?					
3. Sediment accumulation?					
4. Standing water present?					
ADJACENT AREAS					A, AMS
5. Erosion from underdrain outlet?					
6. Exposed soil in areas discharging to porous paving?					
7. Is porous pavement adversely affected by any adjacent site feature?					
DEWATERING					A, AMS
8. Does runoff discharge from pavement area within 48hrs?					
OUTLETS/OVERFLOW					A, AMS
9. Is outlet for storm sewer system free from debris and in good working order?					
OTHER					
10. Have there been complaints?					A
11. Public Hazard noted?					
12. Other:					

Inspection Frequency Key A= Annual, M= Monthly, AMS= After Major Storm

Comments:

OVERALL CONDITION OF FACILITY:

In accordance with approved design plans? Y / N

In accordance with As-Built plans? Y / N

Dimension on as built: Y / N

Field Verified Dimension: Y / N

Maintenance required as detailed above? Y / N

Compliance with other consent conditions? Y / N

Comments:_____

_____

Dates by which maintenance must be completed: _____/___/_____

Dates by which outstanding information as per consent conditions is required by: :_____/___ /_____

Inspector's signature:_____

Consent Holder/Engineer/Agent's signature:_____

Consent Holder/Engineer/Agent's name printed:_____

B. Example Conservation Easement Template

OPEN SPACE CONSERVATION EASEMENT AGREEMENT

This **OPEN SPACE CONSERVATION EASEMENT AGREEMENT** is entered into by and between _____, a Limited Liability Company under the laws of the State of Minnesota (the "**Grantor**"), and Carver County, Minnesota, a political subdivision of the State of Minnesota (the "**Grantee**"); the terms of this Conservation Easement Agreement may also be enforced by _____, as the agent for Grantee, as authorized by Grantee from time to time.

RECITALS

A. Grantor is the current owner of real property in Carver County, Minnesota legally described on **Exhibit A** attached hereto (the "**Protected Property**").

B. The Protected Property has open space values of significant importance, hereafter referred to as "**Conservation Values**." [MORE SPECIFICS IF POSSIBLE RE: THIS] Preservation of the Protected Property will further policies established by the Carver County Comprehensive Land Use Plan, Carver County Planning & Water Management Plan, Minnesota Statutes Chapter 84C, and Minnesota Statutes Chapter 103A.

C. The Grantor and Grantee intend to create a conservation easement that is binding upon the Grantor and all future owners of the Protected Property, conveying to Grantee the right to protect and preserve the Conservation Values of the Protected Property for the benefit of current and future generations.

D. The Grantor and Grantee intend this Easement Agreement to meet the volume requirements of appendix A of the Carver County Water Resource Management Ordinance, Chapter No. 153.

CONVEYANCE OF CONSERVATION EASEMENT:

Pursuant to the laws of the State of Minnesota including Minnesota Statutes Chapter 84C, and in consideration of the facts recited above and the mutual covenants contained herein, Grantor, for themselves and for their successors and assigns, hereby conveys and warrants to Grantee, and their successors and assigns, a perpetual conservation open space easement over the Protected Property, consisting of the following rights, terms, and restrictions (the "Easement"):

1. CONSERVATION PURPOSE.

The purpose of this Easement is to preserve and protect in perpetuity the Conservation Values of the Protected Property, by restricting the future development, management and use of the Protected Property, and by providing remedies for any breach or violation of this Agreement or the Easement.

2. LAND USE RESTRICTIONS.

Except as specifically permitted in paragraph 3 below, restrictions imposed upon the Protected Property include the following:

2.1. Industrial and Commercial Activity. No industrial or commercial activities may be conducted upon the Protected Property.

2.2. Agricultural Use. No agricultural activities may be conducted upon the Protected Property. Prohibited agricultural activities include, without limitation, tilling, plowing, haying, planting and harvesting of row crops, or the keeping, breeding, feeding or grazing of poultry, swine, cows or any other livestock.

2.3. Residential Development. No residential use or development of the Protected Property is allowed.

2.4. Right of Way. No right of way shall be granted across the Protected Property, in conjunction with any industrial, commercial, or residential use or development of other adjacent land not protected by this Easement; provided, that nothing in this paragraph shall impose any duty on the part of the Grantor to contest any eminent domain or other similar proceeding, or other taking by any federal, state or local government entity or agency.

2.5. Subdivision. The Protected Property may not be subdivided or partitioned, and may hereafter be conveyed only in its entirety as a single parcel, except as otherwise agreed by Grantee in each instance.

2.6. Density. No portion of the Protected Property may be used to satisfy land area requirements for other property not subject to this Easement, for purposes of calculating building density, lot coverage, or open space under otherwise applicable laws, regulations, or ordinances controlling land use.

2.7. Structures and Improvements. No temporary or permanent buildings, structures, utilities, roads or other improvements of any kind may be placed or constructed on the Protected Property.

a. Utilities. Electrical lines may be maintained, repaired and replaced only to serve uses and activities already occurring, or as otherwise hereafter approved by Grantee. Communications towers, electrical transmission towers and lines, wind turbines, and other similar structures will not be permitted, without prior written approval of Grantee in each instance.
b. Signs. No billboards or other signs may be placed or maintained on the Protected Property, other than small, unlighted signs for notice purposes, such as "no trespassing" or "private property" signs.
c. Roads and Trails. No roads or trails may be constructed or used on the Protected Property.

2.8. Dumping. No trash, non-compostable waste, hazardous or toxic substances, junk, or other unsightly material or debris may be dumped or accumulated on the Protected Property.

2.9. Topography And Surface Alteration. No alteration or change in the topography of the surface of the Protected Property is allowed. Ditching, draining, filling, grading and excavation or removal of soil, sand, gravel, rock or other materials, are not permitted, except where incidental to activities or uses specifically permitted by this Easement.

2.10. Water. No alteration or manipulation of natural watercourses, ponds, lakes, wetlands or other surface or subsurface bodies of water is allowed, except to restore or enhance wildlife habitat or native biological communities, or to improve or enhance the function and quality of existing wetlands, in accordance with a habitat management plan approved by the Grantee under paragraph 3 below.

2.11. Storage. The Protected Property may not be used for any kind of storage, whether above or below ground, specifically including boats, vehicles, equipment, etc.

2.12. Vegetation Management. No removal, cutting, pruning, trimming or mowing of any trees or other vegetation, and no introduction of non-native species, is allowed, except as follows:
a. In conjunction with forest or habitat protection and management, or as otherwise specifically permitted in paragraph 3 below.
b. As reasonably required to prevent or control insects, noxious weeds, invasive vegetation, disease, fire, personal injury, or property damage.
c. To remove fallen or dead trees, and to gather firewood for personal use, or as otherwise provided in Subparagraph 3.2 below.

3. RESERVED RIGHTS.

Grantor retains all rights associated with ownership and use of the Protected Property that are not expressly restricted or prohibited by this Agreement and the Easement. The Grantor may not, however, exercise such rights in a manner that would have a material, adverse impact on the open space Conservation Values of the Protected Property. Additionally, the Grantor must give notice to the Grantee before exercising any reserved right that might have a material, adverse impact on the Conservation

Values associated with the Protected Property. Without limiting the generality of the above, the following rights are expressly reserved and the Grantor may use and allow others to use the Protected Property as follows:

3.1. Right to Convey. The Grantor may sell, give, lease, bequeath, devise, mortgage or otherwise encumber or convey the Protected Property; provided, that any conveyance or encumbrance of the Protected Property is subject to the Easement and the terms of this Agreement.

3.2. Habitat and Forest Management. The Protected Property may be used to maintain, restore and enhance habitat for native wildlife, native plant life, and native biological communities. Any removal of timber shall be limited to fallen or dead trees, and firewood for personal use, unless in accordance with a woodland management plan approved by Grantee.

4. GRANTEE'S RIGHTS AND REMEDIES.

In order to accomplish the purposes of this Easement, the Grantee has the following rights and remedies:

4.1. Right to Enter. The Grantee or its agent has the right to enter the Protected Property at reasonable times and in a reasonable manner for the following purposes:

a. To inspect the Protected Property and to monitor compliance with the terms of this Easement.
b. To obtain evidence for use in seeking judicial or other enforcement of this Easement.
c. To survey or otherwise mark the boundaries of all or part of the Protected Property, if necessary to determine whether there has been or may be a violation of this Easement.
d. To otherwise exercise its rights under this Easement.

4.2. Right of Enforcement. The Grantee has the right to prevent or remedy violations of this Easement through appropriate judicial action brought against the Grantor or other responsible party, in any court of competent jurisdiction.

a. Notice. Grantee may not initiate judicial action until Grantor is given written notice of the violation, or threatened violation, of this Agreement and the terms of the Easement, and a reasonable opportunity to correct the violation, unless immediate judicial action is necessary to prevent or mitigate significant damage to the Protected Property and good faith efforts to notify Grantor are unsuccessful.
b. Remedies. Remedies available to the Grantee in enforcing the terms of the Easement and this Agreement include the right to request temporary or permanent injunctive relief for any such violation or threatened violation, to require restoration of the Protected Property to its condition at the time of this conveyance or as otherwise necessitated by such violation, to seek

specific performance or declaratory relief, and to recover damages resulting from such violation. The foregoing remedies are cumulative and are available without requiring the Grantee to prove actual damage to the Conservation Values.

c. Costs. Any costs incurred by Carver County in enforcing the terms of this Agreement against Grantor, including court costs and attorney's fees, and any cost of restoration necessitated by Grantor's violation of the terms of this Grant shall be borne by Grantor.

d. Discretionary Enforcement. Enforcement of the terms of the Easement and this Agreement is solely at the discretion of Grantee, and Grantee does not waive or forfeit the right to take any action necessary to assure compliance with the terms of the Easement and this Agreement by any delay or prior failure of Grantee in discovering a violation or initiating enforcement proceedings.

e. Acts Beyond Grantor's Control. Grantee may not bring any action against Grantor for any change to the Protected Property resulting from causes beyond Grantor's control, such as changes caused by fire, flood, storm, natural deterioration or the unauthorized acts of persons other than the Grantor or the Grantor's agents, employees or contractors, or, changes resulting from reasonable actions taken in good faith to attempt to prevent or mitigate damage resulting from such causes.

5. NO PUBLIC ACCESS.

Nothing whatsoever in this Easement shall be construed as giving the general public a right to enter upon or otherwise use the Protected Property, or to otherwise claim any rights whatsoever with respect to the Protected Property.

6. GENERAL PROVISIONS.

6.1. Assignment. This Agreement and the Easement may only be assigned or transferred by Grantee to another political subdivision of the State of Minnesota. Any such future holder of the Easement shall have the rights of Grantee pursuant to the terms of the Easement and this Agreement. Grantee will notify Grantor of any assignment within fifteen (15) days thereof, and will provide the Grantor with the name and address of the new holder.

6.2. Amendment. This Agreement and the Easement may not be modified, amended or extinguished without the express written agreement of Grantee in each instance. If the Easement is extinguished or terminated in whole or in part, Grantee shall not be entitled to any portion of any proceeds received from a sale, exchange or involuntary conversion.

6.3. Indemnification. Grantor, its successor and assigns, shall hold harmless, indemnify and defend Grantee and its employees, agents and contractors, and their successors and assigns (collectively "Indemnified Parties") from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action,

claims, demands or judgments, including without limitation, reasonable attorneys' fees arising from or in any way connected with: (1) the result of a violation or alleged violation of any State or Federal environmental statue or regulation including the storage or disposal of hazardous or toxic chemicals or materials; (2) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition or other matter related to or incurring on or about the premises, regardless of costs, unless due solely to the gross negligence of any of the Indemnified Parties; and (3) existence and administration of this easement.

6.4. Binding Effect. The Easement and this Agreement shall run with and burden the Protected Property in perpetuity. The terms of this Easement are binding and enforceable against Grantor, all successors in title to the Protected Property, and all other parties entitled to possess or use the Protected Property. This Easement creates a property right immediately vested in the Grantee and its successors and assigns that cannot be terminated or extinguished except as set out herein.

6.5 Enforceability. If any provisions of this easement, or the application thereof to any person or circumstances, is found to be invalid, the remainder of the provisions of this easement, or the application of such provision to the persons or circumstances other than those as to which it found to be invalid, as the case may be, shall not be affected and shall continue in full force and effect.

6.6 Authorized Representative. Each individual signing on behalf of a party to this Agreement states that he or she is the duly authorized representative of the signing party and that his or her signature on this Agreement has been duly authorized by; and creates the binding and enforceable obligation of the party on whose behalf the representative is signing.

IN WITNESS WHEREOF, said parties have hereunto executed this document the date and year first written below.

DATE: GRANTORS:

_____

_____

STATE OF MINNESOTA)
) ss
COUNTY OF CARVER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____, named in the forgoing instrument, and _____, his spouse, as their free act and deed.

_____
Notary Public

OR

STATE OF MINNESOTA)
) ss
COUNTY OF CARVER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____, Grantor.

_____
Notary Public

OR

STATE OF MINNESOTA)
) ss
COUNTY OF CARVER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____, a Minnesota corporation named in the forgoing instrument, and said that he did so pursuant to authority given him by the board of directors of said corporation.

_____
Notary Public

GRANTEE:
County of Carver

By: _____

STATE OF MINNESOTA)
) ss
COUNTY OF CARVER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20__, by _____
_____.

_____
Notary Public

This document drafted by:

Office of the Carver County Attorney
604 East Fourth Street
Chaska, Minnesota 55318
(952) 361-1400

CONSENT OF MORTGAGEE

The foregoing Conservation Easement is hereby consented to by _____, a national association.

BANK

By _____

Its_____

By _____

Its_____

Date: _____

STATE OF MINNESOTA)
) ss
COUNTY OF CARVER)

The foregoing instrument was acknowledged before me on _____, 20___ by _____, the _____ and _____, the _____, of _____, a national association on behalf of said national association.

EXHIBIT A (legal description)