Storm Water Management & Erosion Control Report

Isthmus Montessori Academy

City of Madison
Dane County, Wisconsin

MSA Project No. 21586000

March 2022

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1.0 GENERAL INFORMATION

1.1. Introduction

This report provides the conclusions reached as part of the stormwater management study for the Isthmus Montessori Academy (IMA) school/building addition project located in the City of Madison, WI. This report is intended to meet the requirements of Wisconsin Administrative Code NR 151 and City of Madison storm water and development ordinances, and demonstrate that the proposed construction will incorporate stormwater management and erosion control practices that will satisfy all applicable state and local standards.

1.2. Project Location

The project is located at 1802 Pankratz Street in the City of Madison, WI. This project is located in the NW ¼, NE ¼, Section 31, T08N, R10E, Dane County, Wisconsin, (**Appendix A)**. The total site area is 4.41 acres, with approximately 3.6 acres disturbed for the school building development project.

The site is located on the near north side of Madison near the Dane County Regional Airport. Generally, the topography in this area is fairly flat as this is at the edge of an large flood plain/wetland that the airport and surrounding area was built on. The immediate location of the site lies on a fill material that is elevated above the airport and surrounding roadways (Packers Avenue). The area was filled 80+ years ago when this area was first developed.

1.3. Project Development

The proposed project includes an addition to an existing building to expand the capacity of the school, relocation of a sidewalk, redevelopment of a large portion of the east parking lot, a small parking lot addition north of the existing parking lot, storm water BMPs and all other associated turf restoration. Various temporary and permanent erosion control measures will also be included as part of the project.

2.0 STORMWATER RUNOFF INFORMATION

2.1. Existing Drainage Conditions

The current site is split into two lots. The lot to the south was developed in 2005 or 2006 as a commercial office building. It was redeveloped approximately five years ago as a school. The developed lot to the south currently has two parking lots, an access driveway (shared with another parcel to the south), a 15,000 sf building, sidewalks and other open/turf/playground areas. Storm water from the majority of the site, approximately 65%-70%, flows east to an existing swale along Pankratz Street. The balance flows to the west toward Packers Avenue. The north lot is currently undeveloped for the most part. Approximately ½ the lot flows flows east to the east swale and the other half flows either directly to Packers Avenue or to one of two area drains within the lot.

2.2. Proposed Drainage Conditions

The proposed drainage conditions will not change somewhat after the proposed project is complete. The site will be graded in order to most of the existing east parking lot and new building addition to a new bio-infiltration basin located north of the proposed parking lot. Smaller storms/lower flows form the pond will be conveyed to the west and south to the existing 18-inch concrete storm sewer pipe located on the west side of the site and ultimately connects to a storm sewer system along Packers Avenue. The larger flows will flow through a standpipe and overflow weir to the east toward the existing east swale along Pankratz Street. The areas west of the south parking lot and school building itself will continue to flow toward Packers Avenue. See **Appendix B and C** for Calculations.

2.3. Soil Types

Four main soil categories, known as Hydrologic Soil Groups (HSG), are considered when using the TR-55 method of runoff analysis. These are based partially on the soils minimum infiltration rates and range from a well-drained HSG A soil to a poorly drained HSG D soil. A map showing the existing soil types can be found in **Appendix A**, and the following table summarizes these soils:

Table 1: ***Dane County Soil Data for Project Limits***

Soil Type	Description	Soil Code	Hydrologic Soil Group	Infiltration Rate (in/hr)
St. Charles	***Silt Loam***	***ScB***	***B***	***0.13***

Infiltration rates in this table were determined according to information summarized in WDNR Conservation Practice Standard 1002. Soil borings and pits were completed at the site. The soil borings showed some layers of sandy to sandy loam soils around 8 feet below existing ground along the north side of the site. The soil pits though showed only two pits that had decent infiltrating soils and they were located approximately 11 feet below existing ground. These soils at 11 feet were sandy loams, therefore, the infiltration rates are 0.50”/hr. The geotechnical results are shown in **Appendix K**.

2.4. Runoff Curve Number (RCN)

A runoff curve number (RCN) is roughly defined as the percentage of water that can be anticipated to run off the surface without infiltrating. These numbers are assigned based on the land use, soil type, and ground cover conditions, according to the conditions published by the NRCS under TR-55 (June 1986).

The project curve numbers were based on soil conditions consisting of HSG Type A soils. *Impervious* asphalt roadways, driveways, sidewalks/paths, and building/roof areas were assigned an RCN of 98. Pervious surfaces that consist of

turf grass were assigned an RCN of 61 (Type B soils). All pervious surfaces were assumed to be soils in good condition.

The post-development percent of impervious areas for the site's disturbed areas will increase from 39.6% to 59.1% as the result of adding approximately 0.9 acres of impervious area.

3.0 STORMWATER ANALYSIS

3.1. Description

HydroCAD 10.0, utilizing methodology from TR-55, was used to calculate flows for the site to size the storm water conveyance system and the wet detention basin. The developed site was required to satisfy a combination of existing site, new development, and redevelopment post-construction standards. The time of concentration, runoff curve number, land use, and soil groups were all used as inputs in this model. Storm Load and Management Model (SLAMM) 10.3.4 was also utilized to calculate the TSS removal from the proposed wet detention basin.

3.2. Design Standards

NR 151 (State Standards)

- New Development – 80% TSS Reduction (NR 151.121)
- Redevelopment - 40% TSS Reduction
- Peak Flow Control – 1yr and 2yr (NR 151.123)
- Infiltration – 75% of Preconstruction stay-on volume (NR 151.124)

City of Madison of Caledonia (Local Standards)

- Maintain peak flow rates for 5-yr to 200-yr storms

3.3. Total Suspended Solids Reduction

Total suspended solids will be removed by the proposed bio-infiltration basin. Storm Load and Management Model (SLAMM) was utilized to calculate total TSS generated from different areas onsite and for the removal calculations. Portions of the site need to meet 80% TSS reduction (new impervious areas) and other redeveloped parking lot areas need to meet 60% TSS reduction. The modeling shows that the TSS reduction for the disturbed site, approximately 3.7 acres, utilizing the bio-infiltration basins, meets the required standards. The results are shown in **Appendix D**.

3.4. Peak Discharge Rates

Table 2 below shows the existing (2022 pre-construction) peak flow rates based TP-40 rainfall intensities and a Type II rainfall distribution.

Table 2. ***Peak Discharge Rates***

Event	Existing	Post Construction
1-year, 24-hour	5.6 cfs	2.8 cfs
2-year, 24-hour	6.5 cfs	3.3 cfs
5-year, 24-hour	8.7 cfs	4.9 cfs
10-year, 24-hour	11.0 cfs	7.7 cfs
25-year, 24-hour	14.7 cfs	9.7 cfs
50-year, 24-hour	18.0 cfs	11.4 cfs
100-year, 24-hour	21.9 cfs	13.2 cfs
200-year, 24-hour	25.5 cfs	17.6 cfs

The post-construction discharge for the all storms shows the peak flow is maintained.

3.5. Infiltration

The surficial soils on this site are silt loam. These lots were filled at one time in the past with a mix of sands and clays. Soil borings and pits completed as part of this project shows the site to contain mostly sandy clays below the fill. Two borings/pits did show an area of sandy loam toward the northeast corner of the site This area will be utilized for storm water management and a bio-infiltration basin. The soil pits indicate there is no groundwater or other confining layers near the below the tighter soils. Therefore, infiltration will be required on the site.

The area was once developed with buildings associated with the US Army. These buildings were removed in the early 2000s. The area is also adjacent to a known landfill located across Pankratz Avenue to the east. However, there is no known contamination or landfill debris on the immediate site.

One bio-filtration basin will be installed to reduce peak flows and infiltrate storm water. The basins will be able to infiltrate sufficient volume of storm water to meet the DNR requirements. Calculations are located in **Appendix E**.

3.6. Wetland Analysis

There are no wetland areas on the site. A soil and wetland map is included in **Appendix A**.

4.0 CONSTRUCTION PHASE EROSION CONTROL

4.1. Erosion Control Devices

The Contractor shall install and maintain all proposed erosion control measures listed below in accordance with the corresponding Wisconsin DNR technical

standards attached in **Appendix F**. Inspections during construction shall be performed weekly, and following a rain event (>0.5"), and documented on DNR Form 3400-187, "Construction Site Inspection Report."

Erosion control on the site will consist of conventional BMPs to control sediment during construction, and aid in turf restoration after construction is complete. The first erosion control item to be installed will be a stone tracking pad at the main truck entrance to the site assumed to be the new north parking lot entrance to the site. Prior to grading, silt fence is required as shown per the plans and specifications on the west side of the property adjacent to Packers Avenue and on the east side of the property adjacent to the east swale.

The first anticipated site activity will be stripping and rough grading the majority of the north undeveloped the site in order to grade the parking lot and pad for the new building. The proposed bio-infiltration basin will need to be excavated immediately after construction begins in order to utilize it as a temporary sedimentation basin. The next construction activity will be to install the storm sewer throughout the site. The storm sewer outfalls to the ditch and in the basin will require rip rap while the area drains/inlets will require inlet protection. All disturbed areas adjacent to the basins will be restored with turf will be covered with erosion mat, Class 1, Type B. After the site is restored and 70% of the turf is germinated along with all hard surfaces paved, the basin will be excavated to the sandy loam layer approximately 11 feet below existing ground or 4 to 5 feet below the stone storage layer. This area will need to be filled with clean stone to connect the bottom of the basin to the good soils at this elevation. Next, the stone storage layer will be installed along with the engineered soil, pipe underdrain, observation wells, mulch, plants, sediment logs, and erosion mat on the bottom of the basin. After construction operations are complete and the site is restored, all temporary erosion control items shall be removed.

A. **Stone Tracking Pad**

At least one tracking pad will be installed north at the northern gravel driveway entrance of the site. Other tracking pads may be required if material is hauled offsite and other driveway entrances to public roads are used. The tracking pads will measure a minimum of 20-feet wide (or the full width of ingress or egress if less than 20-feet wide) by 50-feet long according to WDNR technical standard 1057.

B. **Erosion Mat**

Non-channel erosion mat will be utilized throughout the site in all swales and along the graded areas sloped at 4:1 or greater, along the bottom and side slopes of all swales and ditches, and on the side slopes of the wet detention basin. Erosion mat shall be installed according to WDNR technical standard 1053.

C. **Silt Fence**

Silt fence will be utilized in all areas that slope away from the project site. The silt fence will be utilized to prevent soil and other material from leaving the site. Construction and maintenance of the silt fence will follow WDNR technical standard 1056.

D. **Seeding and Mulching**

Disturbed soil within the project will be restored with seed and mulch according to the MSA seeding specification included in **Appendix G**. All fill areas and topsoil stock piles shall be seeded within seven days of the last land disturbing activity at any fill site.

E. **Bio-Infiltration Basin**

The proposed basins will be excavated at the beginning of the project to be used as temporary settling basins during the development project. After the site has been restored and the parking lot and sidewalk/paths paved, the basins will be regraded to remove the accumulated sediment and install the engineered soils and plantings/plugs.

4.2. Construction Schedule

The following schedule is approximate based on the best available information from the Owner:

Install tracking pads & E.C. Items ..... April 2022
Rough grading and excavation for foundation..... April 2022
Building addition construction.....April-October 2022
Site Utility installation .....May-June 2022
Grading for parking lot and installation of ..... June-August 2022
Asphalt paving ..... Sept.-Oct 2022
Initial restoration..... September 2022
Project Completion .....November 2022

4.3. Construction Costs

The cost for the proposed erosion control measures is estimated to be $155,000 and is detailed in **Table 3** shown below. This includes the delivery, installation, and maintenance of the measures called for on the plan.

Table 3: Storm Water and Erosion Control Construction Estimate

Description	Quantity	Unit	Unit Price	Total
Seed and Mulch	5,500	S.Y.	$1.00	$5,500.00
Stone Tracking Pad	100	S.Y.	$20.00	$2,000.00
Silt Fence	1,000	L.F.	$2.50	$2,500.00

Rip Rap w/ Fabric	60	C.Y.	$50.00	$3,000.00
Erosion Mat, CL 1, Type B	3,000	S.Y.	$2.00	$6,000.00
Inlet Protection, Type A/D	14	Ea.	$150.00	$2,100.00
Small diameter storm sewer	1,300	L.F.	$40.00	$52,000.00
Small diameter endwalls	4	Ea.	$500.00	$2,000.00
Area Drains/Inlets	12	Ea.	$2,500.00	$30,000.00
Bio-Infiltration Basins	1	Ea.	$50,000	$50,000.00
			TOTAL =	$155,100.00

5.0 REPORTING

5.1. Erosion Control Inspection

- All controls will be inspected at least once per week and within 24-hours of any storm event greater than 0.5-inches. One inspection form shall be completed by the Owner or Owner's Representative at the time of inspection (**Appendix G**).

5.2. Minimum Maintenance Requirements

- All measures are to be maintained in good working order. If repairs are necessary, they will be initiated within 24 hours of identification.
- Built up sediment shall be removed from silt fence, sediment logs, and weepers before it reaches the height greater than one-third of that of the BMP in place.
- Silt fences shall be inspected for tears, and checked for proper anchorage and be repaired as necessary.
- All temporary stockpiles shall be seeded no later than 7 days after construction activities cease in the area.
- Cover and control measures at soil stockpiles shall be maintained to prevent erosion.
- Washouts and bare spots shall be repaired in temporary or permanent seeding. Maintenance measures shall be performed to promote healthy vegetative growth.
- The temporary sediment trap shall be regraded immediately prior to final restoration of the site to restore sediment capture capacity of the pond.

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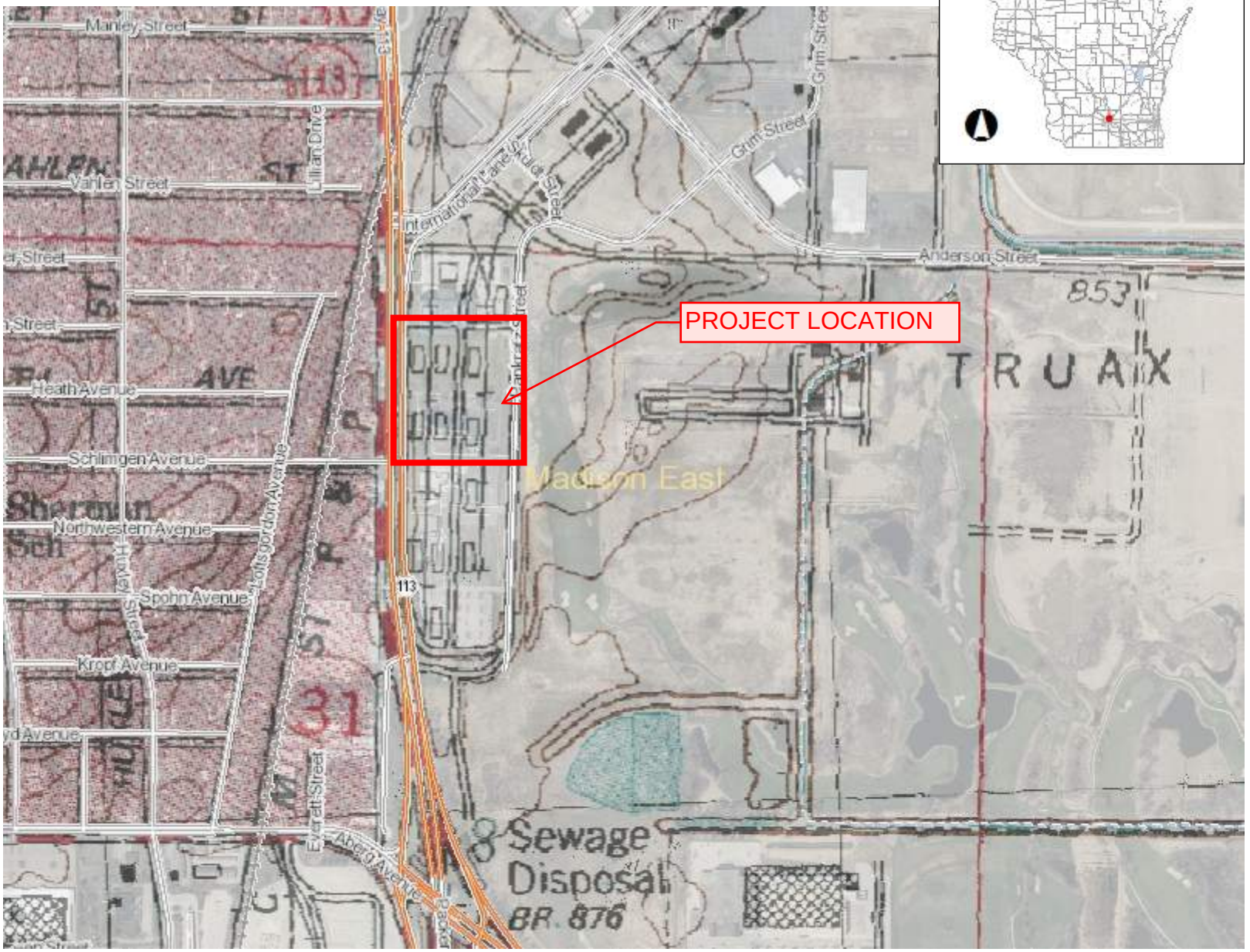
APPENDIX A

Project Maps

- USGS Project Location Map
- Dane County Soil Survey and Wetlands Map
- Erosion Control Plans

USGS LOCATION MAP - APPENDIX A



Legend

- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water
- 24K USGS Quad Index - Level 7 - 16
- Index to EN_Image_Basemap_Leaf_Off

Notes

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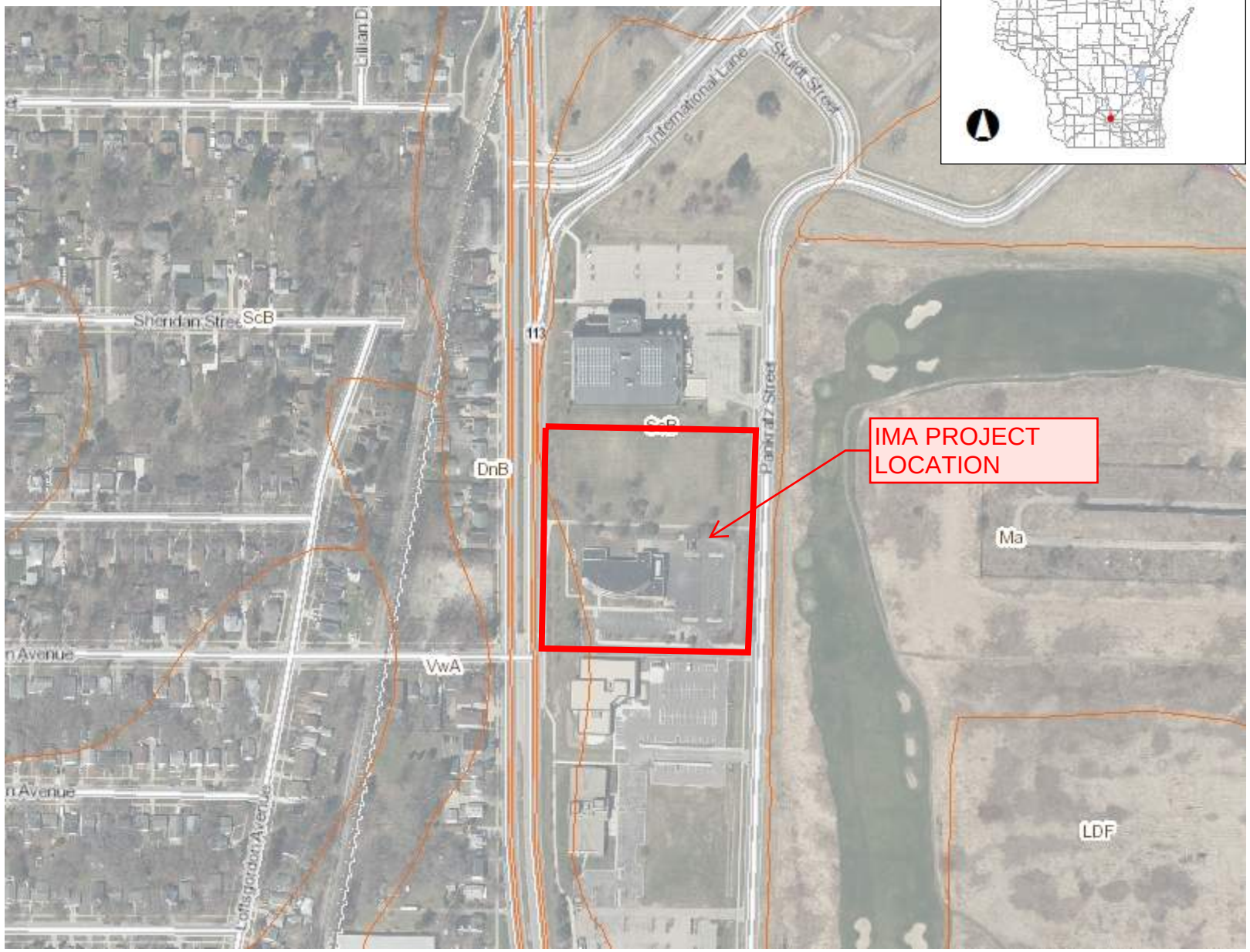
NAD_1983_HARN_Wisconsin_TM

1: 7,920

WETLAND/SOILS MAP - EXHIBIT A



Legend

- Wetland Indicators
- NRCS Wetspots
- NRCS Wisconsin Soils
  - Soil Mapping Unit
  - Water
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Railroads
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water
- Index to EN_Image_Basemap_Leaf_Off

Notes

0.1 0 0.06 0.1 Miles

NAD_1983_HARN_Wisconsin_TM

1: 3,960

0 20 40

EXISTING SCHOOL BUILDING
FFE - 884.50

PROPOSED SCHOOL BUILDING
FFE - 884.50

SB #3

SB #5

EROSION MAT CLASS 1, TYPE B, URBAN, TYP.

INLET PROTECTION, TYPE D, TYP.

SEDIMENT LOG, TYP.

VEHICLE TRACKING PAD

SILT FENCE, TYP.

MEDIUM RIP RAP WITH FABRIC

PANKRATZ STREET

		NO.	DATE	REVISION	BY
PROJECT DATE: .	DRAWN BY: LPS	.	.	.	.
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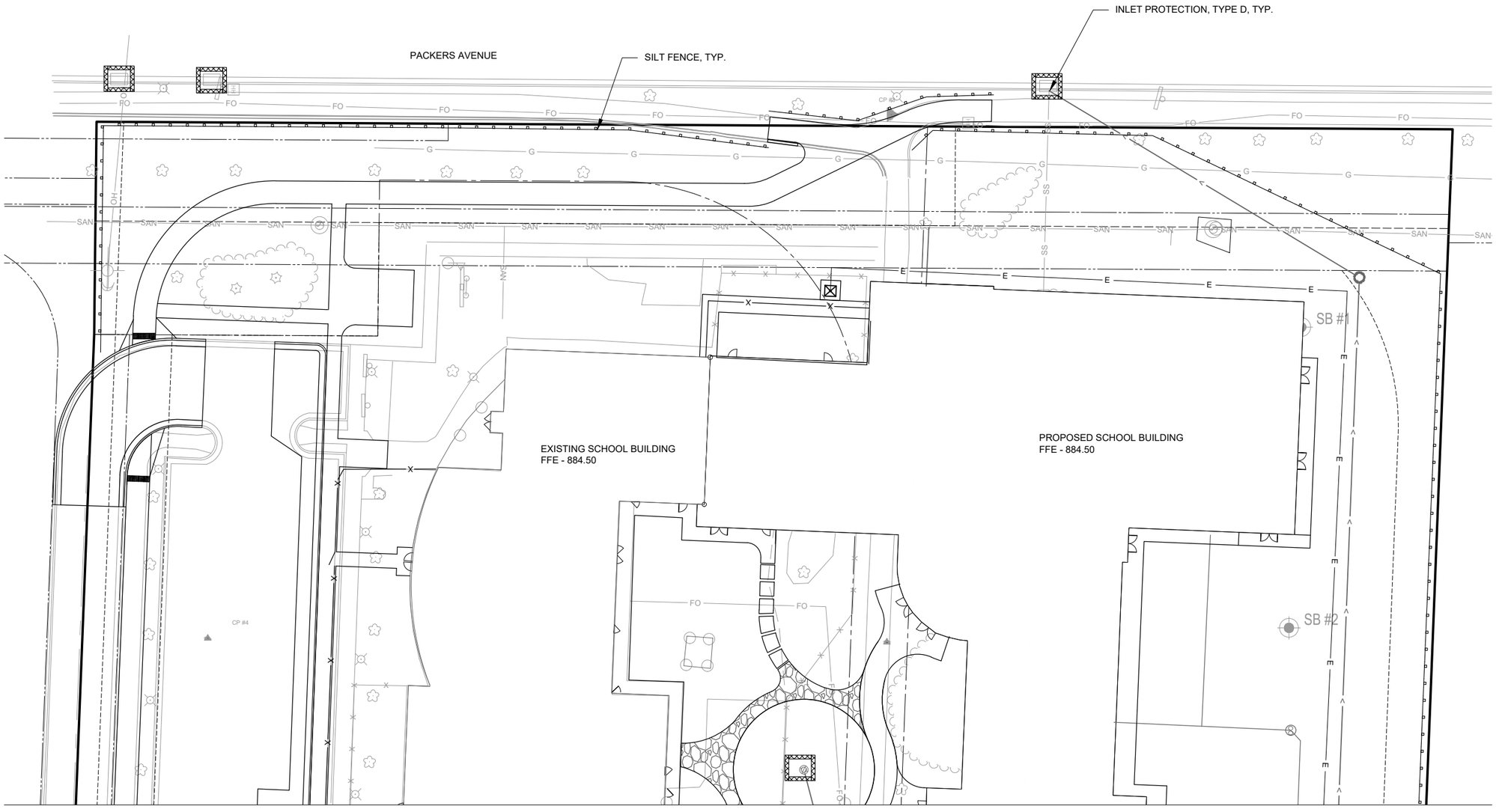
MADISON, WISCONSIN

EROSION CONTROL PLAN - EAST

PROJECT NO. 21586000

SHEET C110

0 20 40



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MADISON, WISCONSIN

EROSION CONTROL PLAN - WEST

PROJECT NO. 21586000
SHEET C111

APPENDIX B

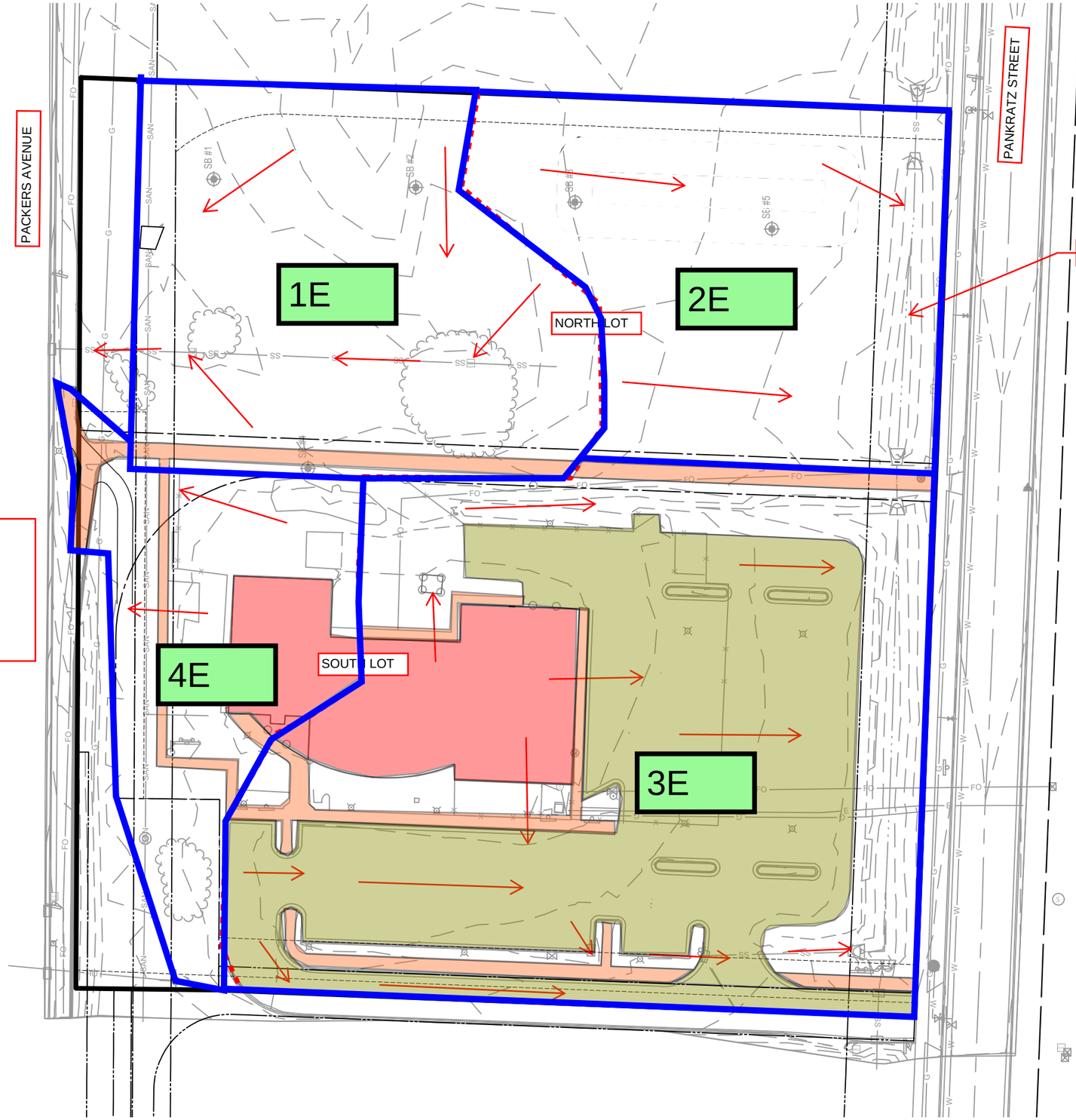
Peak Flow Calculations – Existing

WEST WATERSHED - AREA SUMMARY -
NORTH LOT:

GRASS/TURF:	37,500 SF
GRASS/TURF (OFFSITE):	4,500 SF
TOTAL:	**42,000 SF**

WEST WATERSHED - AREA SUMMARY
SOUTH LOT:

BUILDING:	4,450 SF
SIDEWALK/CONC.	3,600 SF
PAVEMENT:	0 SF
GRASS/TURF:	24,000 SF
TOTAL:	**32,050 SF**



EAST WATERSHED - AREA SUMMARY
NORTH LOT:

GRASS/TURF:	39,400 SF
TOTAL:	**39,400 SF**

EAST WATERSHED - AREA SUMMARY
SOUTH LOT:

BUILDING:	10,550 SF
SIDEWALK/CONC.	6,325 SF
PAVEMENT:	53,000 SF
GRASS/TURF:	22,375 SF
TOTAL:	**92,250 SF**

EXISTING BUILDING

EXISTING SIDEWALK/CONC.

EXISTING PAVEMENT

NO.	DATE	REVISION	BY

PROJECT DATE: .
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PLOT DATE: 3/13/2022 2:03 PM, G:\21\21586\21586000\CADD\Construction Documents\Exhibits\21586000 Stormwater Exhibit Existing 2022-03-13.dwg

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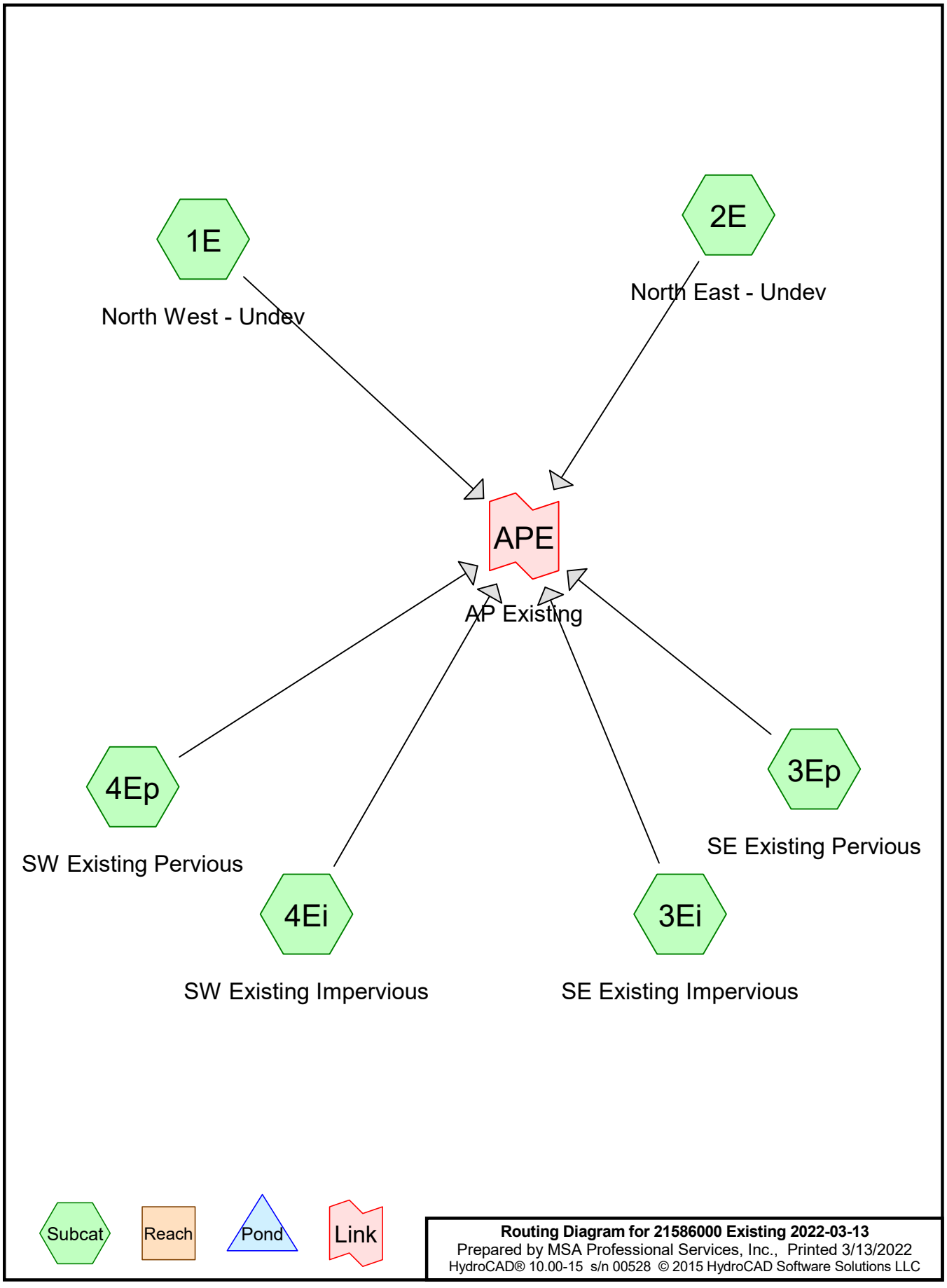
MADISON, WI

EXISTING WATERSHEDS

PROJECT NO. 21586000

SHEET P1



Routing Diagram for 21586000 Existing 2022-03-13
Prepared by MSA Professional Services, Inc., Printed 3/13/2022

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>0.17"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=0.09 cfs 0.014 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>0.17"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=0.08 cfs 0.013 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=98 Runoff=4.96 cfs 0.289 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>0.17"
Flow Length=315' Tc=16.8 min CN=61 Runoff=0.04 cfs 0.007 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=98 Runoff=0.57 cfs 0.033 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>0.17"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=0.06 cfs 0.008 af

Link APE: AP Existing Inflow=5.57 cfs 0.363 af
Primary=5.57 cfs 0.363 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.363 af Average Runoff Depth = 0.92"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 0.09 cfs @ 12.36 hrs, Volume= 0.014 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.013 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 4.96 cfs @ 12.13 hrs, Volume= 0.289 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 0.04 cfs @ 12.43 hrs, Volume= 0.007 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.033 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 0.06 cfs @ 12.25 hrs, Volume= 0.008 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 0.92" for 1-Year event
Inflow = 5.57 cfs @ 12.13 hrs, Volume= 0.363 af
Primary = 5.57 cfs @ 12.13 hrs, Volume= 0.363 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=0.20 cfs 0.022 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=0.19 cfs 0.021 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=98 Runoff=5.68 cfs 0.333 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=315' Tc=16.8 min CN=61 Runoff=0.09 cfs 0.012 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=98 Runoff=0.65 cfs 0.038 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=0.14 cfs 0.013 af

Link APE: AP Existing Inflow=6.54 cfs 0.438 af
Primary=6.54 cfs 0.438 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.438 af Average Runoff Depth = 1.11"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 0.20 cfs @ 12.28 hrs, Volume= 0.022 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 0.19 cfs @ 12.27 hrs, Volume= 0.021 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 5.68 cfs @ 12.13 hrs, Volume= 0.333 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 0.09 cfs @ 12.35 hrs, Volume= 0.012 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 0.65 cfs @ 12.13 hrs, Volume= 0.038 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 0.14 cfs @ 12.20 hrs, Volume= 0.013 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-Year Rainfall=2.84"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 1.11" for 2-Year event
Inflow = 6.54 cfs @ 12.13 hrs, Volume= 0.438 af
Primary = 6.54 cfs @ 12.13 hrs, Volume= 0.438 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>0.52"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=0.50 cfs 0.041 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>0.52"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=0.48 cfs 0.039 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=98 Runoff=7.01 cfs 0.414 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>0.51"
Flow Length=315' Tc=16.8 min CN=61 Runoff=0.24 cfs 0.022 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=98 Runoff=0.81 cfs 0.048 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>0.52"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=0.35 cfs 0.024 af

Link APE: AP Existing Inflow=8.71 cfs 0.588 af
Primary=8.71 cfs 0.588 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.588 af Average Runoff Depth = 1.49"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 0.50 cfs @ 12.25 hrs, Volume= 0.041 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 0.48 cfs @ 12.25 hrs, Volume= 0.039 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 7.01 cfs @ 12.13 hrs, Volume= 0.414 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 0.24 cfs @ 12.31 hrs, Volume= 0.022 af, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 0.81 cfs @ 12.13 hrs, Volume= 0.048 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 0.35 cfs @ 12.18 hrs, Volume= 0.024 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-Year Rainfall=3.49"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 1.49" for 5-Year event
Inflow = 8.71 cfs @ 12.14 hrs, Volume= 0.588 af
Primary = 8.71 cfs @ 12.14 hrs, Volume= 0.588 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>0.79"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=0.86 cfs 0.063 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>0.79"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=0.81 cfs 0.059 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=98 Runoff=8.24 cfs 0.490 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>0.78"
Flow Length=315' Tc=16.8 min CN=61 Runoff=0.40 cfs 0.034 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=98 Runoff=0.95 cfs 0.056 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>0.79"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=0.60 cfs 0.036 af

Link APE: AP Existing Inflow=10.96 cfs 0.738 af
Primary=10.96 cfs 0.738 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.738 af Average Runoff Depth = 1.88"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 0.86 cfs @ 12.24 hrs, Volume= 0.063 af, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 0.81 cfs @ 12.23 hrs, Volume= 0.059 af, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 8.24 cfs @ 12.13 hrs, Volume= 0.490 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 0.40 cfs @ 12.29 hrs, Volume= 0.034 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 0.95 cfs @ 12.13 hrs, Volume= 0.056 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 0.60 cfs @ 12.17 hrs, Volume= 0.036 af, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-Year Rainfall=4.09"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 1.88" for 10-Year event
Inflow = 10.96 cfs @ 12.14 hrs, Volume= 0.738 af
Primary = 10.96 cfs @ 12.14 hrs, Volume= 0.738 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>1.27"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=1.49 cfs 0.102 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>1.27"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=1.42 cfs 0.096 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>4.52"
Tc=6.0 min CN=98 Runoff=10.12 cfs 0.604 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>1.27"
Flow Length=315' Tc=16.8 min CN=61 Runoff=0.70 cfs 0.054 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>4.52"
Tc=6.0 min CN=98 Runoff=1.17 cfs 0.070 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>1.27"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=1.03 cfs 0.059 af

Link APE: AP Existing Inflow=14.67 cfs 0.985 af
Primary=14.67 cfs 0.985 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.985 af Average Runoff Depth = 2.50"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 1.49 cfs @ 12.23 hrs, Volume= 0.102 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 1.42 cfs @ 12.22 hrs, Volume= 0.096 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 10.12 cfs @ 12.13 hrs, Volume= 0.604 af, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 0.70 cfs @ 12.28 hrs, Volume= 0.054 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 1.17 cfs @ 12.13 hrs, Volume= 0.070 af, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 1.03 cfs @ 12.16 hrs, Volume= 0.059 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-Year Rainfall=5.01"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 2.50" for 25-Year event
Inflow = 14.67 cfs @ 12.14 hrs, Volume= 0.985 af
Primary = 14.67 cfs @ 12.14 hrs, Volume= 0.985 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=2.11 cfs 0.140 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=2.00 cfs 0.131 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=11.73 cfs 0.703 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=315' Tc=16.8 min CN=61 Runoff=1.00 cfs 0.074 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=1.35 cfs 0.081 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>1.75"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=1.45 cfs 0.080 af

Link APE: AP Existing Inflow=18.04 cfs 1.210 af
Primary=18.04 cfs 1.210 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.210 af Average Runoff Depth = 3.07"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 2.11 cfs @ 12.22 hrs, Volume= 0.140 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 2.00 cfs @ 12.22 hrs, Volume= 0.131 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 11.73 cfs @ 12.13 hrs, Volume= 0.703 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 1.00 cfs @ 12.27 hrs, Volume= 0.074 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 1.35 cfs @ 12.13 hrs, Volume= 0.081 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 1.45 cfs @ 12.16 hrs, Volume= 0.080 af, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 50-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 3.07" for 50-Year event
Inflow = 18.04 cfs @ 12.14 hrs, Volume= 1.210 af
Primary = 18.04 cfs @ 12.14 hrs, Volume= 1.210 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>2.30"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=2.83 cfs 0.185 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>2.30"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=2.68 cfs 0.173 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>6.06"
Tc=6.0 min CN=98 Runoff=13.48 cfs 0.810 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>2.29"
Flow Length=315' Tc=16.8 min CN=61 Runoff=1.34 cfs 0.098 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>6.06"
Tc=6.0 min CN=98 Runoff=1.55 cfs 0.093 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>2.30"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=1.93 cfs 0.106 af

Link APE: AP Existing Inflow=21.85 cfs 1.465 af
Primary=21.85 cfs 1.465 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.465 af Average Runoff Depth = 3.72"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 2.83 cfs @ 12.22 hrs, Volume= 0.185 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 2.68 cfs @ 12.22 hrs, Volume= 0.173 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 13.48 cfs @ 12.13 hrs, Volume= 0.810 af, Depth> 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 1.34 cfs @ 12.27 hrs, Volume= 0.098 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 1.55 cfs @ 12.13 hrs, Volume= 0.093 af, Depth> 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 1.93 cfs @ 12.16 hrs, Volume= 0.106 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-Year Rainfall=6.66"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 3.72" for 100-Year event
Inflow = 21.85 cfs @ 12.14 hrs, Volume= 1.465 af
Primary = 21.85 cfs @ 12.14 hrs, Volume= 1.465 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: North West - Undev Runoff Area=42,000 sf 0.00% Impervious Runoff Depth>2.85"
Flow Length=185' Slope=0.0160 '/' Tc=13.0 min CN=61 Runoff=3.53 cfs 0.229 af

Subcatchment 2E: North East - Undev Runoff Area=39,400 sf 0.00% Impervious Runoff Depth>2.85"
Flow Length=170' Slope=0.0160 '/' Tc=12.7 min CN=61 Runoff=3.34 cfs 0.215 af

Subcatchment 3Ei: SE Existing Runoff Area=69,875 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=15.11 cfs 0.909 af

Subcatchment 3Ep: SE Existing Pervious Runoff Area=22,375 sf 0.00% Impervious Runoff Depth>2.84"
Flow Length=315' Tc=16.8 min CN=61 Runoff=1.67 cfs 0.122 af

Subcatchment 4Ei: SW Existing Runoff Area=8,050 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=1.74 cfs 0.105 af

Subcatchment 4Ep: SW Existing Pervious Runoff Area=24,000 sf 0.00% Impervious Runoff Depth>2.85"
Flow Length=65' Slope=0.0150 '/' Tc=8.3 min CN=61 Runoff=2.41 cfs 0.131 af

Link APE: AP Existing Inflow=25.51 cfs 1.710 af
Primary=25.51 cfs 1.710 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.710 af Average Runoff Depth = 4.35"
62.12% Pervious = 2.933 ac 37.88% Impervious = 1.789 ac

Summary for Subcatchment 1E: North West - Undev

Runoff = 3.53 cfs @ 12.22 hrs, Volume= 0.229 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	37,500	61	North Area Grass (west)
*	4,500	61	NW Offsite
	42,000	61	Weighted Average
	42,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.6	85	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	185	Total			

Summary for Subcatchment 2E: North East - Undev

Runoff = 3.34 cfs @ 12.21 hrs, Volume= 0.215 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	39,400	61	North Area Grass (east)
	39,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0160	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.3	70	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	170	Total			

Summary for Subcatchment 3Ei: SE Existing Impervious

Runoff = 15.11 cfs @ 12.13 hrs, Volume= 0.909 af, Depth> 6.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	53,000	98	Asphalt (to be redeveloped)
*	6,325	98	Sidewalk
*	10,550	98	Building (existing)
	69,875	98	Weighted Average
	69,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3Ep: SE Existing Pervious

Runoff = 1.67 cfs @ 12.26 hrs, Volume= 0.122 af, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	22,375	61	Grass
	22,375		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
5.1	215	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	315	Total			

Summary for Subcatchment 4Ei: SW Existing Impervious

Runoff = 1.74 cfs @ 12.13 hrs, Volume= 0.105 af, Depth> 6.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	3,600	98	Sidewalk
*	4,450	98	Building (existing)
	8,050	98	Weighted Average
	8,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4Ep: SW Existing Pervious

Runoff = 2.41 cfs @ 12.16 hrs, Volume= 0.131 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	24,000	61	Grass
	24,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	65	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Link APE: AP Existing

Inflow Area = 4.722 ac, 37.88% Impervious, Inflow Depth > 4.35" for 200-Year event
Inflow = 25.51 cfs @ 12.14 hrs, Volume= 1.710 af
Primary = 25.51 cfs @ 12.14 hrs, Volume= 1.710 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

APPENDIX C

Peak Flow Calculations – Proposed

EXISTING - AREA SUMMARY - WEST:

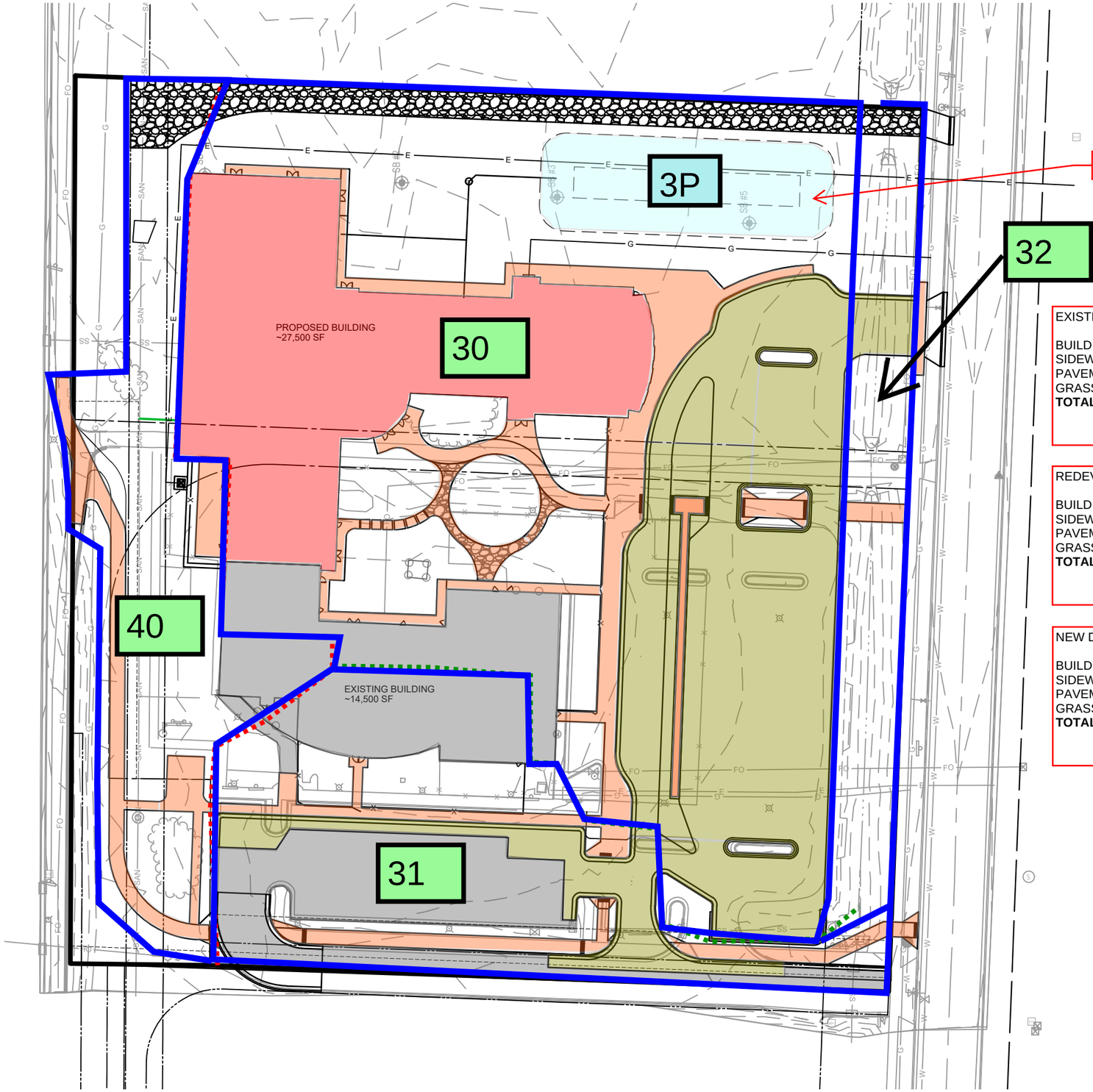
BUILDING:	2,500 SF
SIDEWALK/CONC.	0 SF
PAVEMENT:	0 SF
GRASS/TURF:	0 SF
TOTAL:	**2,500 SF**

REDEVELOPED - AREA SUMMARY - WEST:

BUILDING:	0 SF
SIDEWALK/CONC.	3,600 SF
PAVEMENT:	0 SF
GRASS/TURF:	18,075 SF
TOTAL:	**22,525 SF**

NEW DEVELOPMENT - AREA SUMMARY - WEST:

BUILDING:	0 SF
SIDEWALK/CONC.	1,325 SF
PAVEMENT:	0 SF
GRASS/TURF:	0 SF
TOTAL:	**1,325 SF**



EXISTING - AREA SUMMARY - EAST:

BUILDING:	12,500 SF
SIDEWALK/CONC.	325 SF
PAVEMENT:	13,000 SF
GRASS/TURF:	14,500 SF
TOTAL:	**40,325 SF**

REDEVELOPED - AREA SUMMARY - EAST:

BUILDING:	0 SF
SIDEWALK/CONC.	6,275 SF
PAVEMENT:	28,850 SF
GRASS/TURF:	9,250 SF
TOTAL:	**44,375 SF**

NEW DEVELOPMENT - AREA SUMMARY - EAST:

BUILDING:	27,450 SF
SIDEWALK/CONC.	11,050 SF
PAVEMENT:	12,225 SF
GRASS/TURF:	40,275 SF
TOTAL:	**91,000 SF**

EX. IMPERVIOUS - NOT REDEVELOPED

PROPOSED BUILDING

PROPOSED SIDEWALK/CONC.

PROPOSED PAVEMENT

			NO.	DATE	REVISION	BY
PROJECT DATE: .	DRAWN BY:	Init	.	.	.	.
	DESIGNED BY:	Init	.	.	.	.
	CHECKED BY:	Init	.	.	.	.

PLOT DATE: 3/13/2022 2:04 PM, G:\21\21586\21586000\CADD\Construction Documents\Exhibits\21586000 Stormwater Exhibit Proposed 2022-03-13.dwg

MSA
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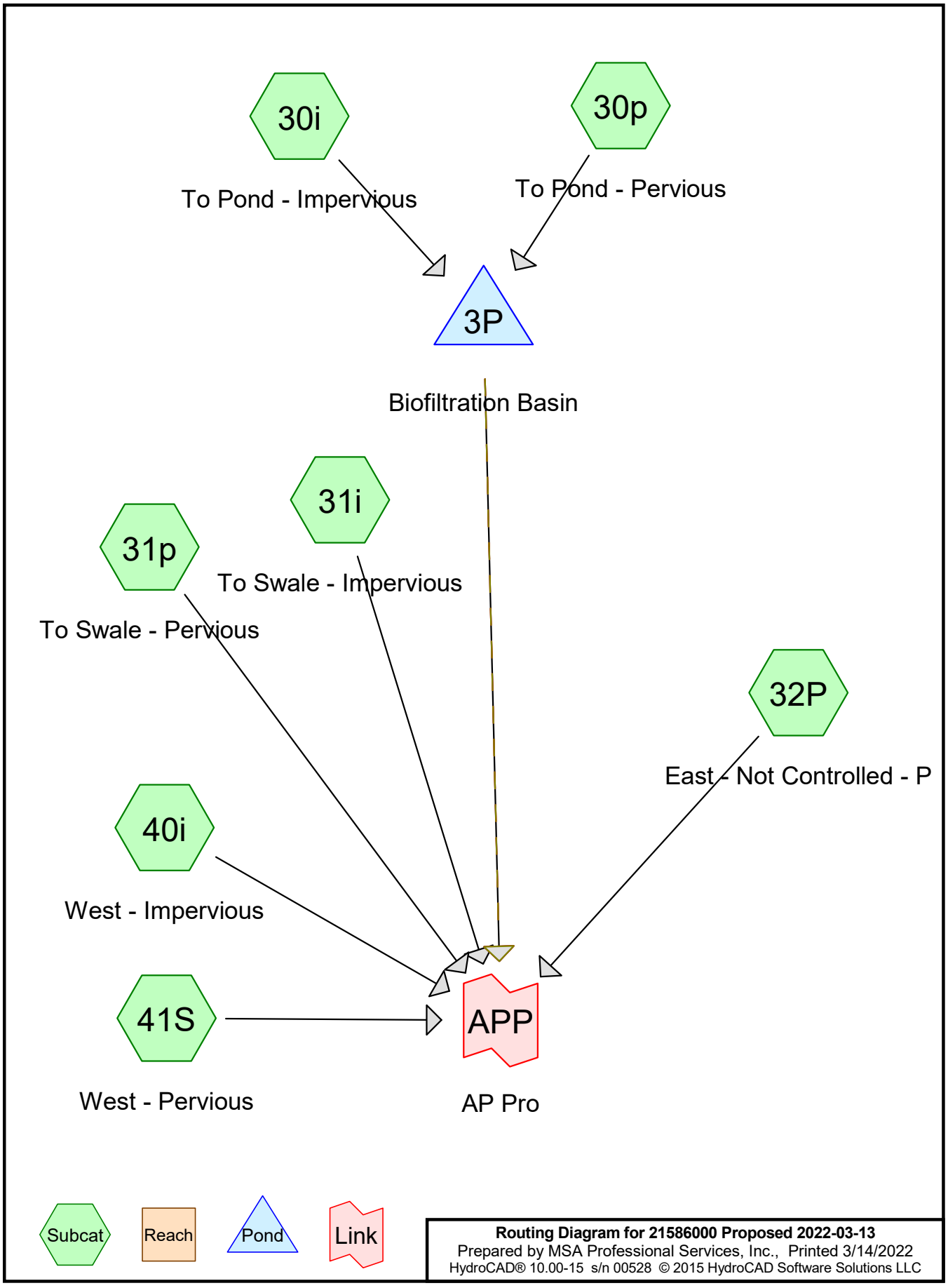
ISTHMUS MONTESSORI ACADEMY EXPANSION
ISTHMUS MONTESSORI ACADEMY
MADISON, WI

PROPOSED WATERSHEDS

PROJECT NO. 21586000
SHEET P1



Routing Diagram for 21586000 Proposed 2022-03-13
Prepared by MSA Professional Services, Inc., Printed 3/14/2022

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=98 Runoff=5.66 cfs 0.330 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>0.19"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=0.13 cfs 0.018 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=98 Runoff=2.08 cfs 0.121 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>0.17"
Tc=6.0 min CN=61 Runoff=0.02 cfs 0.002 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>0.17"
Tc=6.0 min CN=61 Runoff=0.04 cfs 0.005 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=98 Runoff=0.53 cfs 0.031 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>0.17"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=0.04 cfs 0.006 af

Pond 3P: Biofiltration Basin Peak Elev=881.01' Storage=10,333 cf Inflow=5.68 cfs 0.348 af
s 0.051 af Primary=0.24 cfs 0.106 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.158 af

Link APP: AP Pro Inflow=2.79 cfs 0.271 af
Primary=2.79 cfs 0.271 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.513 af Average Runoff Depth = 1.30"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Summary for Subcatchment 30i: To Pond - Impervious

Runoff = 5.66 cfs @ 12.13 hrs, Volume= 0.330 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	27,450	98	Building (New)
*	6,250	98	Building (Existing)
*	12,225	98	Parking Lot (New)
*	23,500	98	Parking Lot (Redev.)
*	7,550	98	Sidewalk (New)
*	2,825	98	Sidewalk (Redev.)
	79,800	98	Weighted Average
	79,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 30p: To Pond - Pervious

Runoff = 0.13 cfs @ 12.32 hrs, Volume= 0.018 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Adj	Description
*	42,550	61		Grass/Turf
*	4,500	61		Grass (Offsite)
*	2,500	98		Sidewalk (New - Unconnected)
	49,550	63	62	Weighted Average, UI Adjusted
	47,050			94.95% Pervious Area
	2,500			5.05% Impervious Area
	2,500			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0150	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	150	Total			

Summary for Subcatchment 31i: To Swale - Impervious

Runoff = 2.08 cfs @ 12.13 hrs, Volume= 0.121 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	0	98	Building (New)
*	6,250	98	Building (Existing)
*	5,350	98	Parking Lot (Redev.)
*	13,000	98	Parking Lot (Existing)
*	1,000	98	Sidewalk (New)
*	3,450	98	Sidewalk (Redev.)
*	325	98	Sidewalk (Existing)
	29,375	98	Weighted Average
	29,375		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 31p: To Swale - Pervious

Runoff = 0.02 cfs @ 12.20 hrs, Volume= 0.002 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	6,975	61	Grass/Turf
	6,975		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 32P: East - Not Controlled - P

Runoff = 0.04 cfs @ 12.20 hrs, Volume= 0.005 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	14,500	61	East Swale
	14,500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 40i: West - Impervious

Runoff = 0.53 cfs @ 12.13 hrs, Volume= 0.031 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	2,500	98	Building (Existing)
*	3,600	98	Sidewalk (Redev)
*	1,300	98	Sidewalk (New)
	7,400	98	Weighted Average
	7,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 41S: West - Pervious

Runoff = 0.04 cfs @ 12.22 hrs, Volume= 0.006 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-Year Rainfall=2.49"

	Area (sf)	CN	Description
*	18,075	61	Grass/Turf
	18,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	65	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.84"

Summary for Pond 3P: Biofiltration Basin

Inflow Area = 2.969 ac, 63.63% Impervious, Inflow Depth > 1.41" for 1-Year event
Inflow = 5.68 cfs @ 12.13 hrs, Volume= 0.348 af
Outflow = 0.30 cfs @ 13.56 hrs, Volume= 0.158 af, Atten= 95%, Lag= 86.2 min
Discarded = 0.05 cfs @ 13.56 hrs, Volume= 0.051 af
Primary = 0.24 cfs @ 13.56 hrs, Volume= 0.106 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Tertiary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 881.01' @ 13.56 hrs Surf.Area= 4,446 sf Storage= 10,333 cf

Plug-Flow detention time= 247.0 min calculated for 0.158 af (45% of inflow)
Center-of-Mass det. time= 156.0 min (904.9 - 748.9)

Volume	Invert	Avail.Storage	Storage Description
#1	875.00'	20,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 34,725 cf Overall - 13,750 cf Embedded = 20,975 cf
#2	878.00'	1,485 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 5,500 cf Overall x 27.0% Voids
#3	875.00'	2,723 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) Inside #1 8,250 cf Overall x 33.0% Voids
		25,183 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
875.00	3,200	0	0
878.00	3,200	9,600	9,600
880.00	3,200	6,400	16,000
883.50	7,500	18,725	34,725

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
878.00	2,750	0	0
880.00	2,750	5,500	5,500

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
875.00	2,750	0	0
878.00	2,750	8,250	8,250

Device	Routing	Invert	Outlet Devices
#1	Discarded	875.00'	**0.500 in/hr Exfiltration over Surface area**
#2	Primary	878.00'	**10.0" Round Culvert** L= 350.0' Ke= 0.500 Inlet / Outlet Invert= 878.00' / 877.00' S= 0.0029 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Primary	878.05'	**6.0" Round Culvert** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 878.05' / 878.00' S= 0.0005 '/' Cc= 0.900 n= 0.070, Flow Area= 0.20 sf
#4	Device 2	881.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	879.50'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 879.50' / 879.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#6	Device 5	883.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Tertiary	883.25'	**30.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.05 cfs @ 13.56 hrs HW=881.01' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.21 cfs @ 13.56 hrs HW=881.01' (Free Discharge)
├**2=Culvert** (Passes 0.05 cfs of 2.13 cfs potential flow)
│ └**4=Orifice/Grate** (Weir Controls 0.05 cfs @ 0.38 fps)
└**3=Culvert** (Barrel Controls 0.16 cfs @ 0.84 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=875.00' (Free Discharge)
└**5=Culvert** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 5.00 hrs HW=875.00' (Free Discharge)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link APP: AP Pro

Inflow Area = 4.722 ac, 57.89% Impervious, Inflow Depth > 0.69" for 1-Year event
Inflow = 2.79 cfs @ 12.13 hrs, Volume= 0.271 af
Primary = 2.79 cfs @ 12.13 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=98 Runoff=6.48 cfs 0.380 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>0.30"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=0.28 cfs 0.028 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=98 Runoff=2.39 cfs 0.140 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>0.27"
Tc=6.0 min CN=61 Runoff=0.05 cfs 0.004 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>0.27"
Tc=6.0 min CN=61 Runoff=0.10 cfs 0.008 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=98 Runoff=0.60 cfs 0.035 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=0.11 cfs 0.009 af

Pond 3P: Biofiltration Basin Peak Elev=881.09' Storage=10,657 cf Inflow=6.58 cfs 0.409 af
s 0.053 af Primary=1.02 cfs 0.158 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=1.07 cfs 0.211 af

Link APP: AP Pro Inflow=3.33 cfs 0.354 af
Primary=3.33 cfs 0.354 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.604 af Average Runoff Depth = 1.54"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=98 Runoff=8.01 cfs 0.473 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>0.56"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=0.67 cfs 0.053 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=98 Runoff=2.95 cfs 0.174 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>0.52"
Tc=6.0 min CN=61 Runoff=0.12 cfs 0.007 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>0.52"
Tc=6.0 min CN=61 Runoff=0.24 cfs 0.014 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=98 Runoff=0.74 cfs 0.044 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>0.52"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=0.28 cfs 0.018 af

Pond 3P: Biofiltration Basin Peak Elev=881.33' Storage=11,812 cf Inflow=8.37 cfs 0.526 af
s 0.054 af Primary=2.41 cfs 0.262 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=2.46 cfs 0.316 af

Link APP: AP Pro Inflow=4.92 cfs 0.519 af
Primary=4.92 cfs 0.519 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.783 af Average Runoff Depth = 1.99"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=98 Runoff=9.41 cfs 0.559 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>0.84"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=1.10 cfs 0.079 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=98 Runoff=3.46 cfs 0.206 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=61 Runoff=0.19 cfs 0.011 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=61 Runoff=0.40 cfs 0.022 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=98 Runoff=0.87 cfs 0.052 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>0.79"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=0.47 cfs 0.027 af

Pond 3P: Biofiltration Basin Peak Elev=881.79' Storage=14,168 cf Inflow=10.10 cfs 0.638 af
s 0.055 af Primary=2.56 cfs 0.363 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=2.63 cfs 0.418 af

Link APP: AP Pro Inflow=7.67 cfs 0.680 af
Primary=7.67 cfs 0.680 af

Total Runoff Area = 4.722 ac Runoff Volume = 0.956 af Average Runoff Depth = 2.43"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>4.52"
Tc=6.0 min CN=98 Runoff=11.56 cfs 0.690 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>1.34"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=1.89 cfs 0.127 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>4.52"
Tc=6.0 min CN=98 Runoff=4.25 cfs 0.254 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>1.28"
Tc=6.0 min CN=61 Runoff=0.33 cfs 0.017 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>1.28"
Tc=6.0 min CN=61 Runoff=0.69 cfs 0.035 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>4.52"
Tc=6.0 min CN=98 Runoff=1.07 cfs 0.064 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>1.28"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=0.81 cfs 0.044 af

Pond 3P: Biofiltration Basin Peak Elev=882.46' Storage=18,055 cf Inflow=12.85 cfs 0.817 af
s 0.057 af Primary=2.77 cfs 0.529 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=2.85 cfs 0.586 af

Link APP: AP Pro Inflow=9.66 cfs 0.943 af
Primary=9.66 cfs 0.943 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.232 af Average Runoff Depth = 3.13"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=13.39 cfs 0.803 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>1.82"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=2.63 cfs 0.173 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=4.93 cfs 0.296 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>1.75"
Tc=6.0 min CN=61 Runoff=0.46 cfs 0.023 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>1.75"
Tc=6.0 min CN=61 Runoff=0.96 cfs 0.048 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=1.24 cfs 0.074 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>1.75"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=1.14 cfs 0.060 af

Pond 3P: Biofiltration Basin Peak Elev=883.00' Storage=21,613 cf Inflow=15.28 cfs 0.975 af
s 0.059 af Primary=2.93 cfs 0.681 af Secondary=0.03 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=3.04 cfs 0.740 af

Link APP: AP Pro Inflow=11.35 cfs 1.183 af
Primary=11.35 cfs 1.183 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.477 af Average Runoff Depth = 3.76"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>6.06"
Tc=6.0 min CN=98 Runoff=15.40 cfs 0.925 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>2.39"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=3.49 cfs 0.226 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>6.06"
Tc=6.0 min CN=98 Runoff=5.67 cfs 0.340 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>2.30"
Tc=6.0 min CN=61 Runoff=0.61 cfs 0.031 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>2.30"
Tc=6.0 min CN=61 Runoff=1.28 cfs 0.064 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>6.06"
Tc=6.0 min CN=98 Runoff=1.43 cfs 0.086 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>2.30"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=1.51 cfs 0.080 af

Pond 3P: Biofiltration Basin Peak Elev=883.24' Storage=23,285 cf Inflow=17.97 cfs 1.151 af
s 0.060 af Primary=3.00 cfs 0.772 af Secondary=3.66 cfs 0.083 af Tertiary=0.00 cfs 0.000 af Outflow=6.75 cfs 0.915 af

Link APP: AP Pro Inflow=13.22 cfs 1.456 af
Primary=13.22 cfs 1.456 af

Total Runoff Area = 4.722 ac Runoff Volume = 1.752 af Average Runoff Depth = 4.45"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 30i: To Pond - Impervious Runoff Area=79,800 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=17.26 cfs 1.039 af

Subcatchment 30p: To Pond - Pervious Runoff Area=49,550 sf 5.05% Impervious Runoff Depth>2.95"
Flow Length=150' Tc=12.9 min UI Adjusted CN=62 Runoff=4.33 cfs 0.280 af

Subcatchment 31i: To Swale - Impervious Runoff Area=29,375 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=6.35 cfs 0.382 af

Subcatchment 31p: To Swale - Pervious Runoff Area=6,975 sf 0.00% Impervious Runoff Depth>2.86"
Tc=6.0 min CN=61 Runoff=0.76 cfs 0.038 af

Subcatchment 32P: East - Not Controlled - P Runoff Area=14,500 sf 0.00% Impervious Runoff Depth>2.86"
Tc=6.0 min CN=61 Runoff=1.58 cfs 0.079 af

Subcatchment 40i: West - Impervious Runoff Area=7,400 sf 100.00% Impervious Runoff Depth>6.80"
Tc=6.0 min CN=98 Runoff=1.60 cfs 0.096 af

Subcatchment 41S: West - Pervious Runoff Area=18,075 sf 0.00% Impervious Runoff Depth>2.85"
Flow Length=65' Slope=0.0200 '/' Tc=7.4 min CN=61 Runoff=1.88 cfs 0.099 af

Pond 3P: Biofiltration Basin Peak Elev=883.35' Storage=24,105 cf Inflow=20.51 cfs 1.318 af
0.061 af Primary=3.03 cfs 0.848 af Secondary=6.52 cfs 0.151 af Tertiary=2.58 cfs 0.023 af Outflow=12.22 cfs 1.082 af

Link APP: AP Pro Inflow=17.59 cfs 1.715 af
Primary=17.59 cfs 1.715 af

Total Runoff Area = 4.722 ac Runoff Volume = 2.013 af Average Runoff Depth = 5.12"
42.11% Pervious = 1.988 ac 57.89% Impervious = 2.734 ac

APPENDIX D

TSS Calculations

IMA TSS Calculations

Data file name: G:\21\21586\21586000\Permits\Storm Water\SLAMM\21586000 IMA SLAMM 2022-03-13.mdb
WinSLAMM Version 10.3.4
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 03-13-2022 Time: 21:26:06
Site information:

LU# 1 - Commercial: 30 - To Bio-Infiltration Basin Total area (ac): 2.968
1 - Roofs 1: 0.630 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 0.143 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.539 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Paved Parking 2: 0.281 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.173 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
32 - Sidewalks 2: 0.065 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.057 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.977 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

52 - Small Landscaped Areas 2: 0.103 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Commercial: 31 - To Swale (Not Controlled) Total area (ac): 0.833

1 - Roofs 1: 0.143 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

13 - Paved Parking 1: 0.123 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

14 - Paved Parking 2: 0.298 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

31 - Sidewalks 1: 0.023 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

32 - Sidewalks 2: 0.079 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

33 - Sidewalks 3: 0.007 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

51 - Small Landscaped Areas 1: 0.160 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Commercial: 32 - East Swale (Not Controlled) Total area (ac): 0.333

51 - Small Landscaped Areas 1: 0.333 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Commercial: 40 - To West (Not Controlled) Total area (ac): 0.585

1 - Roofs 1: 0.057 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

31 - Sidewalks 1: 0.083 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

32 - Sidewalks 2: 0.030 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

51 - Small Landscaped Areas 1: 0.415 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Biofilter CP# 1 (DS) - 3P - Bio-Infiltration Basin

1. Top area (square feet) = 7500
2. Bottom aea (square feet) = 3200
3. Depth (ft): 8.5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0.01
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 3
10. Porosity of rock filled volume = 0.33
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1

17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data — Soil Type Fraction in Eng. Soil

User-Defined Soil Type 1.000

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 20
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 8.25

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 3
2. Stand pipe height above datum (ft): 8

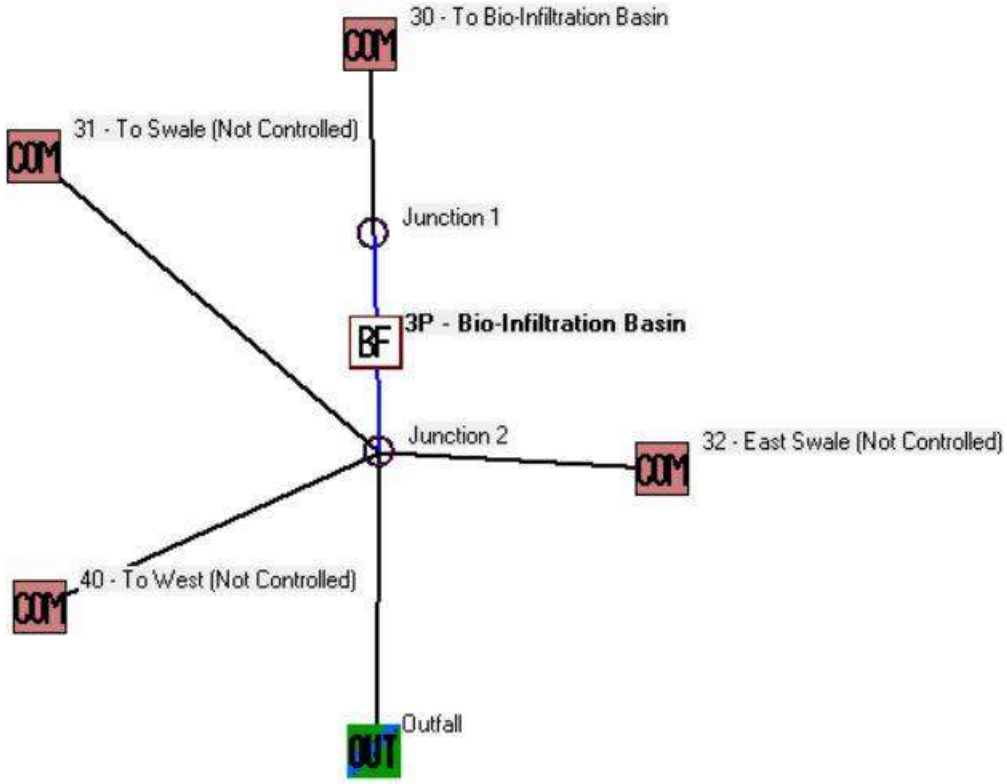
Outlet type: Surface Discharge Pipe

1. Surface discharge pipe outlet diameter (ft): 0.25
2. Pipe invert elevation above datum (ft): 5
3. Number of surface pipe outlets: 1

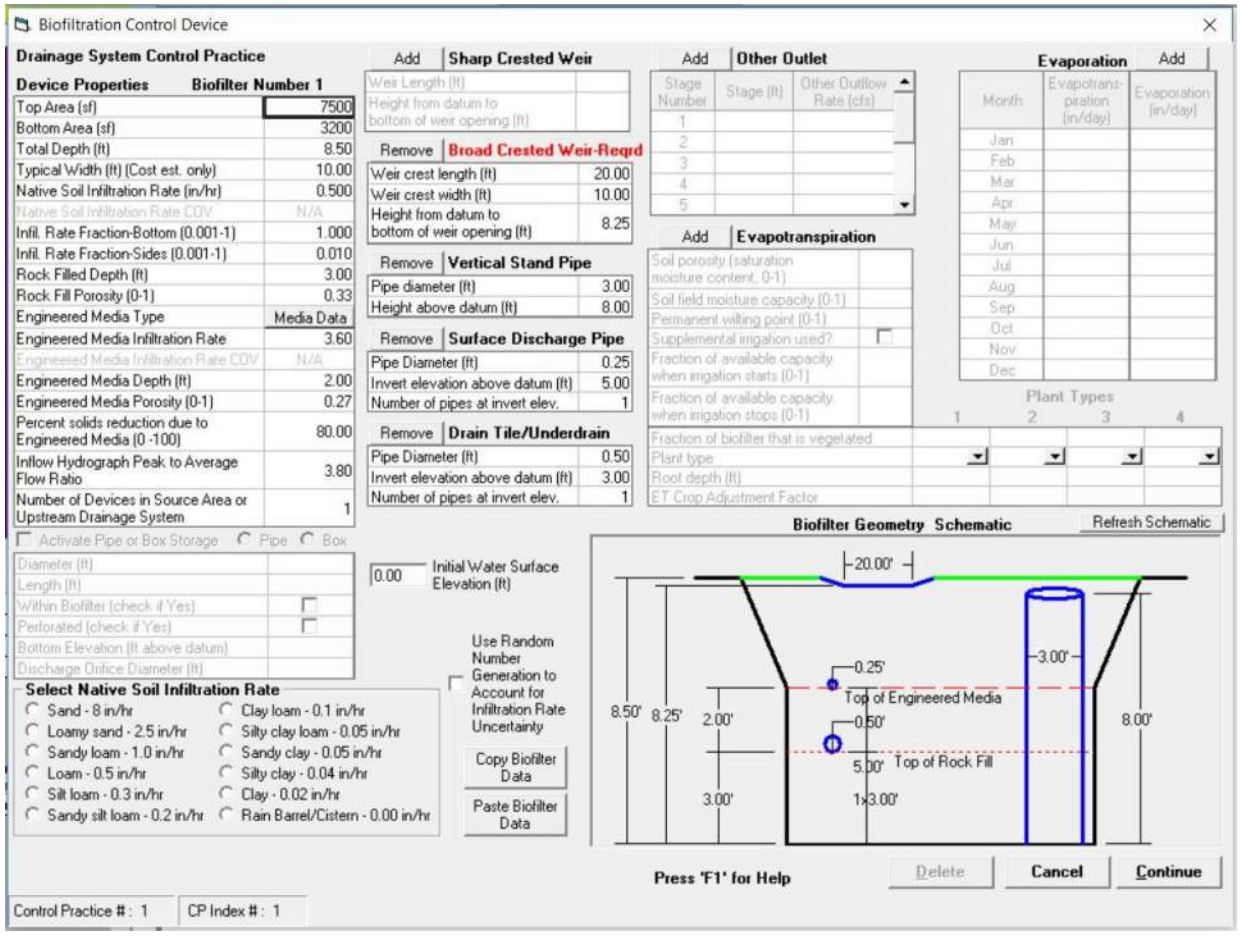
Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 3
3. Number of underdrain outlets: 1

Routing Diagram



Bio-Infiltration Basin #1



Control Practice Results

Land Uses | Junctions | **Control Practices** | Outfall | Output Summary

Runoff Volume | Part. Solids Yield (lbs) | Part. Solids Conc. (mg/L) | **Summary Table**

Data File: G:\21\21586\215860G000 IMA SLAMM 2022-03-13.mdb
Rain File: WisReg - Madison WI
Date: 03-13-22 Time: 9:14:20 PM
Site Description:

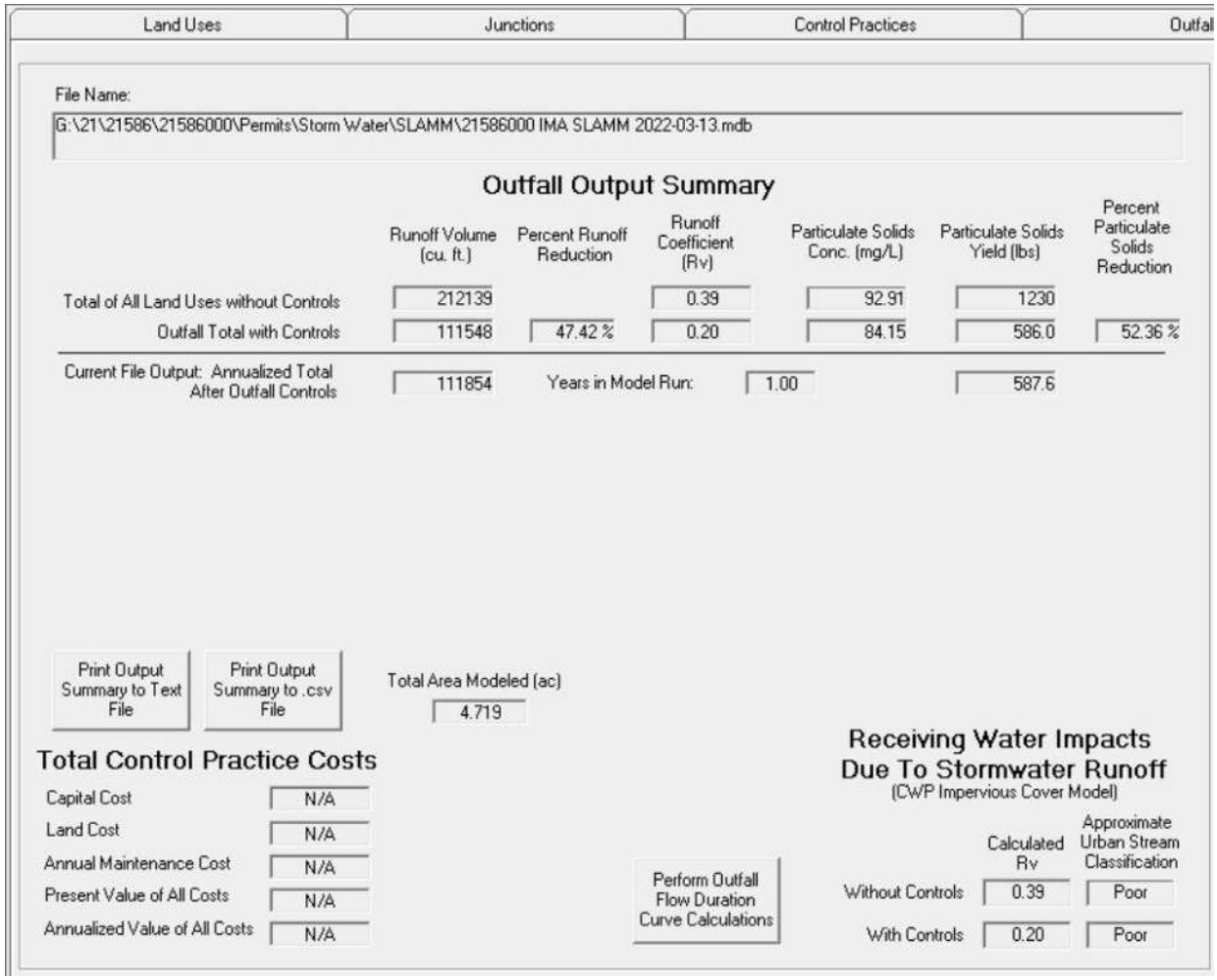
Col. #:	2	4	5	6	7	8	9	10	11	12	13	14	15	18
Control Practice No.	Control Practice Type	Total Inflow Volume (cf)	Total Outflow Volume (cf)	Percent Volume Reduction	Total Influent Load (lbs)	Total Effluent Load (lbs)	Percent Load Reduction	Flow Weighted Influent Conc (mg/L)	Flow Weighted Effluent Conc (mg/L)	Percent Conc. Reduction	Influent Median Part. Size (microns)	Effluent Median Part. Size (microns)	Notes	Maximum Stage (ft)
1	Biofilter	149456	48863	67.31	815.2	170.8	79.05	87.37	55.98	35.927	7.80	4.43	No Biofilter Overflows	6.55

Runoff Volume | Part. Solids Yield (lbs) | Part. Solids Conc. (mg/L) | **Summary Table**

Data File: G:\21\21586\215860
Rain File: WisReg - Madison WI
Date: 03-13-22 Time: 9:14:20 PM
Site Description:

Col. #:	2	19	27	28	29	30	31	32	33	34	35	39	54	61
Control Practice No.	Control Practice Type	Hydraulic Volume Out (cf)	Maximum Surface Ponding Time (hrs)	Maximum Subsurface Ponding Time (hrs)	Volume Infiltrated (cf)	Underdrain Discharge Vol. (cf)	Evapo-Transpir. Vol. (cf)	Minimum Soil Moist. (frac)	Surface Discharge Bypass Vol. (cf)	Evap. Vol. (cf)	Volume Supplemtl. Irrig.(cf)	Surface Ponding Events >72 hrs (Count)	Residence Time in Media (hrs)	Runoff Producing Events/ Ttl. Rains
1	Biofilter	46845	11.3	28.35	102998.60	22850			0.00			0	1.80	87/90

Results


Land Uses
Junctions
Control Practices
Outfal
File Name:
G:\21\21586\21586000\Permits\Storm Water\SLAMM\21586000 IMA SLAMM 2022-03-13.mdb
Outfall Output Summary
Runoff Volume (cu. ft.)
Percent Runoff Reduction
Runoff Coefficient (Rv)
Particulate Solids Conc. (mg/L)
Particulate Solids Yield (lbs)
Percent Particulate Solids Reduction
Total of All Land Uses without Controls
212139
0.39
92.91
1230
Outfall Total with Controls
111548
47.42 %
0.20
84.15
586.0
52.36 %
Current File Output: Annualized Total After Outfall Controls
111854
Years in Model Run:
1.00
587.6
Print Output Summary to Text File
Print Output Summary to .csv File
Total Area Modeled (ac)
4.719
Total Control Practice Costs
Capital Cost
N/A
Land Cost
N/A
Annual Maintenance Cost
N/A
Present Value of All Costs
N/A
Annualized Value of All Costs
N/A
Perform Outfall Flow Duration Curve Calculations
Receiving Water Impacts Due To Stormwater Runoff
(CWP Impervious Cover Model)
Calculated Rv
Approximate Urban Stream Classification
Without Controls
0.39
Poor
With Controls
0.20
Poor

Proposed Area Breakdown

30i - To Pond Impervious	Area (Ac.)	Area (sf)
Building - New	0.630	27450
Building - Existing	0.143	6250
Parking Lot - Pavement - New	0.281	12225
Parking Lot - Pavement - Redeveloped	0.539	23500
Sidewalk - New	0.173	7550
Sidewalk - Redeveloped	0.065	2825
30p - To Pond Pervious		
Small Landscaped Area - Grass	0.977	42550
Small Landscaped Area - Grass (offsite)	0.103	4500
Sidewalk (Unconnected)	0.057	2500
31i - To Swale Impervious		
Building - New	0.000	0
Building - Existing	0.143	6250
Parking Lot - Pavement - New	0.000	0
Parking Lot - Pavement - Redeveloped	0.123	5350
Parking Lot - Pavement - Existing	0.298	13000
Sidewalk - New	0.023	1000
Sidewalk - Redeveloped	0.079	3450
Sidewalk - Existing	0.007	325
31p - To Swale Pervious		
Small Landscaped Area - Grass	0.160	6975
32p - East Swale (Not Controlled)		
Small Landscaped Area - Grass	0.333	14500
40i - To West (Not Controlled)		
Building - Existing	0.057	2500
Sidewalk - Redeveloped	0.083	3600
Sidewalk - New	0.030	1325
40p - To West (Not Controlled)		
Small Landscaped Area - Grass	0.415	18075
	4.722	205700

TSS Removal Calculations

30 - To Bio-Infiltration Basin	**Area (Ac.)**	**TSS Generated (lbs)**	**Required Removal**	**TSS Removal Req'd (lbs)**
Building - New	0.630	104.1	80%	83
Building - Existing	0.143	23.6	0%	0
Parking Lot - Pavement - New	0.281	332.0	80%	266
Parking Lot - Pavement - Redeveloped	0.539	173.1	60%	104
Sidewalk - New	0.173	61.5	80%	49
Sidewalk - Redeveloped	0.065	23.1	60%	14
Small Landscaped Area - Grass	0.977	86.9	0%	0
Small Landscaped Area - Grass (offsite)	0.103	9.2	0%	0
Sidewalk - New (Unconnected)	0.057	1.7	80%	1
	2.969	**815.2**		
31 - To East Swale (Not Controlled)				
Building - Existing	0.143	23.6	0%	0
Parking Lot - Pavement - Redeveloped	0.123	75.8	60%	45
Parking Lot - Pavement - Existing	0.298	183.6	0%	0
Sidewalk - New	0.023	8.2	80%	7
Sidewalk - Redeveloped	0.079	28.1	60%	17
Sidewalk - Existing	0.007	2.5	0%	0
Small Landscaped Area - Grass	0.160	14.2	0%	0
	0.834	**336.0**		
32 - East Swale (Not Controlled)				
Small Landscaped Area - Grass	**0.333**	**29.6**	0%	0
40 - To West (Not Controlled)				
Building - Existing	0.057	9.4	0%	0
Sidewalk - Redeveloped	0.083	2.4	60%	1
Sidewalk - New	0.030	0.9	80%	1
Small Landscaped Area - Grass	0.415	36.9	0%	0
	0.585	**49.6**		
Site Totals	**4.722**	**815.2**		**588.2**

TSS Removal Calcs (Onsite only)	**TSS Generated (lbs)**	**TSS Removed (lbs)**	
Removals from Bio-Infiltration Basin	806.0	637.1	79.1% (SLAMM)

TSS Removal	**637.1 > 588.2 lbs Required Removal**

Total TSS Removal = **637.1 lbs**

APPENDIX E

Infiltration Calculations

IMA BUILDING PROJECT
Infiltration Calculations

Existing Site

Site Area:	4.722	Ac.
Ave. Annual Rainfall Volume:	493,828	cf
Total Ex. Site Runoff:	149,907	cf
Total Ex. Stay-on Volume:	343,921	cf

Proposed Site

Site Area:	4.722	Ac.
Required Stay-on Volume (90%):	309,529	cf
Total Runoff from proposed site (SLAMM)	111,948	cf
Total Stay-on Volume:	381,880	cf
Total Stay-on Volume (%):	**111.0%**	

Infilration of the first 0.5" of runoff

New pervious and impervious area onsite	2.746	Ac.
1/2" of Runoff (Volume)	4984	CF
Basin Infiltration (2.47") Rainfall Event	6098	CF

The bio-infiltration basin will handle a 1.15" rainfall event with 98% of the volume (0.140 ac-ft or 6098 cf) being infiltrated (the remaining 0.003 ac-ft or 130 cf flows through the draintile). This volume of infiltration is greater than the volume of the first 1/2" of runoff from the new areas of the site.

APPENDIX F

Erosion Control Technical Standards

- Non-Channel Erosion Mat
- Silt Fence
- Stone Tracking Pad and Tire Washing
- Inlet Protection

Wisconsin Department of Natural Resources
Conservation Practice Standard
Non-Channel Erosion Mat
1052

DEFINITION

A protective soil cover made of straw, wood, coconut fiber or other suitable plant residue, or plastic fibers formed into a mat, usually with a plastic or biodegradable mesh on one or both sides. Erosion mats are rolled products available in many varieties and combinations of material and with varying life spans.

PURPOSE

The purpose of this practice is to protect the soil surface from the erosive effect of rainfall and prevent erosion during the establishment of grass or other vegetation, and to reduce soil moisture loss due to evaporation. This practice applies to both *Erosion Control Revegetative Mats (ECRM*) and *Turf-Reinforcement Mats* (*TRM*).

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to erosion mat selection for use on erodible slopes.

This standard is not for *channel* erosion. For channel applications, reference WDNR Conservation Practice Standard (1053) Channel Erosion Mat.

Be aware of applicable federal, state, and local laws, rules, regulations, or permit requirements governing the use and placement of erosion mat. This standard does not contain the text of federal, state, or local laws.

CRITERIA

Products

Use erosion mat products identified on the Wisconsin Department of Transportation (WisDOT) Erosion Control Product Acceptability List (PAL).

Selection

Use WisDOT PAL classes and types to select and specify erosion mat.

Select the appropriate erosion mat based on site specific slope and slope length conditions in accordance with the WisDOT Facilities Development Manual (FDM Section 10-5) Slope Erosion Control Matrix.

Select erosion mat that will last long enough for turf grass or other vegetation to become densely established.

Use only mats containing exclusively organic material (no plastic) in or near *waterways* or other sensitive areas.

[1] Words in the standard that are shown in italics are described in the Definitions section. The words are italicized the first time they are used in the text.

Installation

Install and anchor erosion mat in accordance with manufacturer's instructions.

At the time of installation, retain material labels and manufacturer's installation instructions until the site has been stabilized.

Install ECRMs after topsoil is placed and seeding is complete.

Install TRMs in conjunction with placement of topsoil, followed by ECRM installation.

Install erosion mat so that it bears completely on the soil surface.

Use staples that are at least 6 inches long.

Do not install Class I or Class II - Type B products that incorporate photo- or bio-degradable netting after September 1st of a given year.

CONSIDERATIONS

Use Class I Urban mats in locations where shortly mowed turf grasses are to be established.

ECRMs without topsoiling and seeding can be used for temporary soil stabilization during the non-growing season or for periods of inactivity.

Slope interruption products that are designed, installed and maintained in accordance with DNR Interim Manufactured Perimeter Control and Slope Interruption Products Technical Standard 1071 can be used to reduce slope length.

Some erosion mat products can have detrimental effects on local wildlife. Plastic netting without independent movement of strands can easily entrap small animals moving through the area, leading to dehydration, desiccation, and eventually mortality. Netting that contains biodegradable thread with the "leno" or "gauze" weave (contains strands that can move independently) have the least impact on wildlife.

PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard and describe the requirements for applying the practice to achieve its intended use.

OPERATION AND MAINTENANCE

Inspect erosion mat at least weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

If there are signs of rilling under the mat, install more staples or more frequent anchoring trenches. If rilling becomes severe enough to prevent establishment of vegetation, remove the section of mat where the damage has occurred. Fill the eroded area with topsoil, compact, reseed and replace the section of mat, trenching and overlapping ends per manufacturer's recommendations. Additional staking is recommended near where rilling was filled.

In situations where soil type, topography, or other conditions result in poor observed performance, use multiple practices such as adding mulch under the mat, or installing appropriately placed check devices to reduce local velocity.

If the reinforcing plastic netting has separated from the mat, remove the plastic and if necessary replace the mat.

Complete maintenance as soon as possible with consideration to site conditions.

REFERENCES

WisDOT "Erosion Control Product Acceptability List" is available online at:

http://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/pal/default.aspx

DEFINITIONS

Erosion Control Revegetative Mats (ECRM) (II): A blanket like covering laid on top of a prepared seed bed to protect the soil and seed from the erosive forces of nature.

Turf-Reinforcement Mats (TRM) (II): Helps to permanently stabilize the soil by acting as reinforcement for the roots of the vegetation. This open weaved, synthetic mat is installed on top of soil and filled with topsoil and seeded. As the vegetation grows, the roots intertwine into the mat and reinforces the turf.

Channel: A constructed swale or ditch designed to convey storm water.

Waterways: Natural watercourses such as lakes or streams.

Silt Fence
(1056)

Wisconsin Department of Natural Resources
Conservation Practice Standard

I. Definition

Silt fence is a temporary sediment barrier of entrenched permeable geotextile fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil.

II. Purpose

The purpose of this practice is to reduce slope length of the disturbed area and to intercept and retain transported sediment from disturbed areas.

III. Conditions Where Practice Applies

A. This standard applies to the following applications:

1. Erosion occurs in the form of *sheet and rill erosion*[1]. There is no concentration of water flowing to the barrier (*channel erosion*).

2. Where adjacent areas need protection from sediment-laden runoff.

3. Where effectiveness is required for one year or less.

4. Where conditions allow for silt fence to be properly entrenched and staked as outlined in the Criteria Section V.

B. Under no circumstance shall silt fence be used in the following applications:

1. Below the ordinary high watermark or placed perpendicular to flow in streams, swales, ditches or any place where flow is concentrated.

2. Where the maximum gradient upslope of the fence is greater than 50% (2:1).

IV. Federal, State, and Local Laws

Users of this standard shall be aware of applicable federal, state, and local laws, rules, regulations, or permit requirements governing the use and placement of silt fence. This standard does not contain the text of federal, state, or local laws.

V. Criteria

This section establishes the minimum standards for design, installation and performance requirements.

A. Placement

1. When installed as a stand-alone practice on a slope, silt fence shall be placed on the contour. The parallel spacing shall not exceed the maximum slope lengths for the appropriate slope as specified in Table 1.

Table 1.	
Slope	**Fence Spacing**
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
> 33%	20 feet

2. Silt fences shall not be placed perpendicular to the contour.

3. The ends of the fence shall be extended upslope to prevent water from flowing around the ends of the fence.

B. Height – Installed silt fences shall be a minimum 14 inches high and shall not exceed 28 inches in height measured from the installed ground elevation.

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

C. Support – Silt fences shall be supported by either steel or wood supports as specified below:

1. Wood supports

   a. The full height of the silt fence shall be supported by 1 1/8 inches by 1 1/8 inches air or kiln dried posts of hickory or oak.

   b. The silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts in at least 3 places.

   c. The posts shall be a minimum of 3 feet long for 24-inch silt fence and a minimum of 4 feet for 36-inch silt fence fabric.

2. Steel supports

   a. The full height of the silt fence shall be supported by steel posts at least 5 feet long with a strength of 1.33 pounds per foot and have projections for the attachment of fasteners.

   b. The silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners. To prevent damage to the fabric from fastener, the protruding ends shall be pointed away from the fabric.

3. The maximum spacing of posts for non-woven silt fence shall be 3 feet and for woven fabric 8 feet.

4. Silt fence shall have a support cord.

5. Where joints are necessary, each end of the fabric shall be securely fastened to a post. The posts shall then be wrapped around each other to produce a stable, secure joint or shall be overlapped the distance between two posts.

6. A minimum of 20 inches of the post shall extend into the ground after installation.

D. Anchoring – Silt fence shall be anchored by spreading at least 8 inches of the fabric in a 4 inch wide by 6 inch deep trench, or 6 inch deep V-trench on the upslope side of the fence. The trench shall be backfilled and compacted. Trenches shall not be excavated wider and deeper than necessary for proper installation.

On the terminal ends of silt fence the fabric shall be wrapped around the post such that the staples are not visible.

E. Geotextile Fabric Specifications – The geotextile fabric consists of either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Non-woven fabric may be needle punched, heat bonded, resin bonded, or combinations thereof. All fabric shall meet the following requirements as specified in Table 2.

Table 2.

Test Requirement	Method	Value[1]
Minimum grab tensile strength in the machine direction	ASTM D 4632	120 lbs. (550 N)
Minimum grab tensile strength in the cross machine direction	ASTM D 4632	100 lbs. (450 N)
Maximum apparent opening size equivalent standard sieve	ASTM D 4751	No. 30 (600 μm)
Minimum permittivity	ASTM D 4491	0.05 scc^{-1}
Minimum ultraviolet stability percent of strength retained after 500 hours of exposure	ASTM D 4355	70%

(WisDOT Standard Specifications for Road and Bridge Construction, 2001)

[1] All numerical values represent minimum / maximum average roll values. (For example, the average minimum test results on any roll in a lot should meet or exceed the minimum specified values.)

Silt fence shall have a maximum flow rate of 10-gallons/minute/square foot at 50mm constant head as determined by multiplying permittivity in 1/second as determined by ASTM D-4491 by a conversion factor of 74.

F. Removal – Silt fences shall be removed once the disturbed area is permanently stabilized and no longer susceptible to erosion.

VI. Considerations

A. Improper placement as well as improper installation and maintenance of silt fences will significantly decrease the effectiveness of this practice.

Silt fences should be considered for trapping sediment where sheet and rill erosion may be expected to occur in small drainage areas. Silt fences should not be placed in areas of concentrated flow.

B. Silt fences should be installed prior to disturbing the upslope area.

C. Silt fences should not be used to define the boundaries of the entire project. Silt fence should be placed only in areas where it is applicable due to its cost and the fact that it is not biodegradable. For example, silt fence should not be placed in locations where the natural overland flow is from an undisturbed area into disturbed areas of the project. It should also not be used as a diversion.

D. Silt fence should not be used in areas where the silt fence is at a higher elevation than the disturbed area.

E. When placing silt fence near trees, care should be taken to minimize damage to the root system. Avoid compaction and root cutting within 1.5 feet multiplied by the inch diameter of the tree (for example: for 10-inch trees keep out a 15-foot radius from the trunk). Refer to UWEX publication Preserving Trees During Construction for more information.

F. To protect silt fence from damage in areas of active construction or heavy traffic, silt fence should be flagged, marked, or highlighted to improve visibility.

G. Silt fence effectiveness is generally increased when used in conjunction with other upslope erosion control practices. To further strengthen the silt fence, straw / hay bales can be placed on the down slope side.

H. To help ensure effectiveness, silt fence should be inspected and repaired as necessary prior to forecasted rain events.

I. Where installation with wood posts is difficult, such as when hard or frozen ground is encountered, the use of steel post is recommended.

J. Silt fence can be mechanically installed with a plow type device provided that the silt fence is trenched in a manner such that equivalent performance is achieved to that specified in Section V.D.

VII. Plans and Specifications

A. Plans and specifications for installing silt fence shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The plans and specifications shall address the following:

1. Location of silt fence
2. Contributory drainage area
3. Schedules
4. Material specification conforming to standard
5. Standard drawings and installation details
6. Restoration after removal

B. All plans, standard detail drawings, or specifications shall include schedule for installation, inspection, and maintenance. The responsible party shall be identified.

VIII. Operation and Maintenance

A. Silt fences shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24 hour period.

B. Damaged or decomposed fences, undercutting, or flow channels around the end of barriers shall be repaired or corrected.

C. Sediment shall be properly disposed of once the deposits reach ½ the height of the fence.

IX. References

UWEX Publication A0327 “Preserving Trees During Construction”

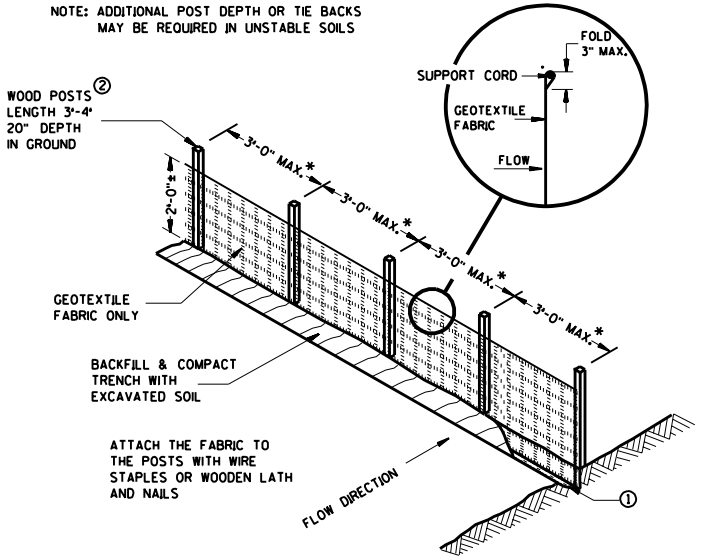
X. Definitions

Channel Erosion (III.A.1): The deepening and widening of a channel due to soil loss caused by flowing water. As rills become larger and flows begin to concentrate, soil detachment occurs primarily as a result of shear.

Sheet and Rill Erosion (III.A.1): Sheet and rill erosion is the removal of soil by the action of rainfall and shallow overland runoff. It is the first stage in water erosion. As flow becomes more concentrated rills occur. As soil detachment continues or flow increases, rills will become wider and deeper forming gullies.

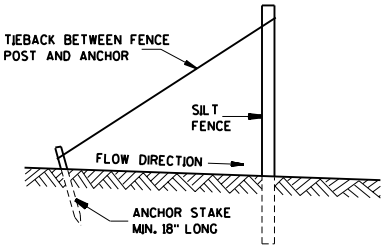
GENERAL NOTES

1. TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
2. WOOD POSTS SHALL BE A MINIMUM SIZE OF 1⅛" X 1⅛" OF OAK OR HICKORY.
3. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS: A) TWIST METHOD -- OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES. B) HOOK METHOD -- HOOK THE END OF EACH SILT FENCE LENGTH.

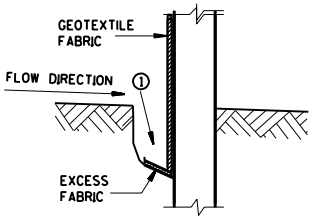


*NOTE: 8'-0" POST SPACING ALLOWED IF A WOVEN GEOTEXTILE FABRIC IS USED.

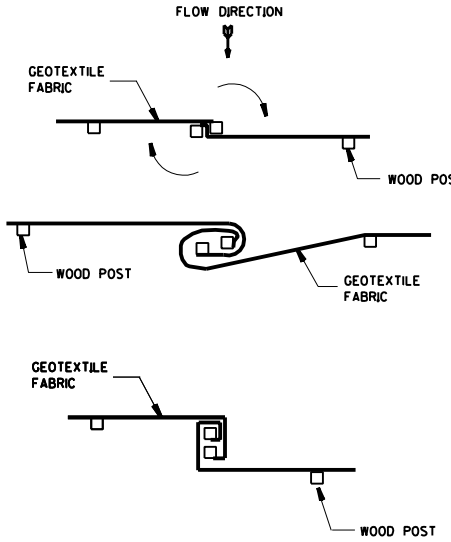
SILT FENCE



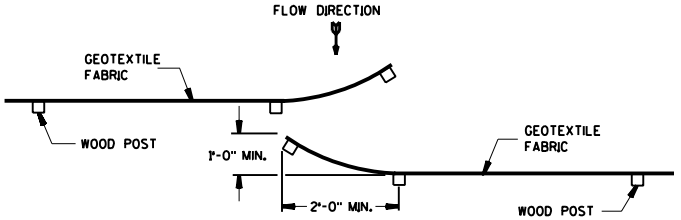
SILT FENCE TIE BACK
(WHEN ADDITIONAL SUPPORT REQUIRED)



TRENCH DETAIL



TWIST METHOD



HOOK METHOD

JOINING TWO LENGTHS OF SILT FENCE ④

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 9-6.

SILT FENCE

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

CONSERVATION PRACTICE STANDARD

TRACKOUT CONTROL PRACTICES

1057

DEFINITION

A practice or combination of practices used to prevent, reduce, or mitigate *trackout*[1] of sediment.

PURPOSE

Land-disturbing construction activity generally creates conditions where a vehicle comes in contact with exposed soil, which is then transported off *site* and/or deposited onto streets and roadways. This sediment can then become a road hazard and be carried from streets into drainage infrastructure and discharged into waters of the state. The purpose of this standard is to identify common methods which may be used to prevent, reduce, and/or mitigate the tracking of sediment.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies where land-disturbing activity is likely to result in trackout.

CRITERIA

General Criteria

Be aware of applicable federal, state, and local laws, rules, regulations, or permit requirements governing the practice. This standard does not contain the text of federal, state, or local laws.

Install one of the following practices, or a combination of practices, to prevent, reduce, or mitigate tracking of sediment off *site*.

Trackout is best managed by implementing controls in the order below. These controls may be implemented in series where conditions warrant.

(1) Prevent trackout with stabilized work surfaces and reduced vehicle contact with soil,

(2) Reduce trackout with stone tracking pad, manufactured trackout control devices, or tire washing,

(3) Mitigate trackout with street cleaning.

Select a device capable of supporting the vehicle load. Provide an alternate stabilized egress for oversized or overweight loads if needed.

Provide stable approaches to and from the practice.

Provide a stable driving surface from the practice to the off-site street or road.

Limit water use to minimize the discharge of sediment into drainage infrastructure.

Apply dust control measures when necessary to minimize generation of airborne dust while implementing trackout control practices.

Criteria Applicable to Stabilized Work Surfaces

Install aggregate, concrete, asphalt, manufactured mats, or other material in work areas and haul roads to minimize contact of vehicles with exposed soils and standing water (Figure 1).

[1] Words in the standard that are shown in italics are described in the Definitions section. The words are italicized the first time they are used in the text.

Install signage or fencing as needed to support intended use.

This practice is applicable, but not limited, to the following areas:

(1) Contractor staging areas and lay-down areas where major grading has been completed and soil stockpiles are not being constructed or removed,

(2) Site trailer and construction employee parking areas,

(3) Private property access routes,

(4) Proposed parking areas,

(5) Redevelopment sites, or

(6) Short-term/low traffic access locations such as directional drilling pits.

Stabilized work surfaces may be used as a stand-alone practice if vehicles leaving the site are restricted to the stabilized surface and the surface is properly maintained.

If an administering authority determines that control is not being maintained, additional measures may be required.

Criteria Applicable to Stone Tracking Pads

Install the stone tracking pad to ensure vehicles that drive over exposed soil exit along the full length of the pad (Figure 2).

Use hard, durable, angular stone or recycled concrete meeting the gradation in Table 1. Where this gradation is not available, meet the gradation in Wisconsin Department of Transportation (DOT) 2018 Standard Specification, Section 312, Select Crushed Material. Use material substantially free from dirt, debris, steel, vegetable matter, and other deleterious material.

Table 1. Gradation for stone tracking pads

Sieve Size	Percent by weight passing
3”	100
2-1/2”	90-100
1-1/2”	25-60
3/4”	0-20
3/8”	0-5

Install the tracking pad across the full width of the access point, or restrict exiting traffic to a dedicated egress lane with a driving surface at least 12 feet wide.

Ensure the tracking pad is at least 50 feet long. If a 50-foot pad length is not possible due to site constraints, install the maximum length practicable and supplement with additional practices as needed to prevent or reduce trackout.

Where warranted due to soil type or high groundwater, underlay the stone tracking pad with geotextile fabric to minimize migration of underlying soil into the stone. Select fabric type based on soil conditions and vehicle loading.

Place the aggregate in a layer at least 12 inches thick.

Divert surface flows away from tracking pads or convey flow under and/or around using culverts and

swales. Direct runoff from tracking pads to sediment control practices.

Do not compact aggregate prior to use. Compaction, grouting, or other means of creating a smooth surface compromise the effectiveness of the tracking pad.

Remove stones lodged between the tires of dual wheel vehicles prior to leaving the construction site.

Criteria Applicable to *Manufactured Trackout Control Devices*

Install the manufactured trackout control device on a surface capable of supporting anticipated loads per manufacturer recommendations (Figure 3).

Situate the device to ensure vehicles that drive over exposed soil exit across the full length of the device. Provide a minimum device length of 32 feet for stand-alone installations. Add length if needed to reduce trackout in adverse conditions.

Criteria Applicable to Tire Washing

Select the type of washing station based on project conditions and water availability. If a wash rack is used, select a rack capable of supporting the vehicle loading.

Install the washing station on site in a stabilized area. If the device discharges untreated water, direct wash water to a sediment basin designed per the current Technical Standard 1064, Sediment Basin, or an equivalent device. Follow the current Technical Standard 1051, Water Application of Additives for Sediment Control, for flocculants used at the tire washing station. Return sediment collected in the sediment basin to the site or dispose of appropriately.

Direct vehicles that drive over exposed soil to exit through the station.

This practice may be applicable, but not limited, to the following areas:

(1) Areas with prolonged periods or significant quantity of hauling on or off site, or

(2) Sites which drain to a sensitive resource such as an Outstanding Resource Water or Exceptional Resource Water.

Perform tire washing per manufacturer's directions until the majority of sediment is removed from the tires.

Criteria Applicable to Street/Pavement Cleaning

Scrape and/or sweep pavements and gutters until a shovel-clean or broom-clean condition is obtained. Repeat as needed to maintain public safety and reduce sediment delivery to drainage infrastructure or water resources, and at the end of each work day.

Use available equipment or select equipment per the recommendations in Table 2.

Return sediment to the site or dispose of appropriately.

CONSIDERATIONS

(1) An extended stabilized work surface such as a 150-foot long aggregate driveway within the site may be used as trackout control if sediment control is provided along the portions of driveways subject to sediment accumulation.

(2) Other methods of trackout control may be utilized if they do not generate dust or result in discharge of untreated water to drainage infrastructure or water resources.

(3) Manual removal of sediment from vehicles may be needed when working in heavy mud cannot be avoided.

(4) Implement traffic guidance (e.g., signs, barriers, fences, flags) to restrict exiting traffic to the trackout device and prevent the circumvention of unfamiliar devices.

(5) Inform drivers of device weight limits and the location of alternate stabilized egress for oversized and/or overweight loads.

(6) Document in the erosion control plan whether stabilized impervious surfaces, such as staging areas, are temporary or permanent. Post-construction performance standards may apply in accordance with s. NR 151.121-128 or s. NR 151-421-249 Wis. Adm. Code.

(7) Vehicles traveling across trackout control practices should maintain a slow constant speed.

(8) Extend the tracking control length and/or implement additional trackout control practices to supplement primary control measures during major hauling operations, in heavy clay soils, or when conditions render the practice insufficient.

(9) All trackout control practices, especially stone tracking pads, generally need more maintenance during and immediately after completion of major hauling operations.

(10) If known soil and/or groundwater contamination is present on site as documented on the Bureau for Remediation and Redevelopment Tracking System (BRRTS on the Web) or has been identified through activities on site, then the potential for contamination transport should be assessed. If contamination is identified, impacted soil or water should be characterized and stored, treated or disposed of in compliance with applicable standards and rules. If this is a new contaminant release, consult Wisconsin Department of Natural Resources (DNR) staff in the regional Remediation and Redevelopment Program.

(11) Methods of street cleaning vary based on project size, conditions, and availability of equipment. These methods require the contractor to follow OSHA standards for silica dust control and may require additional safeguards to meet current standards.

Table 2. Street cleaning methods

Method	Effective for:						Notes
	Larger clumps	Wet	Dry	Sand	Clay/Silt	Minimizing dust	
Shovel and broom by hand	Yes	Yes	Yes	Yes	Yes	Yes	Good for incidental tracking from low traffic sites or minor accumulations.
Power angle broom	Yes	Yes	Yes, with dust control	Yes	Yes	Less effective, but better with dust control	Harder to control collection of debris.
Power pick up broom	Yes	Yes	Yes, with dust control	Yes	Yes	Yes, with dust control	Generally will not get close to edges without a gutter broom, which is less effective. Use in reverse to maximum effects. Better dust control than angle broom.
Traditional street sweeper	Yes	Yes	Yes, with dust control	Yes	Yes	Yes, with dust control	May not be cost effective for low traffic sites. Better dust control than an angle broom.
High efficiency sweeper (vacuum or regenerative air)	No	No	Yes	Yes	Dry – Yes Wet – No	Yes	May not be cost effective for low traffic sites. Presents difficulties with larger material. Best option for dust control.

PLANS AND SPECIFICATIONS

Address the following in plans and specification:

(1) Location, materials, and dimensions of all stabilized work surfaces,

(2) Location of all points of egress with all trackout control practices shown,

(3) Material specifications conforming to this standard,

(4) Sequence or schedule for installation and removal of practices through different phases of construction; clearly indicate if stabilized work surfaces are temporary or permanent,

(5) Standard drawings and installation, and

(6) Stabilization after removal.

Include the responsible party by name, or by title if not known (e.g., general contractor, land owner). Include the frequency of inspection and maintenance in plans, standard detail drawings, or specifications.

Amend onsite erosion control plans to reflect modifications during the life of the project, including relocation or addition of site entrances and exits.

OPERATION AND MAINTENANCE

Monitor all trackout control practices and nearby streets and roads at least daily during construction and more frequently during heavy use.

Clean and maintain all practices as needed to minimize trackout.

Accumulation of sediment on off-site pavement near a site exit is an indication that street cleaning is needed and on-site prevention and control measures need maintenance or are not adequate. Relocate or add practices when construction egress locations are changed or when current control measures are not reducing trackout.

Clean streets and roads as needed to maintain traction, minimize further spread of sediment, and reduce discharge to drainage infrastructure.

Clean trackout control devices, mats, and other reusable materials prior to transport to a new site to reduce the potential for spread of invasive species and minimize further spread of sediment.

Add signage, fencing, steel posts, and/or traffic barriers as needed to improve use of practices.

Stabilized Work Surface

Monitor stabilized work surface areas for soil deposits, standing water, and damage. Remove soil deposits daily through scraping and/or pavement cleaning, and repair damage as needed. Top dress gravel surfaces as needed. Replace or repair torn or damaged mats.

Stone Tracking Pad

Monitor tracking pads for compaction, soil deposits, and mixing of underlying soils and stone layers.

Maintain a loosened, rough surface by scraping, loosening, or top-dressing with additional aggregate.

Replace geotextile and stone if less-intensive maintenance efforts fail to reestablish effectiveness.

Add stone as needed to maintain the minimum pad thickness.

Replace damaged or crushed culverts under tracking pad.

Manufactured Trackout Control Device

Monitor and maintain devices to minimize shifting, rutting of adjacent surfaces, and structural failure.

Remove accumulated sediment as required to maintain the function of the device.

Replace missing or damaged elements such as bars or anchors, and remove and reset devices if they shift during use.

Fill ruts in adjacent surfaces with aggregate or paving materials. Maintain a stable surface between the device and street or road.

Tire Washing

Monitor tire washing station for sediment accumulation, clogged hoses, appropriate water levels, and effectiveness.

Remove accumulated sediment.

Replenish flocculant as needed, and replace or replenish water as needed.

Maintain hoses to minimize clogging or freezing.

For manufactured tire washing stations, maintain per manufacturer’s recommendations.

Modify operations as needed during cold weather to minimize formation of ice-hazards on roadways.

DEFINITIONS

Aggregate: A composite mixture of hard, durable, mineral materials that have been mechanically processed.

Broom-clean: A pavement condition where no measurable material is collected when a push broom is pushed lightly across the surface. This is generally applicable in dry conditions.

Drainage infrastructure: Features present above or below grade for the purpose of collecting and transmitting storm water. These features include, but are not limited to, ditches, storm sewers, drainage inlets, flumes, and manholes.

Manufactured trackout control device: A device installed and maintained at an egress location for reducing trackout of sediments through flexing and vibrating tires.

Trackout: The relocation of material from its intended location to offsite surfaces by vehicles.

Shovel-clean: A pavement condition where no measurable material is collected when a flat-edged shovel is pushed across the surface. This is generally applicable in wet conditions.

Site: The area within the construction limits. Construction limits may change over the course of a project.

Vehicle: Cars, trucks, and other equipment capable of moving persons or property using tires or tracks.

REFERENCES

Wisconsin Council on Forestry, Invasive Species Best Management Practices for Transportation and Utility Rights-of-Way, https://councilonforestry.wi.gov/Documents/InvasiveSpecies/ROW-Manual.pdf

Wisconsin DNR, Outstanding and Exceptional Resource Waters, http://dnr.wi.gov/topic/SurfaceWater/orwerw.html

Wisconsin DNR, Construction Conservation Practice Standards, http://dnr.wi.gov/topic/stormwater/standards/const_standards.html

Wisconsin DNR, Post-Construction Conservation Practice Standards, http://dnr.wi.gov/topic/stormwater/standards/postconst_standards.html

Wisconsin Department of Transportation, *Select Crushed Material*, 2018 Standard Specification, Section 312, http://wisconsindot.gov/rdwy/stndspec/ss-03-12.pdf

Figure 1:

Example of a common setup that can be used to implement a stabilized surface area.

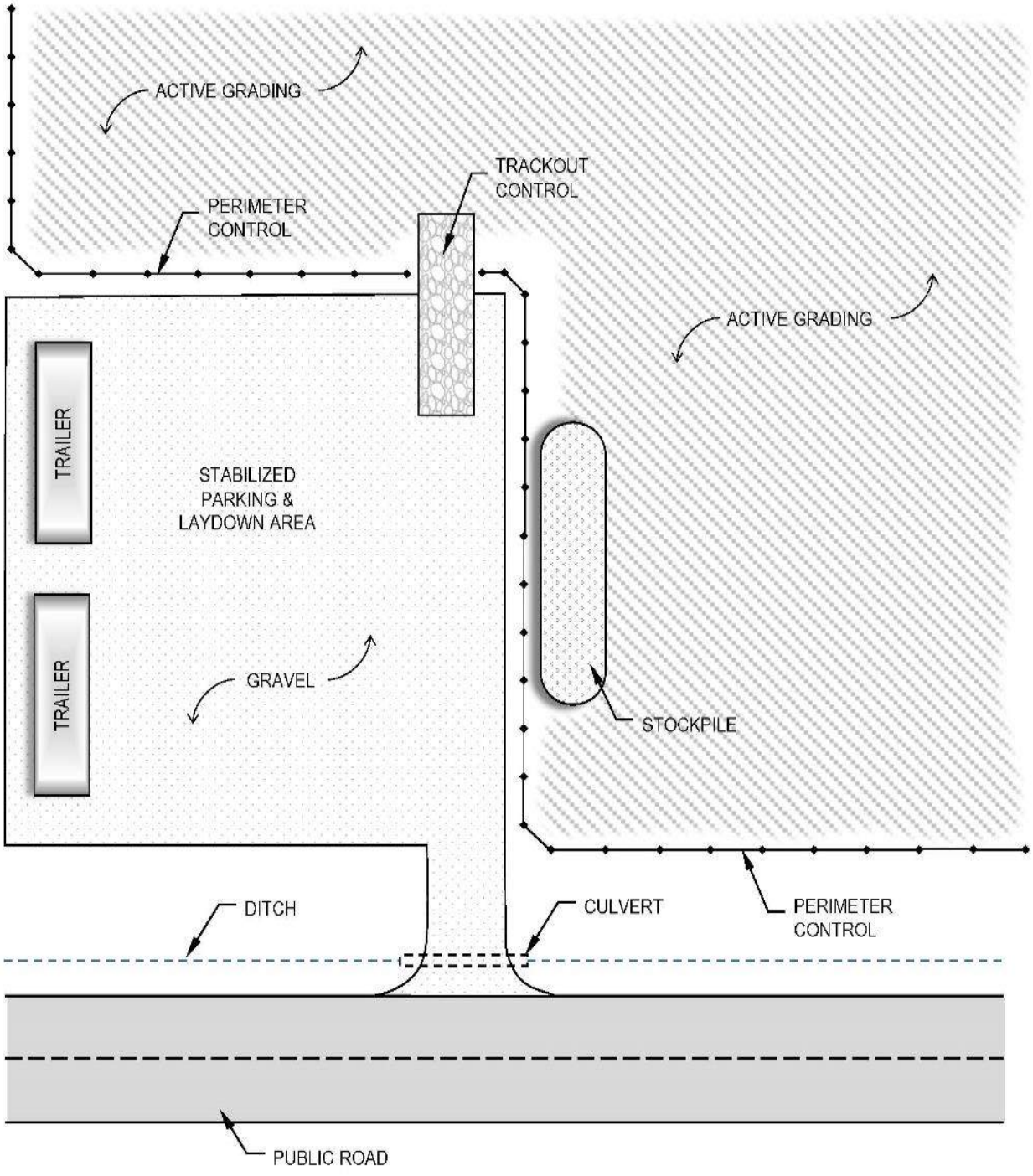
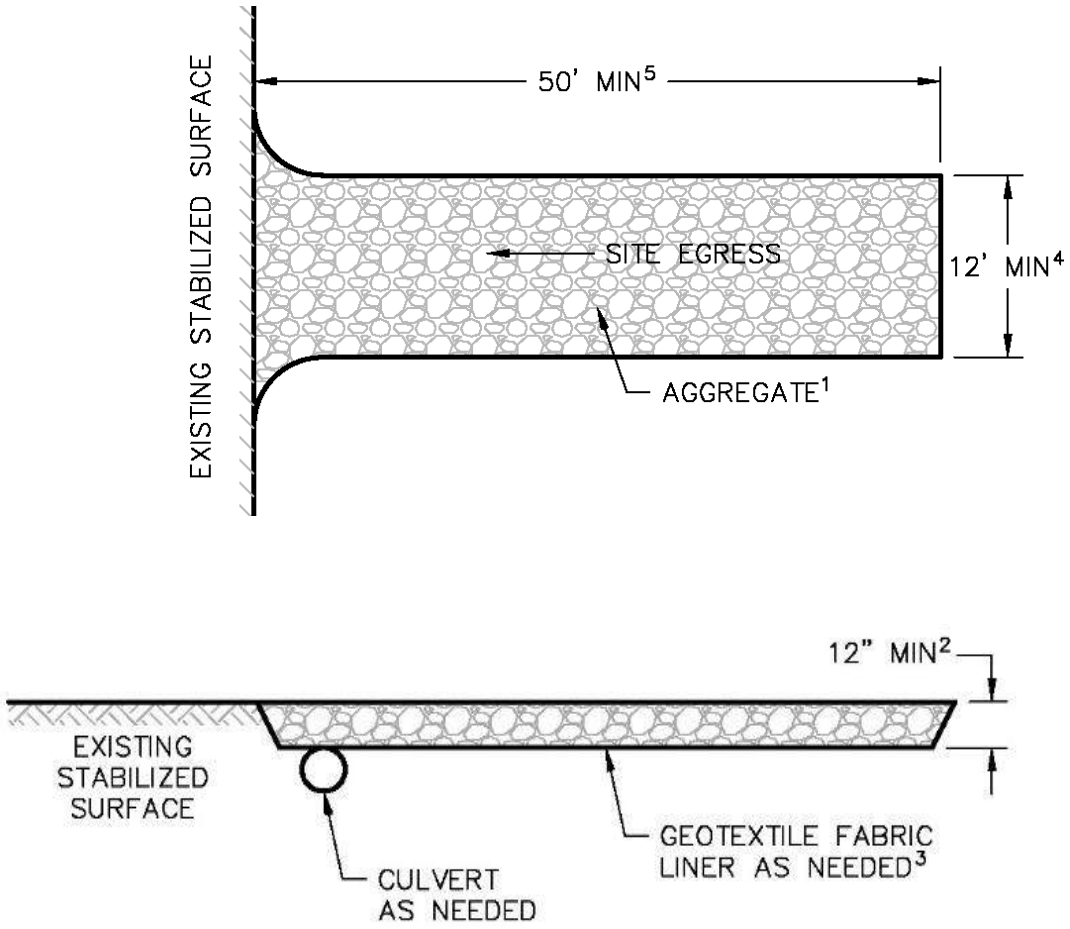


Figure 2:

Stone tracking pad detail



Note 1 Use hard, durable, angular stone or recycled concrete meeting the gradation in Table 1. Where this gradation is not available, meet the gradation in Wisconsin Department of Transportation (DOT) 2018 Standard Specification, Section 312, Select Crushed Material.

Note 2 Slope the stone tracking pad in a manner to direct runoff to an approved treatment practice.

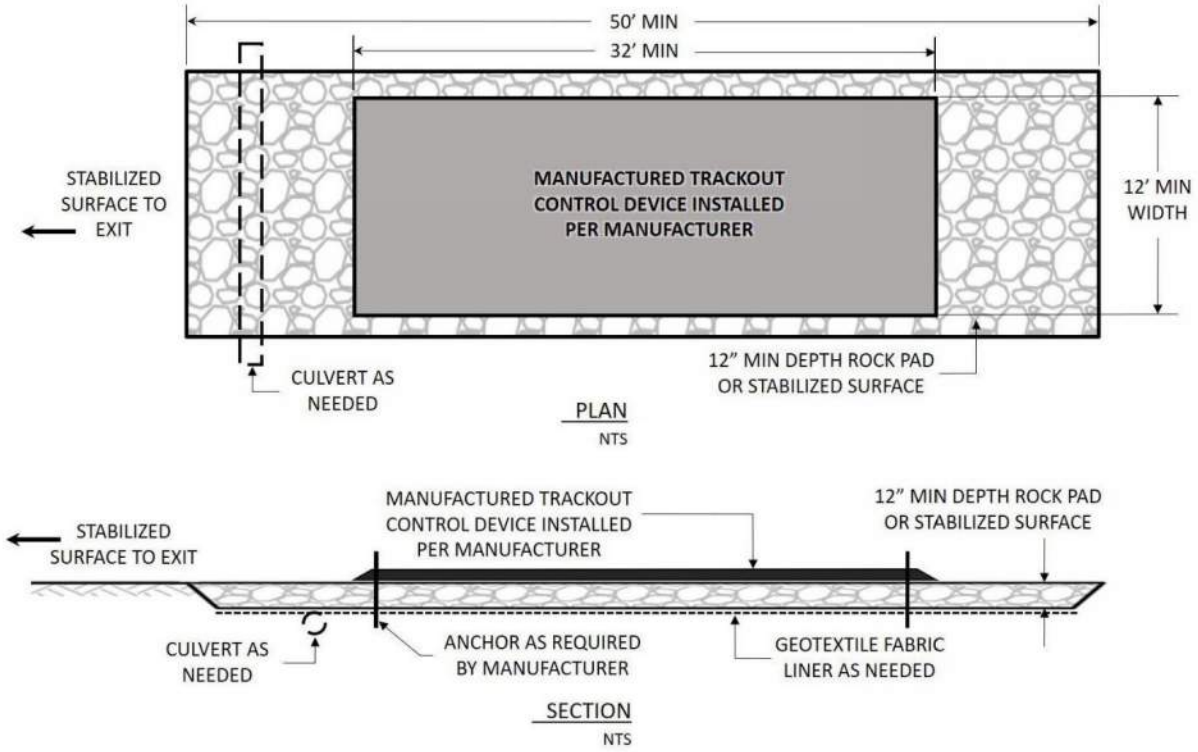
Note 3 Select fabric type based on soil conditions and vehicles loading.

Note 4 Install tracking pad across full width of the access point, or restrict existing traffic to a dedicated egress lane at least 12 feet wide across the top of the pad.

Note 5 If a 50' pad length is not possible due to site geometry, install the maximum length practicable and supplement with additional practices as needed.

Figure 3:

Example manufactured trackout control device detail.



Note 1 This detail is provided as an example. Comply with manufacturer's specifications while also meeting the minimum manufactured tracking pad length and width described in this technical standard.

Note 2 Install such that runoff flows to an approved treatment practice.

Note 4 A thinner stone layer or other stable surface may be acceptable such that rutting is minimized as vehicles mount or dismount from the manufactured trackout control device.

Note 5 Select fabric type based on soil conditions and vehicles loading.

Note 6 Direct all exiting vehicles over manufactured trackout control device. Stone tracking pad installation across remaining access width is recommended. A 12' minimum can be used when exiting traffic is restricted to a dedicated egress lane.

Note 7 If minimum installation length is not possible due to site geometry, install the maximum length practicable and supplement with additional practices as needed.

Note 7 Accommodate exiting vehicles in excess of manufactured trackout control device weight capacity with other treatment practices.

Storm Drain Inlet Protection for Construction Sites

(1060)

Wisconsin Department of Natural Resources
Conservation Practice Standard

I. Definition

A temporary device installed in or around a storm drain inlet, drop inlet, or curb inlet.

II. Purposes

This practice is intended to minimize sediment from entering storm drainage systems in areas where the contributing drainage area is temporarily disturbed.

III. Conditions Where Practice Applies

This practice applies where runoff from construction sites enters conveyance system structures, such as drain inlets, drop inlets, and curb inlets. Inlet protection devices are for drainage areas of one acre or less. Runoff from areas larger than one acre shall be routed through a properly designed sediment trapping or settling practice upstream of the inlet.

IV. Federal, State, and Local Laws

Users of this standard shall be aware of applicable federal, state and local laws, rules, regulations, or permit requirements governing the use and placement of storm drain inlet protection. This standard does not contain the text of federal, state, or local laws.

V. Design Criteria

This section establishes the minimum standards for design, installation, and performance requirements.

The appropriate type of inlet protection shall be installed prior to drain, drop, or curb inlet receiving runoff. The device shall remain in place and be maintained until the disturbed area is stabilized.

A. General Criteria Applicable to All Inlet Protection Devices

1. Ponding water to settle sediment is encouraged; however ponding shall not interfere with the flow of traffic, create a safety hazard, or cause property damage. All devices shall have provisions such as overflow holes or "emergency spillways" to safely pass water if the device becomes clogged.

2. The contributing drainage area to the inlet protection device shall be one acre or less. In instances where a larger contributing drainage area exists, runoff shall be routed through a properly designed sediment trapping or settling practice upstream of the inlet.

3. No gaps shall be left in the material that would allow the flow of water to bypass the inlet protection device, except for overflow holes.

4. All fabrics used as part of Type A, B, C, D, D-M and D-HR inlet protection devices must meet WisDOT specifications for the specified fabric. Type FF geotextile fabric, as specified in the Wisconsin Department of Transportation (WisDOT) Erosion Control Product Acceptability List (PAL), shall be used for Type, A, B, C or D inlet protection. Types R, DF, and HR fabrics, as specified in the WisDOT Standard Specifications for Highway and Structure Construction, shall be used for Types D-M and D-HR inlet protection, however Types D-M and D-HR are not allowed on WisDOT projects.

5. Type D-M inlet protection fabric shall be Type FF for both the upper section and the outer lower sections of the device. The replaceable interior filter fabric type shall be based according to the particle size trapped. Refer to Table 1 for the filter fabric type and exposed soil particle diameter where the device is appropriate.

6. Type D-HR inlet protection fabric shall be Type FF for the upper half of the device. Type HR fabric shall be used in the lower half of the device. Refer to Table 1 for filter fabric type and exposed soil texture and particle diameter where the device is appropriate.

Table 1			
Exposed Soil Texture	**Exposed Soil Particle Diameter (average) (mm)**	**Filtering Fabric Type***	**Recommended Inlet Protection Device Type**
Coarse (Sand)	≥ 0.0625	FF	D, D-M
Medium (Silt Loam)	0.0624 – 0.005	DF	D-M
Fine (Clay)	≤ 0.004	R	D-M
		HR	D-HR

* DF, R or HR filters may be used where FF is the required minimum standard. R or HR filers may be used where DF is the required minimum standard.

B. Criteria Applicable to Inlet Protection Devices for Unpaved Areas or the Pre-Paving Phase of Construction

1. Inlet protection (all device types) - See Figures 1-3.

   a. Type A devices shall be utilized around inlets in unpaved areas and should be maintained until permanent stabilization has been established. Type A devices shall be utilized on inlets prior to installation of curb and gutter or pavement and where safety considerations are not compromised on the site.

   b. Type B and C devices shall be utilized after the casting and grate are in place and may only be utilized when sufficient depth is not available to use Type D, D-M, or D-HR devices.

   c. Inlet protection Type D-M and D-HR devices shall only be used after castings are in place on top of the inlet boxes.

      Type D, D-M, and D-HR devices shall conform to the standard drawings as shown in the figures. To prevent the filter bag from blocking overflow water, there shall be three inches of clearance between the bag and the sides of the inlet. Type D, D-M and D-HR devices when used in inlets less than 30 inches in depth shall have the filter bag cinched to provide the required clearance for overflow.

2. Other inlet protection devices include, but are not limited to: straw bales, rock bags and stone weepers. These devices can be used to settle sediment or divert flow. Note: These devices are not applicable to areas adjacent to traffic and are not approved for inlet protection use on WisDOT projects.

C. Criteria Applicable to Inlet Protection Devices for the Post-Paving / Curbing Phase of Construction

1. Inlet protection Types B, C, D, D-M, and D-HR are applicable to post-paving construction. See Figures 1-3.

   a. Type B devices shall be utilized on inlets without a curb box when Type D inlet devices cannot be used.

   b. Type C devices shall be utilized on street inlets with curb heads. A 2-inch by 4-inch (nominal) piece of wood shall be wrapped and secured in the fabric and placed in front of the curb head, as shown in the figures. The wood shall not block the entire opening of the curb box and shall be secured to the grate with wire or plastic ties. Use Type C devices when Type D devices cannot be used.

   c. Utilize Type D, D-M, and D-HR devices when the depth from the top of the grate to the bottom of the inlet is 30 inches or greater. Note: Type D style devices can be modified by cinching the filter bag to fit inlet structures that are less than 30 inches in depth. Utilize Type D, D-M, and D-HR devices where street flooding or ponding water and the associated traffic safety issues are a concern, or where more effective inlet filtering is needed.

2 Other inlet protection devices are applicable to post paving construction; these devices include but are not limited to: rock bags, manufactured bags, and stone weepers. These devices can be used to either settle sediment or divert flow. Note: Other than for internal to the inlet type filters, these devices are not applicable to areas adjacent to traffic.

a. Manufactured rock bags shall conform to the WisDOT specification for rock bag material, including fill material.

b. Straw bale installation shall conform to the criteria outlined in the WDNR Conservation Practice Standard (1062) Ditch Check.

c. Stone weeper installation shall conform to the criteria in WDNR Conservation Practice Standard (1063) Sediment Trap.

VI. Considerations

A. Inlet protection is only one element in an erosion control plan. Other practices, including temporary stabilization and area clean up, should also be utilized upstream of the inlet.

B. Inlets should be temporarily closed or sealed to prevent entrance of runoff and sediment when site conditions allow.

C. The disturbed area should be stabilized as quickly as possible. Timely stabilization is the most effective method to control sediment entering the storm sewer.

D. Storm drain inlet protection consists of several different types of inlet filters and sediment traps. Inlet protection is only one element in an erosion control plan. Each type differs in application with selection dependent upon site conditions and inlet type. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions.

E. Inlet protection is only as effective as the filter or device used around the inlet. Effectiveness decreases rapidly if the inlet protection is not properly maintained. In general, inlet protection provides relatively good removal of coarse and medium-sized soil particles from runoff; however, to effectively trap fine soil particles, other practices such as the use of polyacramides, may be required. (See DNR technical standard 1050.)

F. Inlet protection requires routine inspection and maintenance. Field inspections have shown where inlet protection causes excessive ponding that the device is removed, punctured, or bypassed. In such situations, a structure with an adequate overflow mechanism should be utilized instead of simply removing the inlet protection device.

G. The effectiveness of inlet protection devices in unpaved areas can be enhanced by additional excavation to increase the storage capacity around the inlet.

H. Good construction site housekeeping measures, such as maintaining clean gutters and street sweeping, are important.

I. The use of fabric intended for a finer soil type on a construction site with coarser soil may increase the required maintenance frequency due to faster clogging.

J. Consider using Type D-M and D-HR inlet protection rather than Type B, C, or D in areas with fine soils where more effective filtering is desired.

K. Inlet protection devices listed in the WisDOT PAL are accepted for use in accordance with this standard.

VII. Plans and Specifications

Plans and specifications for installing inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose:

A. Locations and types of inlet protection.

B. Material specification conforming to this standard.

C. All construction documents shall identify the responsible party and include a schedule for installation, inspection, and maintenance requirements.

VIII. Operation and Maintenance

A. Remove inlet protection devices once the contributing drainage area is stabilized with appropriate vegetation or impervious surface.

B. Inlet protection shall be at a minimum inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

C. For Type A, B or C inlet protection:

1. Remove sediment deposits when sediment has accumulated between ⅓ to ½ of the design depth or the device is no longer functioning as designed.

2. Inspect the device routinely, and repair (if necessary) and restore to original dimension.

3. Sediment removed from the device shall be deposited in a suitable area and stabilized.

D. For Type D and D-M inlet protection;

1. Remove sediment when it accumulates to within 6 inches of the bottom of the overflow holes.

2. If standing water remains within 6 inches of the bottom of the overflow holes 24 hours after a runoff event, accumulated sediment shall be removed and the filtering capacity of the fabric shall be restored.

3. Holes in the Type FF fabric less than 2 inches in length may be repaired by stitching. The bag must be replaced if holes greater than 2 inches are observed in the Type FF fabric.

4. The insert filter fabric shall be replaced if any holes are observed in the fabric.

5. The filter must be replaced if the flap pockets sustain damage that compromises the integrity of the filter or the ability to perform maintenance.

E. For Type D-HR inlet protection:

1. Remove sediment when it has accumulated to within 6 inches of the bottom of the overflow holes.

2. If standing water remains within 6 inches of the bottom of the overflow holes 24 hours after a runoff event, accumulated sediment shall be removed and the filtering capacity of the fabric shall be restored.

3. Holes in the Type FF fabric less than 2 inches in length may be repaired by stitching.

4. The filter shall be replaced if any holes are observed in the Type HR fabric or holes greater than 2 inches are observed in the Type FF fabric.

5. The filter must be replaced if the flap pockets sustain damage that compromises the integrity of the filter or the ability to perform maintenance.

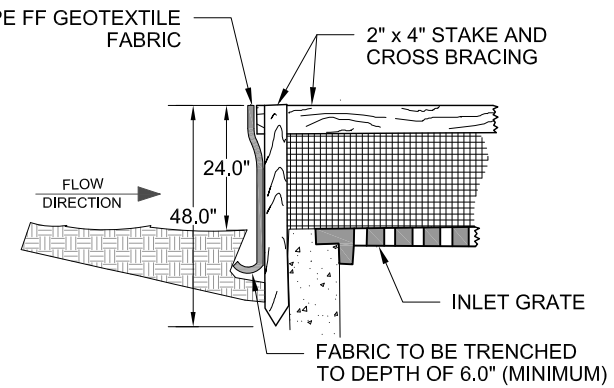
F. Due care shall be taken to minimize sediment falling into the inlet. Any material falling into the inlet shall be removed.

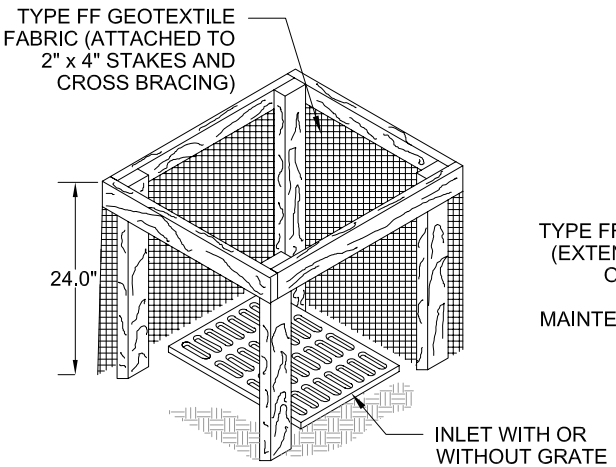
IX. References

WisDOT "Erosion Control Product Acceptability List" is available online at http://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/pal/default.aspx.

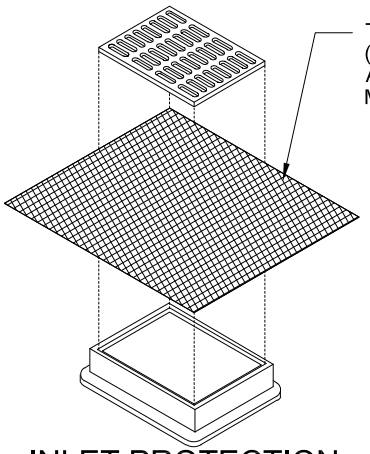
WisDOT "Standard Specifications for Highway and Structures Construction" is available at: http://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/rdwy/stndspec.aspx.

FIGURE 1. INLET PROTECTION TYPES A, B, C AND D

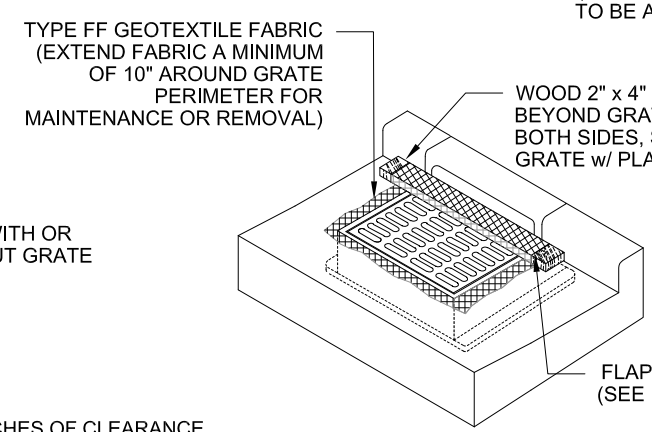




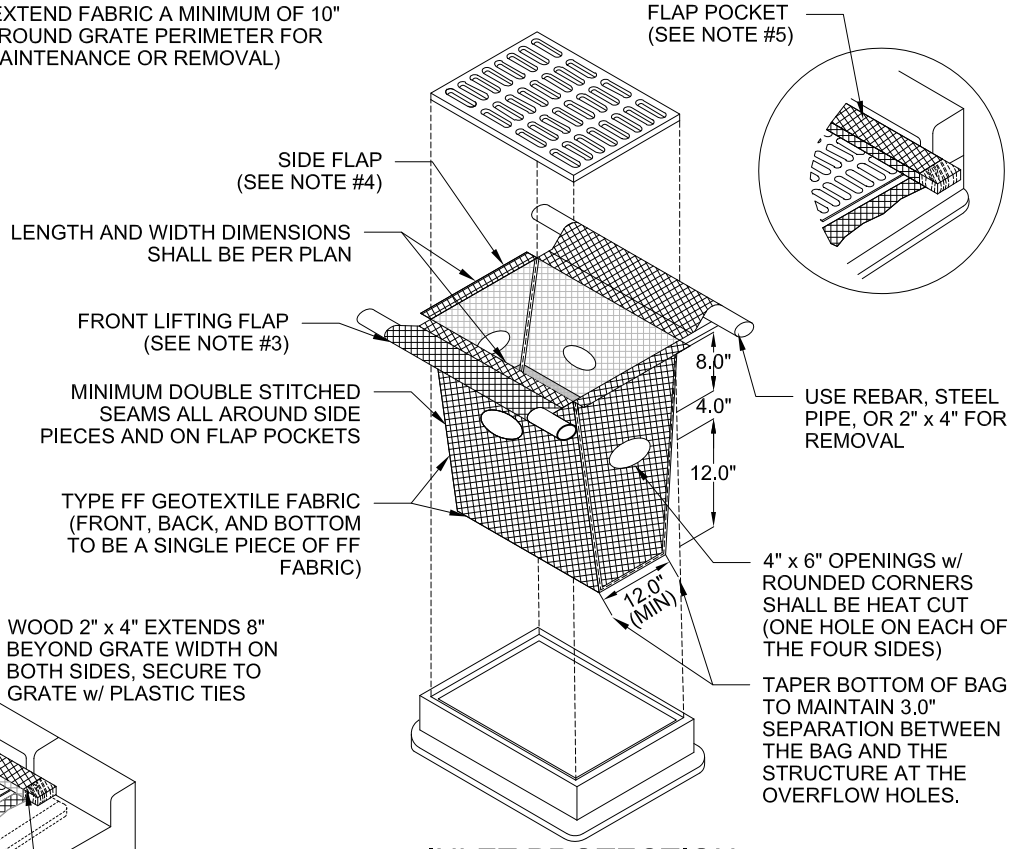
INLET PROTECTION
TYPE A



INLET PROTECTION
TYPE B
WITHOUT CURB BOX



INLET PROTECTION
TYPE C
WITH CURB BOX



INLET PROTECTION
TYPE D
CAN BE INSTALLED IN INLETS
WITH OR WITHOUT CURB BOXES

NOTES:

1. TAPER BOTTOM OF BAG TO MAINTAIN THREE INCHES OF CLEARANCE BETWEEN THE BAG AND THE STRUCTURE, MEASURED FROM THE BOTTOM OF THE OVERFLOW OPENINGS TO THE STRUCTURE WALL.
2. GEOTEXTILE FABRIC TYPE FF FOR FLAPS, TOP AND BOTTOM OF OUTSIDE OF FILTER BAG. FRONT, BACK, AND BOTTOM OF FILTER BAG BEING ONE PIECE.
3. FRONT LIFTING FLAP IS TO BE USED WHEN REMOVING AND MAINTAINING FILTER BAG.
4. SIDE FLAPS SHALL BE A MAXIMUM OF TWO INCHES LONG. FOLD THE FABRIC OVER AND REINFORCE WITH MULTIPLE STITCHES.
5. FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2" x 4". THE REBAR, STEEL PIPE, OR WOOD SHALL BE INSTALLED IN THE REAR FLAP AND SHALL NOT BLOCK THE TOP HALF OF THE CURB FACE OPENING.

MAINTENANCE NOTES:

1. WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED IN THE FABRIC DOES NOT FALL INTO THE STRUCTURE. MATERIAL THAT HAS FALLEN INTO THE INLET SHALL BE IMMEDIATELY REMOVED.

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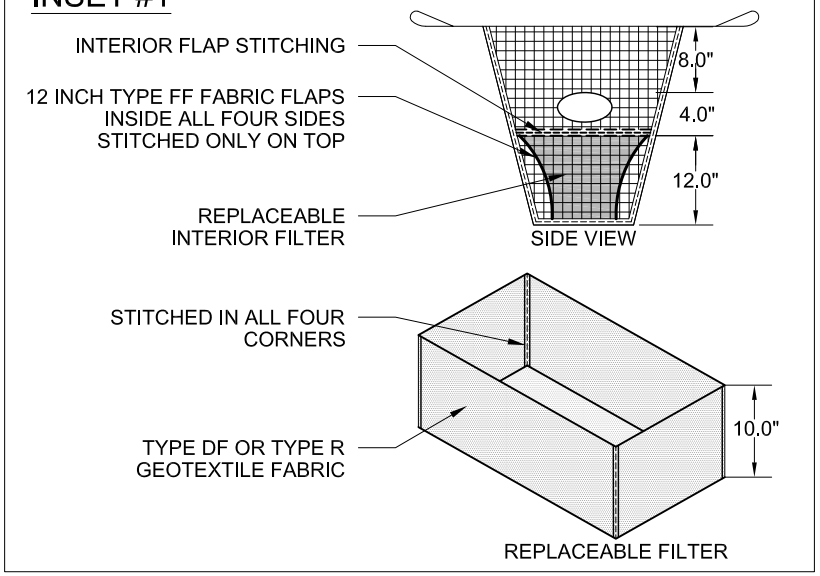
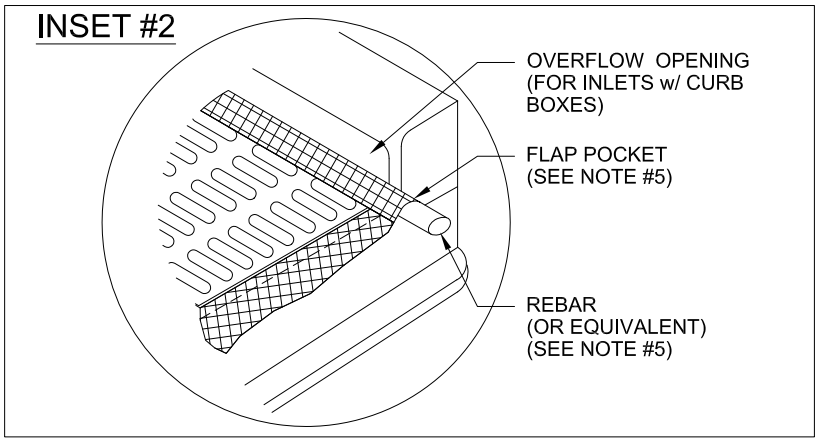
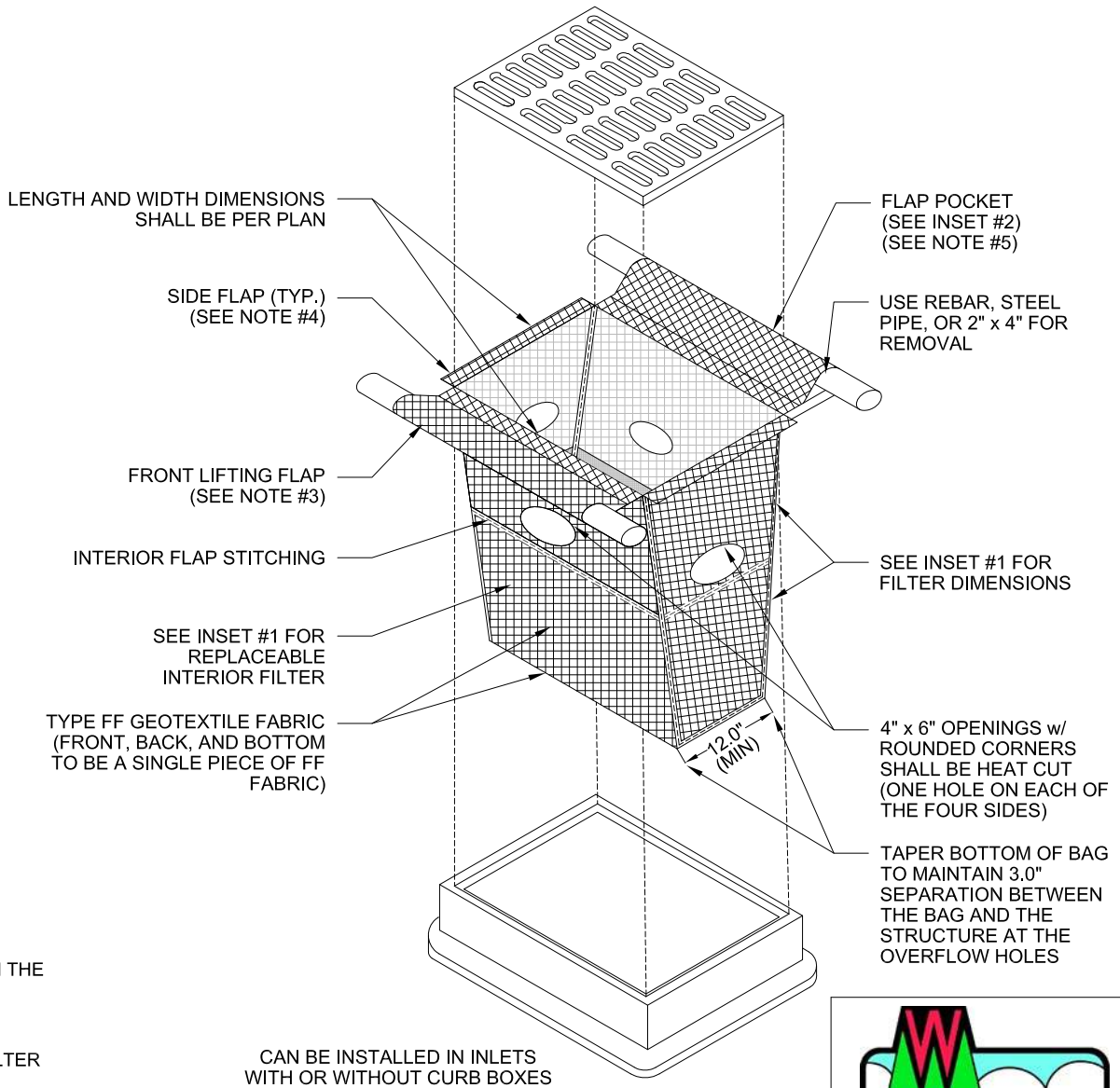
FIGURE 2. INLET PROTECTION TYPE D-M

INSET #1



INSET #2





CAN BE INSTALLED IN INLETS WITH OR WITHOUT CURB BOXES

NOTES:

1. TAPER BOTTOM OF BAG TO MAINTAIN THREE INCHES OF CLEARANCE BETWEEN THE BAG AND THE STRUCTURE, MEASURED FROM THE BOTTOM OF THE OVERFLOW OPENINGS TO THE STRUCTURE WALL.
2. GEOTEXTILE FABRIC TYPE FF FOR FLAPS, TOP AND BOTTOM OF OUTSIDE OF FILTER BAG. FRONT, BACK, AND BOTTOM OF FILTER BAG BEING ONE PIECE.
3. FRONT LIFTING FLAP IS TO BE USED WHEN REMOVING AND MAINTAINING FILTER BAG.
4. SIDE FLAPS SHALL BE A MAXIMUM OF TWO INCHES LONG. FOLD THE FABRIC OVER AND REINFORCE WITH MULTIPLE STITCHES.
5. FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2" x 4". THE REBAR, STEEL PIPE, OR WOOD SHALL BE INSTALLED IN THE REAR FLAP AND SHALL NOT BLOCK THE TOP HALF OF THE CURB FACE OPENING.

MAINTENANCE NOTES:

1. WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED IN THE FABRIC DOES NOT FALL INTO THE STRUCTURE. MATERIAL THAT HAS FALLEN INTO THE INLET SHALL BE IMMEDIATELY REMOVED.

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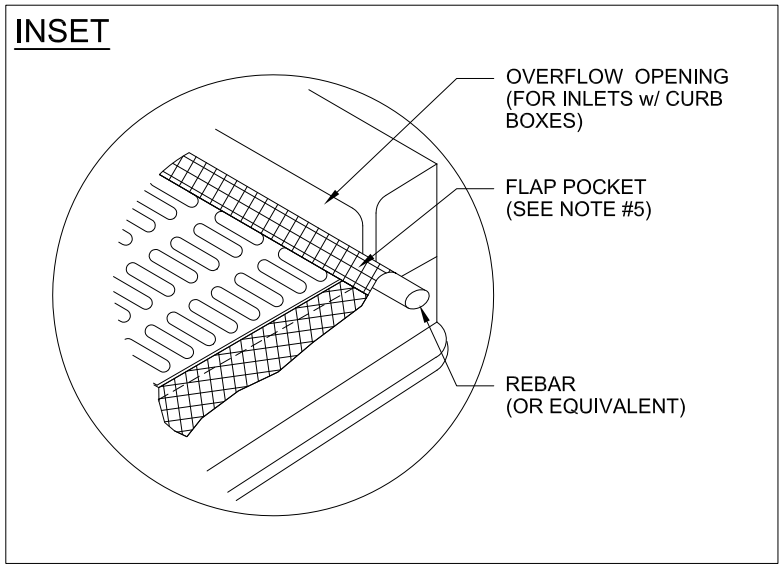
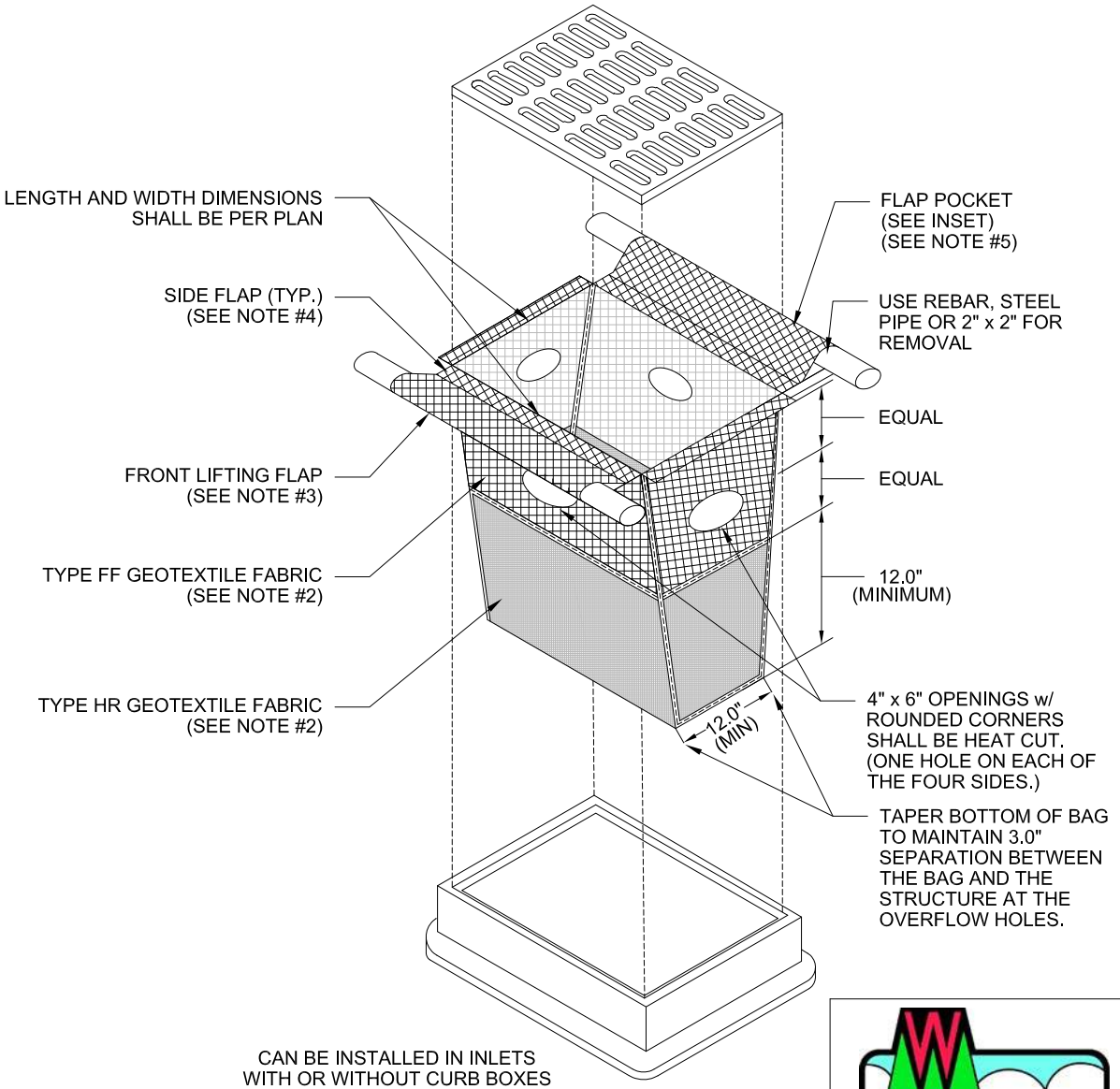
FIGURE 3. INLET PROTECTION TYPE D-HR





CAN BE INSTALLED IN INLETS
WITH OR WITHOUT CURB BOXES

NOTES:

1. TAPER BOTTOM OF BAG TO MAINTAIN THREE INCHES OF CLEARANCE BETWEEN THE BAG AND THE STRUCTURE, MEASURED FROM THE BOTTOM OF THE OVERFLOW OPENINGS TO THE STRUCTURE WALL.
2. GEOTEXTILE FABRIC, TYPE FF FOR FLAPS AND TOP HALF OF FILTER BAG. GEOTEXTILE FABRIC, TYPE HR FOR BOTTOM HALF OF FILTER BAG WITH FRONT, BACK, AND BOTTOM BEING ONE PIECE.
3. FRONT LIFTING FLAP IS TO BE USED WHEN REMOVING AND MAINTAINING FILTER BAG.
4. SIDE FLAPS SHALL BE A MAXIMUM OF TWO INCHES LONG. FOLD THE FABRIC OVER AND REINFORCE WITH MULTIPLE STITCHES.
5. FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2" x 2". THE REBAR, STEEL PIPE, OR WOOD SHALL BE INSTALLED IN THE REAR FLAP AND SHALL NOT BLOCK THE TOP HALF OF THE CURB FACE OPENING.

MAINTENANCE NOTES:

1. WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED IN THE FABRIC DOES NOT FALL INTO THE STRUCTURE. MATERIAL THAT HAS FALLEN INTO THE INLET SHALL BE IMMEDIATELY REMOVED.

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DEWATERING

Code No.
(1061)

Wisconsin Department of Natural Resources
Conservation Practice Standard

I. Definition

A compartmented container, settling basin, filter, or other appropriate best management practice through which sediment-laden water is conveyed to trap and retain the sediment.

II. Purposes

The purpose of this standard is to determine appropriate methods and means to remove sediment from water generated during dewatering activities prior to discharging off-site or to waters of the state. Practices identified in this standard shall be deemed to meet the de-watering performance standard to prevent the discharge of sediment to the maximum extent practicable (MEP) as defined in NR 151.11(6)(c).

III. Conditions where Practice Applies

This practice applies where sediment laden water needs to be removed for construction or maintenance activities. Dewatering practices shall be in keeping with the effective operating and applicability criteria listed on Figure 2, Dewatering Practice Selection Matrix.

This practice does not apply to:

- Water being discharged directly to groundwater or *karst features*[1]. Refer to NR140.
- Well dewatering systems. Refer to NR 812.

IV. Federal, State, and Local Laws

Users of this standard shall be aware of applicable federal, state, and local laws, rules, regulations, or permit requirements governing the use and placement of this practice. This may include activities performed under NR 216 and Chapter 30 permits, for water bodies with *targeted performance standards* per NR 151.004, 303d waterbodies or others. This standard does not contain the text of federal, state, or local laws.

V. Criteria

This section establishes the minimum allowable limits for design parameters, installation and performance requirements.

Dewatering practices shall be selected based on the predominant soil texture encountered at the dewatering site with consideration given to pumping or flow rates, volumes and device effectiveness. Refer to Figure 1 USDA Soil textural triangle to assist with soil classifications at the site. Figure 2, Dewatering Practice Selection Matrix illustrates acceptable dewatering options and their effective ranges. Practices selected that are not on the matrix must provide an equivalent level of control, with justification provided to the reviewing authority.

A. Site Assessment - A site assessment shall be conducted and documented to determine the physical site characteristics that will affect the placement, design, construction and maintenance of dewatering activities. The site assessment shall identify characteristics such as ground slopes, soil types, soil conditions, bedrock, sinkholes, drainage patterns, runoff constituents, proximity to regulated structures, natural resources, and specific land uses. The site assessment shall include the following:

- Sanitary and storm sewer locations
- Potential contamination - Odor or discoloration other than sediment, or an oily sheen on the surface of the sediment laden water. If contamination is present, notify DNR Spills Reporting
- Soil textural class for areas where dewatering will occur. Soil investigation shall extend below grading and trenching activities
- Depth to the seasonally highest water table.
- Discharge outfall locations
- Distance and conveyance method to receiving waters

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

B. General Criteria applicable to all dewatering activities

1. Contact the WDNR when the discharge from a dewatering practice will enter a WDNR listed *Exceptional Resource Water (ERW), Outstanding Resource Water (ORW),* or a wetland in an area of special natural resource interest as identified in NR 103.

2. Contact the owner or operator of the municipal separate stormwater system if the discharge is to a municipal storm water conveyance system. The allowable discharge rate shall be limited by the capacity of the system or requirements of the system owner.

3. When practical, dewatering effluent shall be collected in a pump truck for transport to a *treatment facility* or discharged directly to a treatment facility.

4. For surface dewatering, utilize a floating suction hose, or other method, to minimize sediment being sucked off the bottom.

5. For discharges that will be directed to locations on-site verify that the anticipated volume of water can be fully contained.

6. The topography and condition of the ground cover between the pump discharge point and potential receiving waters shall be evaluated for potential erosion. Appropriate stabilization measures shall be incorporated to prevent erosion.

7. When discharge to a karst feature or other direct groundwater connection can not be avoided, the dewatering system must be designed and operated to maintain compliance with the groundwater quality standards contained in applicable regulations, including ch. NR 140 Wis. Adm. Code.

8. If the discharge directly or indirectly enters a stream, the discharge flow rate shall not exceed 50 percent of the peak flow rate of the 2-year 24-hour storm event.

C. Geotextile Bags

1. Geotextile bags shall meet the criteria listed in Table 1.

Table 1: Properties for Geotextile Bags

Property	Test Method	Type I Value	Type II Value
Maximum Apparent Opening Sizes	ASTM D-4751	0.212 mm	0.212 mm
Grab Tensile Strength	ASTM D-4632	200 lbs.	300 lbs.
Mullen Burst	ASTM D-3786	350 psi	580 psi
Permeability	ASTM D-4491	0.28 cm/sec	0.2 cm/sec
Fabric	Nominal Representative Weight	8 oz	12 oz

2. Geotextile bags shall be sized according to the particle size being trapped, expected flow or pumping rate (gallons per minute) per square foot of fabric and a 50% clogging factor. The footprint of the bag shall be no smaller than 100 square feet.

3. Geotextile bags shall be securely attached to the discharge pipe.

4. Polymers can be used to enhance the efficiency of geotextile bags. If polymer is used, the polymer shall be approved by the WDNR and meet the criteria stipulated in WDNR Conservation Practice Standard 1051, Sediment Control Water Application of Polymers. The polymer supplier or applicator shall provide certifications showing that products have met the performance requirements of Standard 1051. If the manufacturer has not completed the required testing, the project may be used to gain that certification provided it meets the site requirements of Standard 1051. Any such testing will be monitored by DNR or WisDOT, with testing done by a qualified third party.

D. Gravity Based Settling Systems

Gravity based systems rely on settling of particles as the primary means of treatment. To effectively accomplish this, quiescent conditions should exist with sufficient detention time. Practices include portable sediment tanks, sediment traps, sediment basins and wet detention basins.

If polymer is used to enhance settling, the polymer shall be approved by the WDNR and meet the criteria stipulated in WDNR Conservation Practice Standard 1051, Sediment Control Water Application of Polymers. The polymer supplier or applicator shall provide certifications showing that products have met the performance requirements of Standard 1051. If the manufacturer has not completed the required testing, the project may be used to gain that certification provided it meets the site requirements of Standard 1051. Any such testing will be monitored by DNR or WisDOT, with testing done by a qualified third party.

1. Portable Sediment Tank: These tanks are intended to settle only sands, loamy sands, and sandy loams. If polymer is added, these tanks will also be appropriate for settling loams, silt loams and silts. Portable sediment tanks shall have a minimum of two baffled compartments, and be a minimum of three feet deep. The inlet and outlet pipe shall be a minimum diameter of three inches. Use one of the following methods to size a tank:

    a. Settling: Account for settling of the suspended sediments with the following equation:

        Sa = 1.83 * Q;

        where

        Sa = Tank surface area (sq ft)
        Q = Pumping rate (gallons per minute)

        Note: 1.83 is a factor that includes the conversion from gpm to cfs (1 gpm = 0.0022 cfs) and the particle settling velocity for Soil Class 1 (0.0012 ft/sec) from WDNR Conservation Practice Standard 1064 Sediment Basin.

    b. Filtration: Build the first chamber as large as possible to aid in settling. Flow capacity shall be determined by the end area of the filter media (fabric) and the flow rate (gallons per minute) per square foot of the finest filter media and a 50% clogging factor.

2. Sediment Trap or Sediment Basin: This device is a temporary sediment control device. The design, installation, and operation of the sediment trap or basin shall meet the requirements stipulated in WDNR Conservation Practice Standard 1063 Sediment Trap or Standard 1064 Sediment Basin

3. Wet Detention Basin: This device is generally a permanent structure designed to address post-construction pollutant reduction requirements. The design, installation, and operation of the wet detention basin shall meet the requirements stipulated in WDNR Conservation Practice Standard 1001 Wet Detention Basin.

E. Passive Filtration Systems

Passive filtration systems rely on filtration as the primary method of removing particles. Sediment removal efficiency will be related to the particle size distribution in the stormwater. Practices include manufactured filters, filter tanks, filter basins, vegetative filters, grass swales, and filtration fabric.

Filter fabric sediment removal efficiency shall be based on the properties specified in Table 1.

1. Manufactured Filters: Filters shall be sequenced from the largest to the smallest pore opening. Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm.

2. Filter Tank (portable): Install, operate and maintain according to manufacturer recommendations.

3. Filter Basin: Install, operate and maintain according to Wisconsin Department of Transportation technical guidance.

4. Vegetative Filter: Refer to WDNR Conservation Practice Standard 1054 Vegetated Buffer for Construction Sites.

F. Pressurize Filtration Systems

Pressurized filtration systems differ from passive systems in that the water flowing through the media is pressurized and the filter media is designed to handle higher flow rates. Practices include portable sand filters, wound cartridge units, membranes and micro-filtration units.

Pressurized filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is small or substantially more turbid than the stormwater stored in the holding pond or tank, returning backwash water to the pond or tank may be appropriate. However, land application or another means of treatment and disposal may be necessary.

Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.

1. Portable Sand Filter: Install, operate and maintain according to manufacturer recommendations.

2. Wound Cartridge Units: Secondary filtration of sediments using high efficiency filter cartridges may be necessary to remove fine particles such as clays. Install, operate and maintain according to manufacturer recommendations.

3. Membranes and Micro-filtration: Install, operate and maintain according to manufacturer recommendations.

4. If polymer is used to enhance settling, the polymer shall be approved by the WDNR and meet the criteria stipulated in WDNR Conservation Practice Standard 1051, Sediment Control Water Application of Polymers. The polymer supplier or applicator shall provide certifications showing that products have met the performance requirements of Standard 1051. If the manufacturer has not completed the required testing, the project may be used to gain that certification provided it meets the site requirements of Standard 1051. Any such testing will be monitored by DNR or WisDOT, with testing done by a qualified third party.

VI. Considerations

A. It may be necessary to clean the municipal storm drainage system prior to and after discharging to the system to prevent scouring solids from the drainage system.

B. Geotextile bags are generally not appropriate when discharging to ORW, ERW, waterbodies supporting cold water communities, trout streams, or to *highly susceptible* and *less susceptible wetlands*.

C. Pressurized filtration systems are the most efficient for removing fine sediments.

D. Portable sediment tanks may be appropriate when other sediment trapping practices cannot be installed due to lack of space or other reasons.

E. Filtration is not an efficient treatment of water with heavy sediment loads. Use a settling tank or sand filter as pretreatment when possible.

F. It may be necessary to use a combination of dewatering practices to achieve the intended results.

VII. Plans and Specifications

All plans, standard detail drawings, or specifications shall include the schedule for installation, inspection, and maintenance and shall be kept on-site with the erosion control plan.

VIII. Operation and Maintenance

A. Sediment shall be removed from devices to maintain effectiveness. All sediment collected in dewatering devices shall be properly disposed of to prevent discharge to waters of the state.

B. The following monitoring shall be conducted. Test results shall be recorded on a daily log kept on site:

1. Discharge duration and specified pumping rate
2. Observed water table at time of dewatering.
3. If used, type and amount of chemical used for pH adjustment
4. If used, type and amount of polymer used for treatment
5. Maintenance activities

IX. References

The American Association of State Highway Officials (AASHTO) Soil Classification System

X. Definitions

Exceptional Resource Waters (ERW) (V.B.1): are waters listed in s. NR 102.11.

Highly susceptible wetland (VI.B): include the following types: fens, sedge meadows, bogs, low prairies, conifer swamps, shrub swamps, other forested wetlands, fresh wet meadows, shallow marshes, deep marshes and seasonally flooded basins.

Karst feature (III): are an area or geologic feature subject to bedrock dissolution so that it is likely to provide a conduit to groundwater, and may include caves, enlarged fractures, mine features, exposed bedrock surfaces, sinkholes, springs, seeps or swallets.

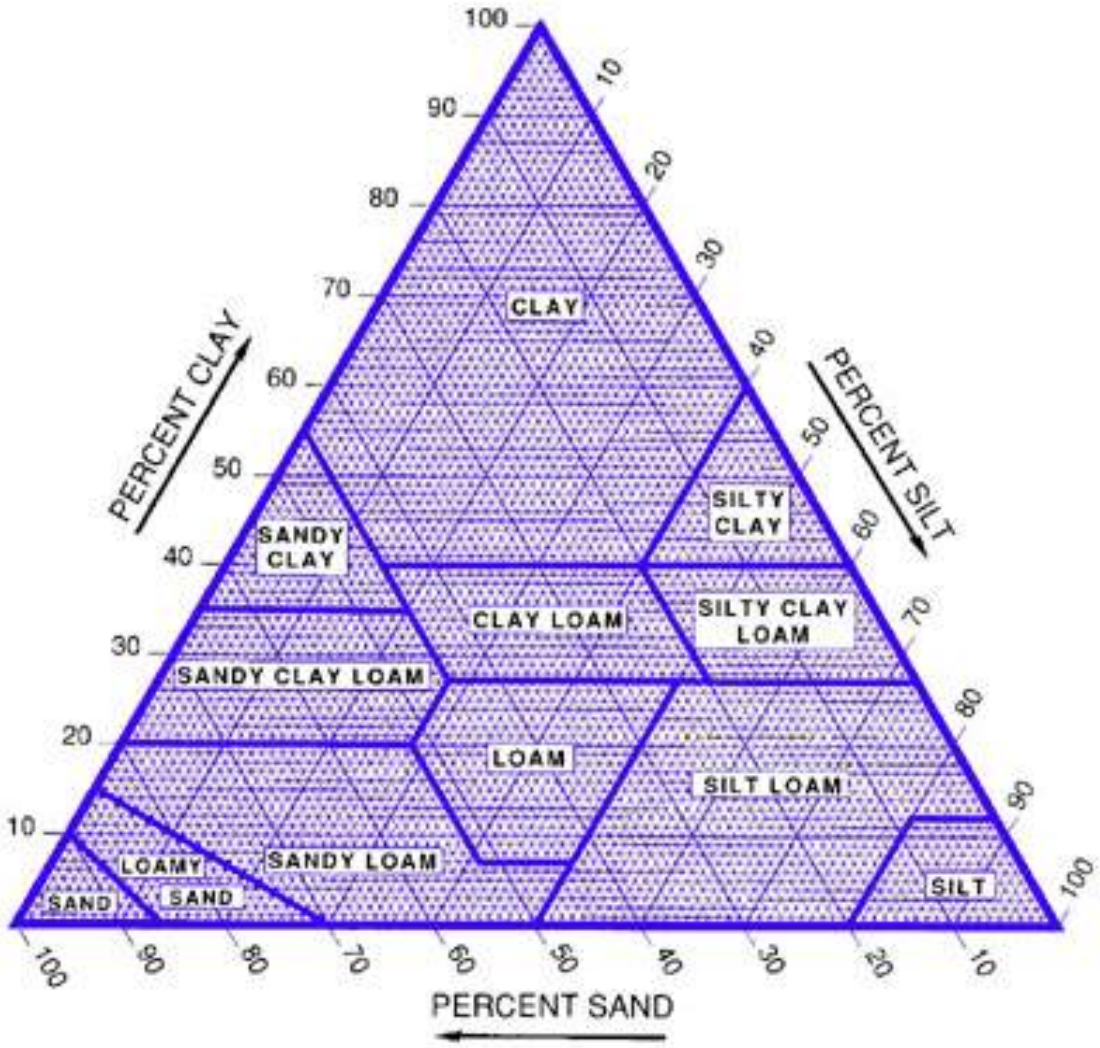
Less susceptible wetland (VI.B)*:* include degraded wetlands dominated by invasive species such as reed canary grass.

Outstanding Resource Waters (ORW) (V.B.1): are waters listed in s. NR 102.10

Targeted performance standard (IV): means a performance standard that will apply in a specific area, where additional practices beyond those contained in NR 151 are necessary to meet water quality standards.

Treatment facility (V.B.3): includes wastewater treatment plants or wet detention basins constructed in accordance with WDNR Conservation Practice Standard 1001 Wet Detention Basin or other approved land application sites.

Figure 1: USDA Soil Textural Triangle



[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

Figure 2: Dewatering Practice Selection Matrix

Type of Dewatering Practice	Soil and Particle Size Classification			Notes
	Coarse to Medium Particles	Medium to Fine Particles	Fine to Very Fine Particles	
	Sand, Loamy Sands, and Sandy Loams	*Loams, Silt Loams, and Silts*	*Clay Loams, Silty Clays and Clay*	
Geotextile Bags				
Type I	▬	●		
Type II	■	▬	●	
Gravity Based Settling				
Sediment Tank (Portable)	▬	●		
Sediment Trap (Temporary)	▬	●		Use Standard 1063 Sediment Trap
Sediment Basin (Temporary)	▬	▬	●	Use Standard 1064 Sediment Basin
Wet Detention Basin (Perm)	▬	▬	▬	Use Standard 1001 Wet Detention Basin
Passive Filtration				
Filter Tank (Portable)	▬	▬	●	Use according to manufacturer's recommendations
Filter Basin	▬	▬	●	See WisDOT Standard Specifications
Vegetative Filter	▬	▬	▬	Effectiveness depends upon the width of the filter and the runoff rate of flow. See Standard 1054 for design guidelines.
Pressurized Filtration				The contractor shall provide a certification sheet from the manufacturer specifiying performance of the device based on soil type and pumping rate.
Portable Sand Filter	▬	●	●	
Wound Cartridge Units	■	▬	▬	
Membranes & Micro-filtration	■	■	■	Very effective but high maintenance requirements
Other Practices				
Sanitary Sewer Discharge	▬	▬	▬	
Pump Truck	▬	▬	▬	Transported to treatment facility
Alternative Method				Discuss with regulatory authority

Key:

Effective range of device: ▬

Device applicable but may not be cost effective: ■

Effective range with addition of polymer: ●

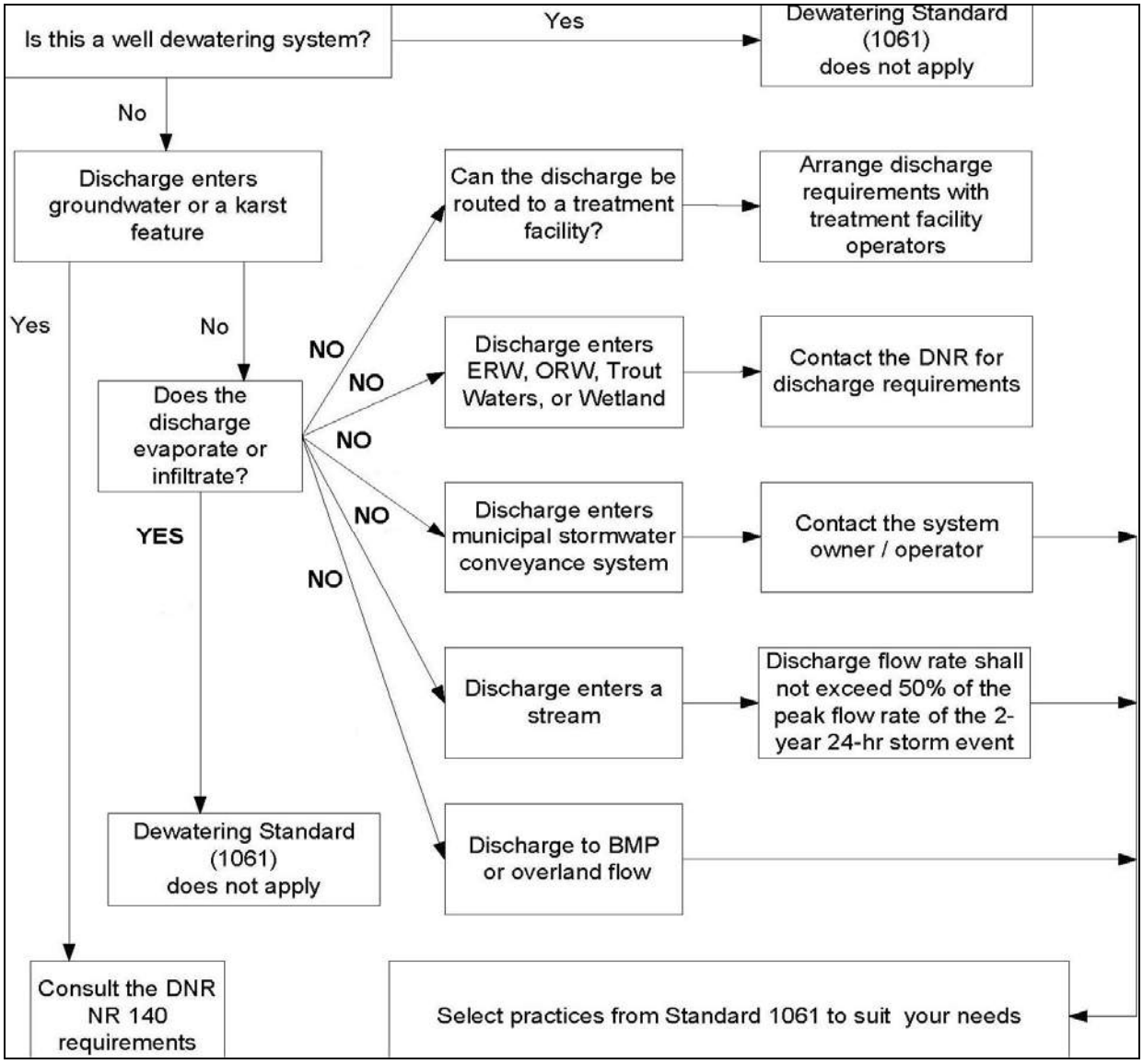
Notes:

(1) The effectiveness of many practices can be enhanced through the use of polymer mixture.

(2) Soil classification shall be done in accordance to an accepted method (i.e. USDA, AASHTO)

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

Figure 3: Factors Influencing The Selection of Dewatering Practices



If the dewatering effluent is discolored, has an order, an oily sheen, or other toxins are present notify the DNR immediately

24 Hours Spills Reporting Hotline 1-800-943-0003

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

APPENDIX G

Construction Site Inspection Forms

State of Wisconsin
Department of Natural Resources (DNR)
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

CONSTRUCTION SITE INSPECTION REPORT

Form 3400-187 (R 11/16)

Notice: This form was developed in accordance with s. NR 216.48 Wis. Adm. Code for WPDES permittees' convenience; however, use of this specific form is voluntary. Multiple copies of this form may be made to compile the inspection report. Inspections of the construction site and implemented erosion and sediment control best management practices (BMPs) must be performed weekly and within 24 hours after a rainfall event 0.5 inches or greater.

Construction Site Name and Location (Project, Municipality, and County): ISTHMUS MONTESSORI ACADEMY SCHOOL EXPANSION	**Site/Facility ID No. (FIN):**
Onsite Contact/Contractor: ICONICA	**Onsite Phone/Cell:**

Note: Inspection reports, along with erosion control and storm water management plans, are required to be maintained on site in accordance with s. NR 216.48 (4) and made available upon request. PLEASE PRINT LEGIBLY.

Date of inspection:

Time of inspection:
Start: _____ ◯ **am** ◯ **pm**
End: _____ ◯ **am** ◯ **pm**

Type of inspection: ◯ **Weekly** ◯ **Precipitation Event** ◯ **Other (specify)**

Weather/Site Conditions:

Temp. _____ **°F** **Antecedent Soil Moisture**

◯ **Dry** ◯ **Frozen or snow covered**
◯ **Variable** ◯ **Frozen (Thaw predicted in next week)**
◯ **Wet** ◯ **Melting Snow/slush**

Last Rainfall Depth: _____ **inches**

Last Rainfall Date: _____

Describe current phase of construction:

Scheduled Final Stabilization Date for Universal Soil Loss Equation (USLE) [1] :

Project on Schedule[2]? ◯ **Yes** ◯ **No**

Name(s) of individual(s) performing inspection:

Inspector Phone/Cell:

I certify that the information contained on this form is an accurate assessment of site conditions at the time of inspection:

Inspector Signature _____ **Date:** _____

Inspection Questions:	**Yes**	**No (Identify Actions Required):**	**Location/Comments:**	**Actions Completed by Date & Initials**
1. Is the erosion control plan accessible to operators?	☐	☐ Provide onsite copy		
2. Is the permit certificate posted where visible?	☐	☐ Post certificate		
3. Is the current phase of construction on sequence with the site-specific erosion and sediment control plan, including installation/stabilization of ponds and ditches?	☐	☐ Add sediment control ☐ Install missing ditch/pipe/pond ☐ Stabilize bare soil		
4. Are all erosion and sediment control BMPs shown on plan properly installed and in functional condition?	☐	☐ Repair ☐ Modify ☐ Install/Replace		
5. Is inlet protection properly installed and functioning in all inlets likely to receive runoff from the site?	☐	☐ Clean ☐ Replace ☐ Install		
6. Is the air free of fugitive dust resulting from construction activity and bare soil exposure?	☐	☐ Apply water ☐ Apply dust control product		

[1] The Universal Soil Loss Equation (USLE) model and the Construction Site Soil Loss and Sediment Discharge Guidance are available at: http://dnr.wi.gov/topic/stormwater/standards/const_standards.html

[2] If the project is not on schedule then the soil loss summary for the project should be reviewed and schedule, plan or practices modified accordingly.

CONSTRUCTION SITE INSPECTION REPORT

Inspection Questions:	Yes	No (Identify Actions Required):	Location/Comments:	Actions Completed by Date & Initials
7. Is the public right of way curb line free of tracked soil and accumulation?	☐	☐ Install tracking pad ☐ Widen/lengthen pad ☐ Amend stone/Add geotextile ☐ Install wheel washing station ☐ Close entrance/exit ☐ Limit traffic across disturbed areas ☐ Sweep road and curb line		
8. Are wetlands, lakes, streams, ditches, or storm sewers downstream of the site free of sedimentation and turbid water leaving the site?[3]	☐	☐ Repair/Replace erosion control ☐ Add sediment controls ☐ Modify operations ☐ Contact DNR to verify extent of cleanup required		
9. Is dewatering and/or vehicle and equipment washing being done in a manner that prevents erosion and sediment discharge?	☐	☐ Install treatment train ☐ Install energy dissipation ☐ Modify discharge location ☐ Modify intake to reduce sediment		
10. Are soil stockpiles existing for more than 7 days covered and stabilized?	☐	☐ Seed ☐ Install mat/mulch/polymer ☐ Cover with tarp/plastic sheeting		
11. Are downstream channels and other downhill areas protected from scour and erosion?	☐	☐ Install energy dissipation at outfall ☐ Install ditch checks ☐ Install slope interruption ☐ Install onsite detention		
12. Are good housekeeping practices or treatment controls in place to prevent the discharge of chemicals, cement, trash, and other materials into wetlands, waterways, storm sewers, ditches, or drainage-ways?[4]	☐	☐ Properly dispose of trash ☐ Provide concrete washout station ☐ Contact DNR to verify extent of cleanup required		
13. Is the plan reflective of current site operations and does it address all erosion and sediment control issues identified during the inspection?	☐	☐ Revise sequence ☐ Revise sediment control BMP ☐ Revise erosion control BMP ☐ Revise post-construction storm water BMP		
14. Are all areas where construction has temporarily ceased (and will not resume for more than 2 weeks) temporarily stabilized?	☐	☐ Topsoil & seed ☐ Install mat/mulch/polymer ☐ Cover with tarp/plastic sheeting		
15. Are all areas at final grade permanently vegetated or stabilized with other treatments?	☐	☐ Topsoil & seed ☐ Install mat/mulch/polymer ☐ Sod ☐ Install stone base		
16. Have temporary sediment controls been removed in areas of the site that meet the permit definition of 'final stabilization'?	☐	☐ Water to establish vegetation ☐ Repair or reseed areas ☐ Remove temporary practices		

3 If sediment discharge enters a wetland or waterbody, the permittee should consult with DNR staff to determine if sediment cleanup and/or additional control measures are required.

4 The permittee shall notify the DNR immediately via the spills hotline at (800)943-0003 of any release or spill of a hazardous substance to the environment in accordance with s. 292.11, Wis. Stats., and ch. NR 706, Wis. Adm. Code.

APPENDIX H

MSA Seeding Specifications

SECTION 32 91 19.13

TOPSOIL PLACEMENT AND GRADING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to salvage and/or furnish, haul, place, and prepare topsoil for this project in accordance with Section 625 of the State of Wisconsin, Department of Transportation Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Erosion and Sedimentation Controls - Division 31

C. Grading - Division 31

D. Subgrade Preparation - Division 31

E. Seeding - Division 32

1.05 SUBMITTALS

A. Submit a sample of the topsoil material prior to placement. Topsoil material shall be approved by the Owner or Engineer prior to placing on the project.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TOPSOIL

A. Topsoil or salvaged topsoil shall be screened and conform to Section 625 of the State of Wisconsin, Department of Transportation, Standard Specifications. A minimum of 100% of the topsoil shall pass through the one-inch sieve (25 mm) and 90% shall pass the No. 10 (2.00 mm) sieve.

B. Topsoil or salvaged topsoil shall be shredded and conform to Section 625 of the State of Wisconsin, Department of Transportation, Standard Specifications. 100% of the topsoil shall pass through the one-inch sieve (25 mm).

PART 3 CONSTRUCTION METHODS

3.01 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during placement and grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

B. When necessary or required by the Contract Documents, trees or shrubs around which embankment is placed shall be protected by tree wells built in accordance with Detailed Drawings or as laid out in the field by the Owner or Engineer.

3.02 PLACEMENT AND GRADING

A. General. Topsoil shall be stripped and placed in accordance with Subsection 625.3 of the State of Wisconsin, Department of Transportation Standard Specifications.

B. Salvaged Topsoil. Topsoil shall be stripped to a minimum depth of 6 inches in all areas of cut or fill, except within roadway limits topsoil shall be stripped full depth. Stockpile topsoil in storage piles in areas shown, or where otherwise directed. Construct storage piles to freely drain surface water. Cover or sprinkle water on storage piles if required to prevent windblown dust. Any appreciable volume left in the stockpile after properly placing shall become the property of the Owner and left in the pile. In any event, the pile shall be smoothed and seeded. All piles, which are to be left for seven or more days, shall be stabilized as indicated in the Erosion and Sedimentation Controls - Division 31.

C. Grading. The Contractor shall grade in back of the curb or walk to provide a smooth surface and a 4:1 maximum slope unless shown otherwise on the plan. Graded

surfaces shall be covered with topsoil to finished grade as shown on the typical sections.

D. Utility Adjustment. The Contractor shall adjust all valve boxes, manhole frames, and other utility appurtenances to within 1 inch of the final grade as shown on the contract drawings or as staked in the field by the Engineer.

E. All areas disturbed by the Contractor's activities shall be topsoiled to the depth of 6-inches, unless shown otherwise on the Contract Drawings or specified in Special Procedures - Division 01.

F. Screened/Sifted Topsoil. In existing urban areas or areas where a lawn type turf is required, the topsoil shall be top dressed with screened/sifted topsoil.

G. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Topsoil placement and grading shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 TOPSOIL PLACEMENT AND GRADING

A. Topsoil Placement and Grading, Lump Sum. The payment for this item shall be at the contract lump sum price bid for topsoil placement and grading.

B. Topsoil Placement and Grading, Inclusive. When no quantity is provided, topsoil placement and grading shall be considered inclusive to unclassified excavation.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the seeding for this project. All areas disturbed by the construction and not covered with pavement, aggregate base course, sod, or other structures shall be seeded, fertilized and mulched.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Subgrade Preparation - Division 31

D. Trenching and Backfilling - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Topsoil Placement and Grading - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to these specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 SEED

A. Seed shall conform to Section 630 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Mixture. Unless specified otherwise, the Contractor shall select a seed mixture or mixtures from the following:

1. Boulevard Mixture by La Crosse Seed LLC, or equal, shall be used on all areas within a street or road right-of- way, and all other turf areas that will be subjected to roadway salts.
2. Madison Parks Mix by La Crosse Seed LLC, or equal, shall be used in lawn and park areas with full sun to light shade and moist soils.
3. Shady Place Mix by La Crosse Seed LLC, or equal, shall be used in areas that are predominantly shaded.
4. Survivor Lawn Mix by La Crosse Seed LLC, or equal, shall be used in areas with sandy or poor soil conditions.
5. In non-urban areas where a lawn type turf is not required, the appropriate seed mixture per Section 630 of the State of Wisconsin, Department of Transportation, Standard Specifications shall be used.
6. La Crosse Seed LLC is located in Madison, Wisconsin; http://www.lacrosseseed.com.

2.02 FERTILIZER

A. Fertilizer shall contain the following percentages by weight:

Nitrogen	(N)	20%
Potash	(K)	10%
Phosphorus	(P)	10%

B. If local ordinances restrict the use of phosphorus in fertilizer, the local restrictions shall supercede the above percentages.

2.03 MULCH

A. Mulching shall consist of any straw, hay, wood excelsior fiber or other suitable material of a similar nature, which is substantially free of noxious weed seeds and objectionable foreign material.

2.04 WATER

A. Water shall be clean and free of impurities or substances that might injure the seed or grass.

PART 3 CONSTRUCTION METHODS

3.01 SEEDING

A. Seeding shall be done in conformance with Subsection 630.3 of the State of Wisconsin, Department of Transportation, Standard Specifications. Seed shall be sown at the manufacturer's recommended application rate.

B. A companion crop of annual rye grass shall be sown with the seeding at a rate of four pound per 1000 square feet of area.

3.02 FERTILIZER

A. Apply fertilizer in conformance with Section 629 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Deliver fertilizer to site in original unopened containers showing manufacturer's name, guaranteed analysis and weight. Store in a weatherproof location and use only when dry and free flowing. Apply fertilizer at rate of 10 pounds per 1000 square feet and evenly mix into top 2 inches of topsoil.

C. At the Contractor's option, the Contractor may perform soil tests and apply fertilizer based on the results.

3.03 MULCHING

A. This work shall consist of furnishing, placing, and anchoring a mulch cover over seeded areas.

B. Construction shall be done in conformance with Section 627 of the State of Wisconsin, Department of Transportation, Standard Specifications.

C. In existing developed areas, mulching shall be done in such a manner to prevent dust and mulch from being deposited on non-seeded areas. Acceptable methods are by hand or a small chopper/mulcher with a controlled discharge.

3.04 ACCEPTANCE

A. The work will be considered acceptable after a 2-inch uniform stand of grass is attained and all gullies, rivulets, and washouts have been repaired to the satisfaction of the Engineer. The Contractor shall request the Engineer's inspection and

acceptance will be made in writing when the above conditions have been complied with.

3.05 WATERING

A. If weather conditions are not suitable establishing turf, the seeded areas shall be watered twice weekly. Water shall be applied uniformly and in such a manner as not to waterlog the topsoil, dislodge the seed, or cause erosion.

B. If water is provided by a water utility, the Contract shall maintain a record of the amount of water obtained and provide it to the utility.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Seeding shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SEEDING

A. Seeding, Square Yard. Payment shall be made at the contract unit price bid per square yard for seeding installed. Measurement shall be per square yard installed as measured in the field.

B. Seeding, Lump Sum. Payment shall be made at the contract lump sum price bid. Measurement shall be to the extent shown on the contract drawings and described in Special Procedures - Division 01.

4.03 WATERING

A. Watering, MGAL. Payment shall be made at the contract unit price bid per MGAL (1000 gallon unit) for watering completed. Measurement shall be per MGAL used for watering purposes. The Contractor shall provide load tickets for the water used.

B. Watering, Each. Payment shall be made at the contract unit price bid per each for watering. Measurement shall be per each watering completed on the entire project restoration area.

C. Watering, Inclusive. When no quantity is provided, payment for watering shall be considered inclusive to payment for seeding.

END OF SECTION

APPENDIX I

USLE Calculations

APPENDIX J

Long Term Maintenance Agreement

APPENDIX K

Geotechnical Investigation

CGC, Inc.
Construction • Geotechnical
Consulting Engineering/Testing

December 8, 2021
C21581

Ms. Melissa Droessler
Isthmus Montessori Academy
1802 Pankratz Street
Madison, WI 53704

Re: Geotechnical Exploration Report
Proposed School Building Addition
1802 Pankratz Street
Madison, Wisconsin

Dear Ms. Droessler:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the geotechnical exploration program for the proposed project. The purpose of this exploration program was to evaluate the subsurface conditions within the proposed building area and to provide geotechnical recommendations regarding site preparation, foundation, floor slab and pavement design/construction. A determination of the site class for seismic design is also included. We are sending you an electronic copy of this report and can provide a paper copy upon request. A copy is also being sent to Jeff Hyland with Iconica.

PROJECT DESCRIPTION/SITE CONDITIONS

We understand that a building addition is planned on the north side of the existing Isthmus Montessori School at 1802 Pankratz Street in Madison, Wisconsin. The proposed building addition will be a two-story, slab-on-grade structure. The floor slab will match the existing finished floor at about EL 884 ft. Footing grade is generally expected to be about 1.5 to 4 ft below floor slab grade. Structural loading information was not provided but is estimated to be light to moderate in magnitude.

The site is generally flat with elevations ranging from approximately 883 to 885 ft +/- (USGS datum). The construction area is currently an open grass covered field with a few large trees. The site is surrounded by other generally commercial properties.

Based on a review of readily available historical aerial photographs of the subject site and surrounding areas, former structures appear to have been present on the subject site and adjacent parcels in the past. Although evidence of these past structures were not observed, with the potential exception of unknown obstruction within Boring 2, buried remnants may exist on the site.

SUBSURFACE CONDITIONS

Subsurface conditions on site were explored by drilling five (5) Standard Penetration Test (SPT) soil borings to planned depths of 10 to 15 ft below existing site grades at general locations selected by

2921 Perry Street, Madison WI 53713
Telephone: 608/288-4100
FAX: 608/288-7887

others. Boring 2 encountered a boulder or an unknown obstruction at about 3 f. As a result, an additional boring (Boring 2) was then offset 10 ft south and drilled to the planned termination depth. The borings were drilled on November 12, 2021 by Soil Essentials (under subcontract to CGC) using a track-mounted Geoprobe 7822DT rotary drill rig equipped with hollow-stem augers and an automatic SPT hammer. Specific details on the drilling and sampling procedures are included in Appendix A.

The soil boring locations are shown in plan on the Soil Boring Exhibit attached in Appendix B. The soil boring locations were located in the field by CGC, and elevations were estimated by CGC utilizing the publicly available topographic site information via DCiMap.

The subsurface profiles at the boring locations were fairly similar, and a generalized profile includes the following strata, in descending order:

- About 10 in. of ***topsoil fill***, over
- Approximately 2.5 to 5.5 ft of ***fill*** consisting of generally loose to medium dense sand with scattered lean clay; then
- About 2 to 9 ft of medium stiff to very stiff ***lean clay***, followed by
- Medium dense ***sand*** strata extending to the maximum depth explored. The sand generally contained some silt and gravel, as well as scattered cobbles and boulders.

As exceptions to the generalized profile listed, Borings 1 and 5 encountered a loose to medium dense *silt/sandy silt* stratum below the clay layer. Boring 3 encountered a thin layer of loose *clayey sand* below the clay layer.

Natural moisture contents in representative clay samples ranged from 20.9% and 27.4%, indicating that the fine grained soils should be considered slightly compressible.

Groundwater was generally not encountered in the borings during or shortly after drilling. Groundwater levels can be expected to fluctuate with seasonal variations in precipitation, infiltration, evapotranspiration and other factors. A more detailed description of the site soil and groundwater conditions is presented on the Soil Boring attached in Appendix B.

DISCUSSION AND RECOMMENDATIONS

Subject to the limitations discussed below and based on the subsurface exploration, it is our opinion that the site is generally suitable for the proposed construction and the building addition can be supported on conventional spread footing foundations. *However, based on the presence of undocumented fill soils and softer native clay soils located at or slightly below the estimated footing*

grade, as well as previously present buildings on this site, we recommend a contingency in the project budget for undercuts below planned footings. Further, undercutting/stabilization of near surface fill soils may also be necessary in planned pavement and floor slab areas, the extents of which will be dependent upon weather conditions and disturbance from construction traffic at the time of this development. Our recommendations for site preparation, foundation, floor slab and pavement design/construction are presented in the following subsections. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

1. Site Preparation

We recommend that topsoil/vegetation (including tree stumps and associated root balls) and concrete sidewalk be stripped/removed at least 5 ft beyond the proposed construction areas, including areas required for cuts and fills within and slightly beyond structural additions and pavement limits. Topsoil can be stockpiled on-site and re-used as fill in landscaped areas or hauled off-site. Based on the borings, the topsoil thickness is expected to be about 10 in., but variable topsoil thickness could be encountered due to past grading activity across the site.

Prior to fill placement (where needed), the exposed subgrades should be carefully evaluated for soft/loose areas by proof-rolling with a loaded tri-axle dump truck. Cobbles, boulders and/or structural remnants exposed within the subgrade should be removed when encountered within about 2 ft of finished grades in planned slab and pavement areas. If fairly thin soft or loose areas are encountered, the soils could potentially be aerated/dried and then recompacted to develop a stable subgrade. Note that this approach is highly weather dependent and may require multiple drying/recompaction cycles to develop a stable subgrade, which could delay the construction schedule. If weather/schedule do not permit drying/recompaction or if the unsuitable soils are thicker, unsuitable soils could also be undercut and replaced with granular backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557). Alternatively, 3-in. dense graded base can be used to restore grades in undercut areas.

Based on a review of readily available digital historical aerial photos, there were several buildings in the proposed site that were demolished before the year 2000. Although we did not encounter any remnants of previous buildings in the soil borings, other than potentially at Boring 2 where refusal occurred, if any portion of foundations from previous buildings are encountered they should be removed in their entirety below the building footprint. If building remnants are encountered in pavement areas, we generally recommend that they are removed at least 2 ft below the finished surfaces.

After the existing soils are evaluated and undercut/stabilized, as needed, fill placement to establish building and site grades can then proceed (if any). We recommend using granular soils (i.e., sands/gravels) as structural fill within the building envelope and upper 2 ft in pavement areas because sand/gravel soils are relatively easy to place and compact in most weather conditions. Silt and clay soils are not recommended as structural fill within the building areas and upper portion of pavement

areas because moisture conditioning will be required to achieve desired compaction levels, which could delay construction progress. Clay/silt soils may be used as fill in landscaped areas or in deeper fills in pavement areas provided the soils are dried back to facilitate compaction. We recommend that fill/backfill be compacted to at least 95% compaction (ASTM D1557) in accordance with our Recommended Compacted Fill Specifications presented in Appendix D. Periodic field density tests should be taken by CGC staff within the fill/backfill to document the adequacy of the compactive effort.

2. Foundation Design

In our opinion, the building addition can be supported on reinforced concrete spread footing foundations bearing on native stiff clay soils or recently placed granular backfill after removal of fill or softer clay soils to expose native sand or stiffer clay soils. *Undercutting should be expected due to the presence of undocumented fill soils or softer native clay soils at/near footing grade, such as near Borings 2A and 4, and a contingency should be included in the project budget.* The following parameters should be used for foundation design:

- Maximum net allowable bearing pressure: 2,500 psf

- Minimum foundation widths:
  --Continuous wall footings: 18 in.
  --Column pad footings: 30 in.

- Minimum footing depths:
  --Exterior/perimeter footings: 4 ft
  --Interior footings: no minimum requirement

Where new footings are planned adjacent to existing building foundations, the effects of overlapping soil stresses must be considered, and the recommended maximum net allowable bearing pressure must not be exceeded. Care must also be exercised not to undermine the existing building foundations.

Undercutting below footing grade will be required where native loose sand, silt or native clay with pocket penetrometer readings (an estimate of the unconfined compressive strength of cohesive soil) of less than 1.5 tsf are encountered at or slightly below footing grade. Where undercutting is required, the base of the undercut excavation should be widened beyond the footing edges at least 0.5 ft in each direction for each foot of undercut depth for stress distribution purposes. Footing grade can be restored with granular backfill compacted to at least 95% compaction (modified Proctor - ASTM D1557) or 3-in. dense graded base that is placed in maximum loose lifts of 10 in. and thoroughly compacted with a large vibratory compactor until deflection ceases.

CGC should be present during footing excavations to check whether the subgrades are satisfactory for the design bearing pressure and to advise on corrective measures, where necessary. We recommend using a smooth-edged backhoe bucket for footing excavations in soil. Additionally, granular soils exposed at footing grade should be recompacted with a large vibratory plate compactor prior to formwork/concrete placement to densify soils loosened during the excavation process. Soils potentially susceptible to disturbance from compaction (e.g., silty or clayey soils) should be hand trimmed. Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should be on the order of 1.0 and 0.5 in., respectively.

3. Floor Slab

As discussed above, existing undocumented fill is present within the building footprint. In our opinion, there is a potential risk that floor slab settlement/cracking may occur, if the slab is supported by the existing fill materials. *The risk is the owner's responsibility. If the risk is not acceptable, the variable fill should be removed completely from below the slab.* If the owner is willing to accept the risk of floor slab settlement/cracking occurring, the risk can be reduced (but not eliminated) if the subgrades are carefully evaluated (by proof-rolling or other means applicable within the confines of the project), including partial undercutting/replacement of surficial unstable soils with engineered granular backfill or compacted coarse aggregate. Consideration could also be given to the partial removal of the existing fill materials to further reduce (but not eliminate) the risk of slab settlement/cracking. We recommend consideration be given to partially removing the existing fill materials to a depth of 1 or 2 ft and replacing with compacted granular fill.

Prior to slab construction, the subgrades should be recompacted to densify soils that may become disturbed or loosened during construction activities. Areas that remain loose after recompaction should be undercut and replaced with compacted 3-in. dense graded base or granular fill. *As mentioned previously, based on the undocumented fill soils at the floor slab subgrade, we anticipate that some undercutting or stabilization of the existing soils at the floor slab subgrade will be required, and we recommend that the project budget include an allowance for this work.*

We recommend including a capillary break layer, which consists of 4 to 6 in. of well-graded sand or gravel having no more than 5% passing the No. 200 U.S. standard sieve, below the slab. Note that some structural engineers prefer to include a dense graded base layer below the slab (in lieu of the sand capillary break layer) to improve the subgrade modulus. To further minimize the potential for moisture migration through the slab, a plastic vapor barrier can also be utilized below the slab.

Fill and base layer material below the floor slab should be placed as described in the Site Preparation section of this report. The design subgrade modulus is based on a recompacted subgrade such that non-yielding conditions are developed. A subgrade modulus of 100 pci may be used for slab design on the capillary break layer above a firm or stabilized subgrade. The slab should be structurally separate from the foundations and have construction joints and reinforcement for crack control.

4. Seismic Design Category

In our opinion, the average soil properties in the upper 100 ft of the site (based on SPT blow counts (N-values) greater than 15 blows/ft on average) may be characterized as a stiff soil profile. This characterization would place the site in Site Class D for seismic design according to the International Building Code (see Table 1613.5.2).

5. Pavement Design

We anticipate that the pavement design will be controlled by generally granular fill present near the surface of the site, and subgrades should be prepared as described in the Site Preparation section of this report, with recompaction/proof-rolling completed prior to base course placement. We anticipate that asphalt pavement on this site will be exposed primarily to automobile traffic with less than one 18-kip equivalent single axle load (ESAL) per day. In view of this, we have assumed Traffic Class I following Wisconsin Asphalt Pavement Association (WAPA) recommendations for parking areas and driveways that are mainly used by light passenger vehicles. However, main sections of the driveway are likely to experience heavier traffic loads from occasional delivery and/or garbage trucks. For pavement areas where trucks will routinely travel, we have assumed a traffic load of less than 5 ESALs per day and Traffic Class 2 according to WAPA. The pavement sections summarized in Table 1 below were selected assuming a Soil Support Value "SSV" of about 4.0 for a firm or adequately stabilized subgrade and a design life of 20 years.

TABLE 1
Recommended Pavement Sections

Material	**Thicknesses (in.)**		**WDOT Specification [(1)]**
	Traffic Class I (Light Duty)	**Traffic Class II (Medium Duty)**	
Bituminous Upper Layer [(2,3)]	1.75	1.75	Section 460, Table 460-1
Bituminous Lower Layer [(2,3)]	1.75	2.25	Section 460. Table 460-1
Dense Graded Base Course [(2,4)]	8.0	10.0	Sections 301 and 305, 3 in. and 1¼ in.
Total Thickness	**11.5**	**14.0**	

Notes:

1) Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, latest edition, including supplemental specifications, and *Wisconsin Asphalt Pavement Association 2020 Asphalt Pavement Design Guide*.

2) Compaction requirements:
   - Bituminous concrete: Refer to Section 460-3.
   - Base course: Refer to Section 301.3.4.2, Standard Compaction

3) Mixture Type LT (or E-0.3) bituminous; refer to Section 460, Table 460-2 of the *Standard Specifications*.

4) The upper 4 in. should consist of 1¼-in. DGB; the bottom part of the layer can consist of 3-in. DGB.

Note that if traffic volumes are greater than those assumed, CGC should be allowed to review the recommended pavement sections and adjust them accordingly. Alternative pavement designs may prove acceptable and should be reviewed by CGC. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompacted.

Where concrete pavement may be used, such as in pavement areas subjected to concentrated wheel loads (e.g., entrance aprons or dumpster pads), we recommend that the concrete be at least 6 in. thick and contain mesh reinforcement for crack control. Concrete slabs underlain by a minimum 6-in. thick dense graded base layer over a firm or stabilized subgrade can be designed utilizing a subgrade modulus of 100 pci.

CONSTRUCTION CONSIDERATIONS

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil related difficulties that could be encountered on the site are discussed below:

- Due to the potentially sensitive nature of the on-site soils, we recommend that final site grading activities be completed during dry weather, if possible. Construction traffic should be avoided on prepared subgrades to minimize potential disturbance.

- Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen or on frozen ground.

- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards.

- When excavating next to the existing building, take care to avoid undermining the existing footings.

- Based on observations made during the field exploration, groundwater infiltration into footing excavations will likely not occur. However, water accumulating at the base of excavations as a result of precipitation or seepage should be controlled and quickly removed using pumps operating from filtered sump pits.

RECOMMENDED CONSTRUCTION MONITORING

The quality of the foundation, floor slab and pavement subgrades will be largely determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Topsoil stripping/subgrade proof-rolling within the construction areas;
- Fill/backfill placement and compaction;
- Foundation excavation/subgrade preparation; and
- Concrete placement.

*** * * * ***

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

Brian S. McIlwaine, E.I.T.
Senior Staff Engineer

Ryan J. Portman, P.E.
Consulting Professional

Encl: Appendix A - Field Exploration
Appendix B - Soil Boring Location Exhibit
Logs of Soil Borings (5)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Five (5) Standard Penetration Test (SPT) soil borings were drilled to planned depths of 10 to 15 ft below existing site grades within the building addition area at general locations selected by Iconica, with the borings located in the field by CGC. The borings were drilled on November 12, 2021 by Soil Essentials (under subcontract to CGC) using a track-mounted Geoprobe 7822DT rotary drill rig equipped with hollow-stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Soil Boring Exhibit attached in Appendix B.

In each boring, soil samples were obtained at 2.5 foot intervals to a depth of 10 ft and at 5 ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

   The boring is extended downward, between samples, by a hollow-stem auger.

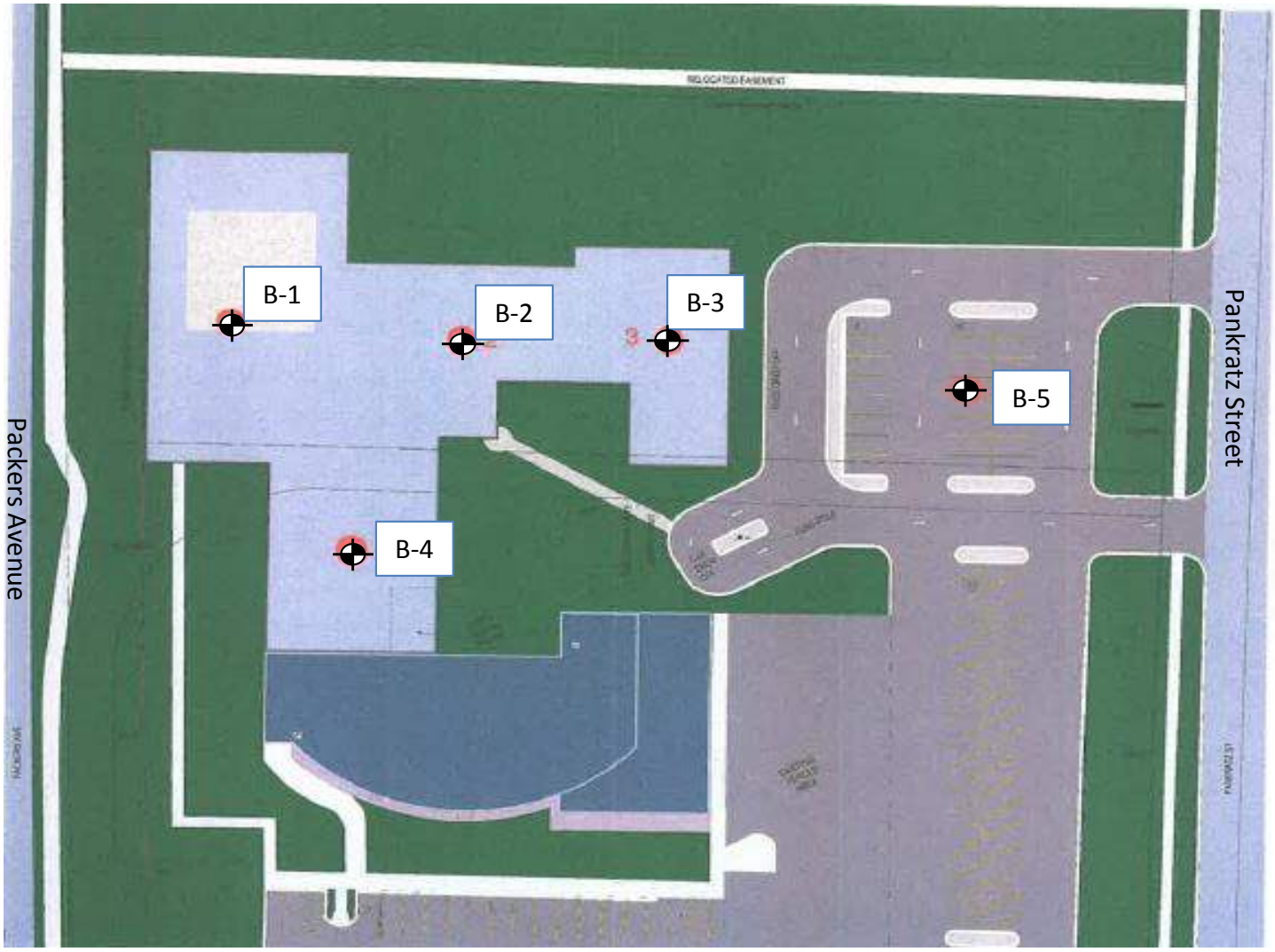
2. Standard Penetration Test and Split-Barrel Sampling of Soils
   (ASTM Designation: D 1586)

   This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the drillers as environmental site assessment activities were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite (where required) to satisfy WDNR regulations and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soil samples were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

SOIL BORING LOCATION EXHIBIT
LOGS OF SOIL BORINGS (5)
LOG OF TEST BORING-GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM



N

Soil Boring Location

Scale: Unknown

Notes

1.) Boring locations are approximate.
2.) Soil boring performed on November 12, 2021 by Soil Essentials
3.) Base map provided by Iconica

Drawn By: BSM	C21581	Date: 11/24/2021

CGC, Inc.

Soil Boring Exhibit
Proposed Building Addition
Isthmus Montessori School
Madison, WI

CGC Inc.

LOG OF TEST BORING

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **±883**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LOI
						10± in. TOPSOIL FILL					
1		10	M	16		FILL: Medium Dense, Brown Fine to Medium Sand, Some Silt and Gravel, Scattered Lean Clay					
2		7	M	9		Very Stiff, Brown Lean CLAY (CL)	(3.5)				
					5						
						Loose, Brown SILT (ML)					
3		16	M	6							
						Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
4		14	M	26							
					10						
5		16	M	34							
					15	End of Boring at 15 ft Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

CGC Inc.

LOG OF TEST BORING

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **2**
Surface Elevation (ft) **±885**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LOI
						10± in. TOPSOIL FILL					
1		16	M	13		FILL: Medium Dense, Brown Fine to Medium Sand, Some Silt and Gravel, Scattered Lean Clay					
					5	End of Boring/Auger Refusal at 3 ft on Probable Boulder Borehole Backfilled with Soil Cuttings					
					10						
					15						
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

CGC Inc.

LOG OF TEST BORING

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **2A**
Surface Elevation (ft) **±885**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LOI
						Boring 2 was Offset 10 ft South after Auger Refusal at 3 ft and Blind Drilled to 3.5 ft, See Boring 2 for Soil Information.					
1		16	M	10		Medium Stiff to Very Stiff, Brown Lean CLAY (CL)	(2.25)	20.9			
					5						
2		16	M	6			(0.75)	26.5			
3		0	M	4		No Recovery from 8.5 to 10 ft - Pushed Stone - Auger Cuttings Sample		22.1			
					10	Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
4		12	M	16							
					15	End of Boring at 15 ft Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

CGC Inc.

LOG OF TEST BORING

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **3**
Surface Elevation (ft) **±884**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LOI
						10± in. TOPSOIL FILL					
1		7	M	100/1"		FILL: Very Dense, Brown Fine to Medium Sand, Some Silt and Gravel, Scattered Cobbles/Boulders					
2		13	M	8	5	Very Stiff, Brown Lean CLAY (CL)	(3.75)				
3		16	M	7		Loose, Brown Clayey Fine to Medium SAND (SC)					
4		10	M	21	10	Medium Dense, Brown Silty Fine to Medium SAND, Some Gravel, Scattered Thin Silt Seams and Cobbles/Boulders (SM)					
5		16	M	15	15	End of Boring at 15 ft Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

LOG OF TEST BORING

CGC Inc.

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **4**
Surface Elevation (ft) **±883**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LOI
						10± in. TOPSOIL FILL					
1		14	M	10		FILL: Loose to Medium Dense, Brown Clayey Fine to Medium Sand, Some Gravel					
						FILL: Stiff, Gray Lean Clay, Scattered Sand Layers					
2		16	M	5	5		(1.25)				
3		13	M	4		Medium Stiff to Stiff, Brown Lean CLAY (CL)	(1.25)	27.4			
4		16	M	7	10	Brown/Gray (Slightly Mottled) near 9 ft	(0.75)	26.7			
						Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		16	M	11	15						
						End of Boring at 15 ft Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

CGC Inc.

LOG OF TEST BORING

Project **Proposed Isthmus Montessori School Addition**
1802 Pankratz Street
Location **Madison, Wisconsin**

Boring No. **5**
Surface Elevation (ft) **±884**
Job No. **C21581**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LOI
						10± in. TOPSOIL FILL					
1		12	M	30		FILL: Dense, Brown Gravelly Fine Sand, Little Silt					
						FILL: Loose to Medium Dense, Brown Silty Fine Sand, Scattered Lean Clay					
2		16	M	10							
					5						
3		16	M	7		Stiff, Brown Lean CLAY (CL)	(1.75)				
						Medium Dense, Brown Sandy SILT (ML)					
4		16	M	11							
					10	End of Boring at 10 ft Borehole Backfilled with Bentonite Chips					
					15						
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** Upon Completion of Drilling **NW**
Time After Drilling
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/12/21** End **11/12/21**
Driller **SE** Chief **Tim** Rig **Geoprobe**
Logger **TIM** Editor **BSM** **7822DT**
Drill Method **2.25" HSA; Autohammer**

CGC, Inc.

LOG OF TEST BORING

General Notes

DESCRIPTIVE SOIL CLASSIFICATION

Grain Size Terminology

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12”	Larger than 12”
Cobbles	3” to 12”	3” to 12”
Gravel: Coarse	¾” to 3”	¾” to 3”
Fine	4.76 mm to ¾”	#4 to ¾”
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

General Terminology

Physical Characteristics
Color, moisture, grain shape, fineness, etc.
Major Constituents
Clay, silt, sand, gravel
Structure
Laminated, varved, fibrous, stratified, cemented, fissured, etc.
Geologic Origin
Glacial, alluvial, eolian, residual, etc.

Relative Density

Term	“N” Value
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

Relative Proportions Of Cohesionless Soils

Proportional Term	Defining Range by Percentage of Weight
Trace	0% - 5%
Little	5% - 12%
Some	12% - 35%
And	35% - 50%

Consistency

Term	q_u-tons/sq. ft
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

Organic Content by Combustion Method

Soil Description	Loss on Ignition
Non Organic	Less than 4%
Organic Silt/Clay	4 – 12%
Sedimentary Peat	12% - 50%
Fibrous and Woody Peat	More than 50%

Plasticity

Term	Plastic Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6” penetrations of the 2” split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30” and is seated to a depth of 6” before commencing the standard penetration test.

SYMBOLS

Drilling and Sampling

CS – Continuous Sampling
RC – Rock Coring: Size AW, BW, NW, 2”W
RQD – Rock Quality Designation
RB – Rock Bit/Roller Bit
FT – Fish Tail
DC – Drove Casing
C – Casing: Size 2 ½”, NW, 4”, HW
CW – Clear Water
DM – Drilling Mud
HSA – Hollow Stem Auger
FA – Flight Auger
HA – Hand Auger
COA – Clean-Out Auger
SS - 2” Dia. Split-Barrel Sample
2ST – 2” Dia. Thin-Walled Tube Sample
3ST – 3” Dia. Thin-Walled Tube Sample
PT – 3” Dia. Piston Tube Sample
AS – Auger Sample
WS – Wash Sample
PTS – Peat Sample
PS – Pitcher Sample
NR – No Recovery
S – Sounding
PMT – Borehole Pressuremeter Test
VS – Vane Shear Test
WPT – Water Pressure Test

Laboratory Tests

q_a – Penetrometer Reading, tons/sq ft
q_a – Unconfined Strength, tons/sq ft
W – Moisture Content, %
LL – Liquid Limit, %
PL – Plastic Limit, %
SL – Shrinkage Limit, %
LI – Loss on Ignition
D – Dry Unit Weight, lbs/cu ft
pH – Measure of Soil Alkalinity or Acidity
FS – Free Swell, %

Water Level Measurement

▽- Water Level at Time Shown
NW – No Water Encountered
WD – While Drilling
BCR – Before Casing Removal
ACR – After Casing Removal
CW – Cave and Wet
CM – Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

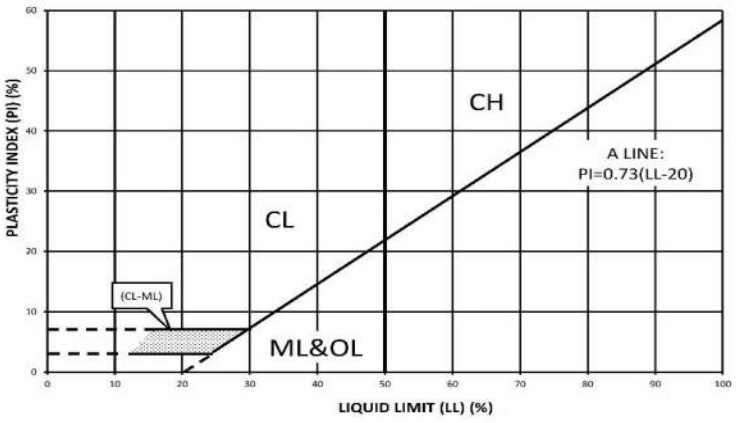
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limts below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limts above "A" line or P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C
DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

READ THE FULL REPORT

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINION

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most

effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the confirmation-dependent recommendations included in your report. *Those confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's confirmation-dependent recommendations if we do not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical engineering report. Confront that risk by having CGC participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

DO NOT REDRAW THE ENGINEER'S LOGS

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

GIVE CONSTRUCTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

READ RESPONSIBILITY PROVISIONS CLOSELY

Some clients, design professionals, and constructors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineer's responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

OBTAIN PROFESSIONAL ASSISTANCE TO DEAL WITH MOLD

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in the Geotechnical Business Council (GBC) of Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of GBC, for more information.

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Geotechnical Business Council
of the Geoprofessional Business Association
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

General Fill Materials

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. Fill containing rock, boulders or concrete pieces should include sufficient finer material to fill voids among the larger fragments.

Special Fill Materials

In certain cases, special fill materials may be required for specific purposes, such as stabilizing subgrades, backfilling undercut excavations or filling behind retaining walls. For reference, WisDOT gradation specifications for various types of granular fill are attached in Table 1.

Placement Method

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 2. Note that these compaction guidelines would generally not apply to coarse gravel/stone fill. Instead, a method specification would apply (e.g., compact in thin lifts with a vibratory compactor until no further consolidation is evident).

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

Table 1
Gradation of Special Fill Materials

Material	WisDOT Section 311	WisDOT Section 312	WisDOT Section 305			WisDOT Section 209		WisDOT Section 210
	Breaker Run	Select Crushed Material	3-in. Dense Graded Base	1 1/4-in. Dense Graded Base	3/4-in. Dense Graded Base	Grade 1 Granular Backfill	Grade 2 Granular Backfill	Structure Backfill
Sieve Size	Percent Passing by Weight							
6 in.	100							
5 in.		90-100						
3 in.			90-100					100
1 1/2 in.		20-50	60-85					
1 1/4 in.				95-100				
1 in.					100			
3/4 in.			40-65	70-93	95-100			
3/8 in.				42-80	50-90			
No. 4			15-40	25-63	35-70	100 (2)	100 (2)	25-100
No. 10		0-10	10-30	16-48	15-55			
No. 40			5-20	8-28	10-35	75 (2)		
No. 100						15 (2)	30 (2)	
No. 200			2-12	2-12	5-15	8 (2)	15 (2)	15 (2)

Notes:

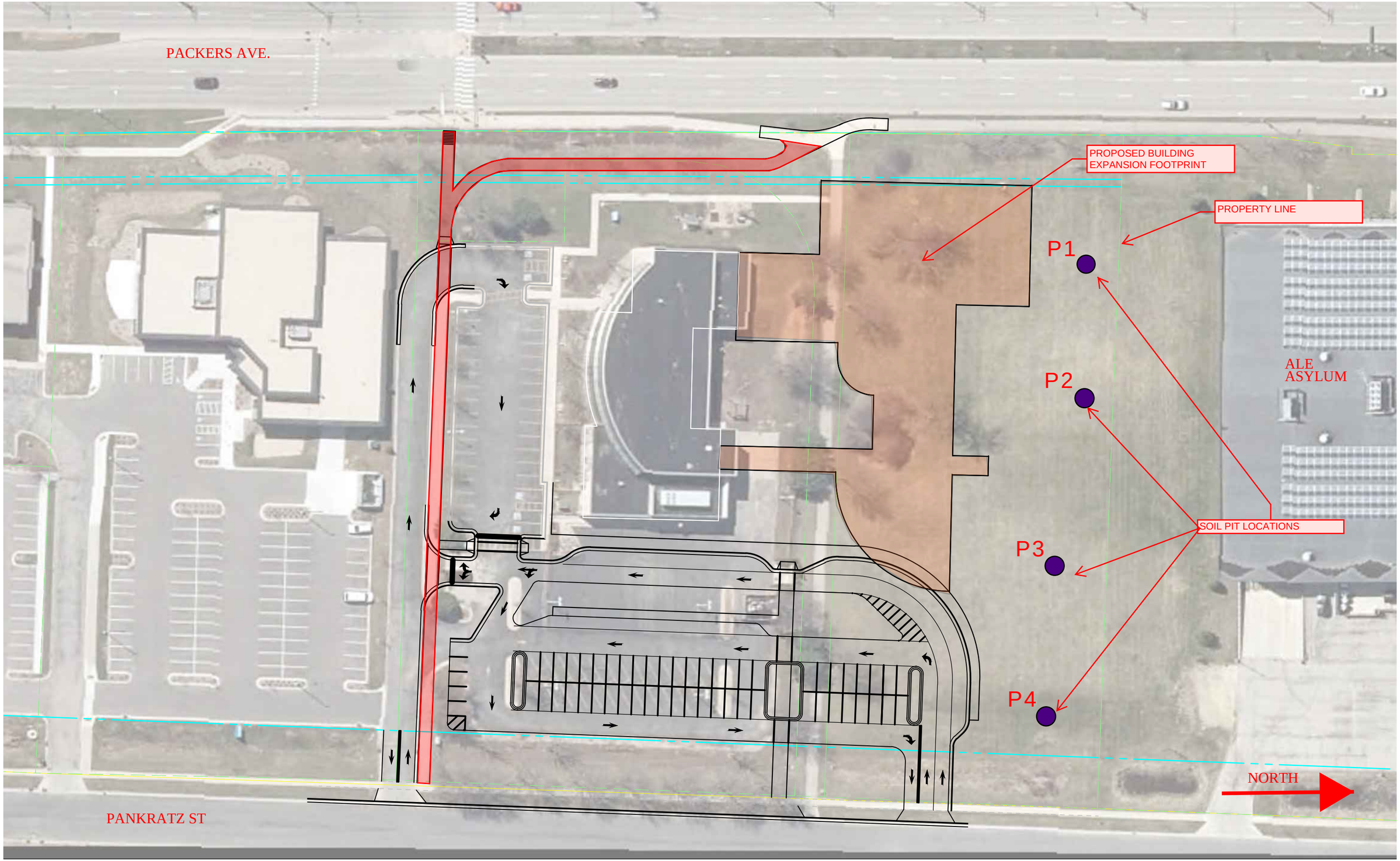
1. Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction.*
2. Percentage applies to the material passing the No. 4 sieve, not the entire sample.
3. Per WisDOT specifications, both breaker run and select crushed material can include concrete that is 'substantially free of steel, building materials and other deleterious material'.

Table 2
Compaction Guidelines

Area	Percent Compaction (1)	
	Clay/Silt	Sand/Gravel
Within 10 ft of building lines		
Footing bearing soils	93 - 95	95
Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab and thicker fill zones	92	95
Beyond 10 ft of building lines		
Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
Landscaping	85	90

Notes:

1. Based on Modified Proctor Dry Density (ASTM D 1557)



		NO.	DATE	REVISION	BY
PROJECT DATE: 10/20/2021	DRAWN BY: Init	.	.	.	.
	DESIGNED BY: Init	.	.	.	.
	CHECKED BY: Init	.	.	.	.

PLOT DATE: 10/20/2021 3:26 PM, \\msa-ps.com\fs\Project\21\21586\21586000\CADD\Construction Documents\Civil Site Plan.dwg

MSA

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ISTHMUS MONTESSORI ACADEMY EXPANSION
ISTHMUS MONTESSORI ACADEMY
MADISON, WI

PRELIMINARY SITE PLAN

PROJECT NO.
21586000

SHEET

Division of Industry Services
P.O. Box 2658
Madison, Wisconsin 53701
Scott Walker, Governor
Laura Gutierrez, Secretary

Attachment 2:

SOIL AND SITE EVALUATION - STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

Attach a complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM referenced to nearest road

Please print all information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]

County: *DANE*

Parcel I.D.: *251/0810-311-0307-1*

Reviewed by:

Date:

Property Owner: *DANE COUNTY*

Property Owner's Mail Address: *210 MLK JR BLVD #114*

City: *MADISON* State: *WI* Zip Code: *53703-3342* Phone Number:

Property Location
Govt. Lot *NW* ¼ *NE* ¼ S *31* T *8* N R *10* E

Lot # *48* Block# Subd. Name or CSM # *2ND ADDITION TO TRUAX AIR PARK WEST*

[X] City [ ] Village [ ] Town *MADISON*

Nearest Road: *1902 PANKRATZ ST*

Drainage area _____ [ ] sq ft [ ] acres

Test site suitable for (check all that apply): [ ] Site not suitable;
[ ] Bioretention; [ ] Subsurface Disperal System;
[ ] Reuse; [ ] Irrigation; [ ] Other _____

Hydraulic Application Test Method
[X] Morphological Evaluation
[ ] Double Ring Infiltrometer
[ ] Other: (specify) _____

Soil Moisture
Date of soil borings: 12/16/2021
USDA-NRCS WETS Value:
[ ] Dry = 1;
[ ] Normal = 2;
[ ] Wet = 3.

P1 #OBS. [X] Pit [ ] Boring Ground surface elevation 884 ft. Elevation of limiting factor < 872 ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
1	0-5	10YR 3/3	None	SIL (Fill)	0mcdy	varies	gw	< 5		0.13(1)
2	5-38	10YR 6/3; 7/3	None	SIL/SICL (Fill)	0mcdy	varies	gw	< 5		0.04(1)
3	38-46	10YR 5/2; 5/1	None	SIL	1fsbk	mefi	gw	< 5		0.13
4	46-96	10YR 5/4	None	SICL	1fsbk	mefi	gw	< 5		0.04
5	96-144	10YR 6/4	None	GRSL/SIL	0sg	ml		15-20	32	0.13-0.5(2)

Comments: No groundwater encountered during or upon completion of excavation. (1)Infiltration rate within existing fill materials is likely to be highly variable. (2)Presence of silt loam seams may limit infiltration rate to lower value. Deep-tilling of deposit may improve infiltration rate.

P2 #OBS. [X] Pit [ ] Boring Ground surface elevation 886 ft. Elevation of limiting factor < 884.5 ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
1	0-7	10YR 3/3	None	SIL (Fill)	0mcdy	varies	gw	< 5		0.13(1)
2	7-20	10YR 6/4	None	SIL-FSL (Fill)	0mcdy	varies	gw	< 5		0.13(1)
3	20-56	10YR 4/3; 4/4	None	SICL (Fill)	0mcdy	varies	gw	< 5		0.04(1)
4	56-76	10YR 4/1; 3/1	None	SICL	1fsbk	mefi	gw	< 5		0.04
5	76-134	10YR 5/4	None	SICL	1fsbk	mvfi	gw	< 5		0.04
6	134-138	10YR 4/6	None	SCL	1fsbk	mvfi		< 5		0.11

Comments: No groundwater encountered during or upon completion of excavation. (1)Infiltration rate within existing fill materials is likely to be highly variable.

Name (Please Print): Ryan J. Portman

Signature: Ryan J. Portman

Credential Number: **1201636**

Address: 201 N. Mallard Dr., Sun Prairie, WI 53590

Date Evaluation Conducted: **12/16/2021**

Telephone Number: 608-288-4100

P3 #OBS. [X] Pit [ ] Boring Ground surface elevation 885 ft. Elevation of limiting factor < 883.5 ft. Page **2** of **2**

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
1	0-10	10YR 3/3	None	SIL (Fill)	0mcdy	Varies	gw	< 5		0.13(1)
2	10-41	10YR 7/3; 7/4	None	SL/SICL (Fill)	0sg/1fsbk	Varies	gw	< 5		0.04-0.5(1)
3	41-55	10YR 4/1; 5/1	None	SICL	1fsbk	mefi	gw	< 5		0.04
4	55-102	10YR 5/4	None	SICL	1fsbk	mefi	gw	< 5		0.04
5	102-138	10YR 7/3; 6/3	None	LFS	0sg	ml		10-15		0.5

Comments: No groundwater encountered during or upon completion of excavation. (1)Infiltration rate within existing fill materials is likely to be highly variable.

P4 #OBS. [X] Pit [ ] Boring Ground surface elevation 884 ft. Elevation of limiting factor < 882.5 ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
1	0-12	10YR 3/1	None	SIL (Fill)	0mcdy	varies	gw	< 5		0.13(1)
2	12-24	10YR 6/4	None	VGRSL (Fill)	0sg	ml	gw	35-40		0.50(1)
3	24-72	10YR 7/4; 5/4	None	SIL/SICL	1fsbk	mfi	gw	< 5		0.04
4	72-96	10YR 7/3	None	FS	0sg	ml	gw	< 5	11	0.5
5	96-138	10YR 7/3	None	FSL/SIL	0sg	ml		< 5		0.13-0.5(2)

Comments: No groundwater encountered during or upon completion of excavation. (1)Infiltration rate within existing fill materials is likely to be highly variable.
(2)Presence of silt loam seams may limit infiltration rate to lower value. Deep-tilling of deposit may improve infiltration rate.

CGC Inc.

LOG OF TEST PIT

Project **Isthmus Montessori Academy - Stormwater**
1802 Pankratz Street
Location **Madison, WI**

Pit No. **P-1**
Surface Elevation **884±**
Job No. **C21581-1**
Sheet **1** of **1**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	SAMPLE TYPE	SAMPLE Rec (in.)	SAMPLE Moist	SAMPLE N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	Probe (in.)
						5± in. TOPSOIL Fill *USDA: 10YR 3/3 Silt Loam (Fill)*					
			M			FILL: Tan/Brown Sandy Silt, Intermixed Clay *USDA: 10YR 6/3; 7/3 Silt Loam, Intermixed Silty Clay Loam (Fill)*					
						Hard, Dark Gray Claycy SILT (CL-ML) *USDA: 10YR 5/2; 5/1 Silt Loam*					
			M		5	Very Stiff to Hard, Brown Lean CLAY, Little to Some Sand (CL) *USDA: 10YR 5/4 Silty Clay Loam*	(3.0+)				
			M		10	Tan Fine SAND, Some Silt and Gravel, Interbedded Silt Seams (SM/ML) *USDA: 10YR 6/4 Gravelly Sandy Loam, Interbedded Silt Loam Seams* %P200 (Near 9 ft): 31.6					
						End Test Pit at 12± ft Backfilled with Excavation Spoils					
					15						

WATER LEVEL OBSERVATIONS

While Excavating ▽ **NW** Upon Completion of Drilling **NW**
Time After Excavating
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/16/21** End **12/16/21**
Driller **HBE** Chief **Brad**
Logger **RJP** Editor **RJP**
Equip. Used: **Takeuchi TB290**

CGC Inc.

LOG OF TEST PIT

Project **Isthmus Montessori Academy - Stormwater**
1802 Pankratz Street
Location **Madison, WI**

Pit No. **P-2**
Surface Elevation **886±**
Job No. **C21581-1**
Sheet **1** of **1**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	Probe (in.)
						7± in. TOPSOIL Fill *USDA: 10YR 3/3 Silt Loam (Fill)*					
						FILL: Tan Sandy Silt to Silty Fine Sand *USDA: 10YR 6/4 Silt Loam to Fine Sandy Loam (Fill)*					
			M			FILL: Brown Lean Clay, Little to Some Sand *USDA: 10YR 4/3; 4/4 Silty Clay Loam (Fill)*					
			M		5	Hard, Dark Gray Lean CLAY (CL) *USDA: 10YR 4/1; 3/1 Silty Clay Loam*	(4.5)				
						Brown Lean CLAY, Little to Some Sand (CL) *USDA: 10YR 5/4 Silty Clay Loam*					
			M		10						
						Brown Silty Clayey SAND (SC) *USDA: 10YR 4/6 Sandy Clay Loam*					
						End Test Pit at 11.5± ft					
						Backfilled with Excavation Spoils					
					15						

WATER LEVEL OBSERVATIONS

While Excavating ▽ **NW** Upon Completion of Drilling **NW**
Time After Excavating
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/16/21** End **12/16/21**
Driller **HBE** Chief **Brad**
Logger **RJP** Editor **RJP**
Equip. Used: **Takeuchi TB290**

CGC Inc.

LOG OF TEST PIT

Project **Isthmus Montessori Academy - Stormwater**
1802 Pankratz Street
Location **Madison, WI**

Pit No. **P-3**
Surface Elevation **885±**
Job No. **C21581-1**
Sheet **1** of **1**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	Probe (in.)
						10± in. TOPSOIL Fill *USDA: 10YR 3/3 Silt Loam (Fill)*					
			M			FILL: Mixture of Tan/Brown Sand and Clay, Some Gravel, Intermixed Asphalt *USDA: 10YR 7/3; 4/4 Mixture of Sandy Loam and Silty Clay Loam (Fill)*					
						Hard, Dark Gray Lean CLAY (CL) *USDA: 10YR 4/1; 5/1 Silty Clay Loam*	(4.5+)				
			M		5	Brown Lean CLAY, Little to Some Sand (CL) *USDA: 10YR 5/4 Silty Clay Loam* (Sandier with Depth)					
			M		10	Tan Fine SAND, Little to Some Silt and Gravel (SP-SM/SM) *USDA: 10YR 7/3; 6/3 Loamy Fine Sand*					
					15	End Test Pit at 11.5± ft Backfilled with Excavation Spoils					

WATER LEVEL OBSERVATIONS

While Excavating ▽ **NW** Upon Completion of Drilling **NW**
Time After Excavating
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/16/21** End **12/16/21**
Driller **HBE** Chief **Brad**
Logger **RJP** Editor **RJP**
Equip. Used: **Takeuchi TB290**

CGC Inc.

LOG OF TEST PIT

Project **Isthmus Montessori Academy - Stormwater**
1802 Pankratz Street
Location **Madison, WI**

Pit No. **P-4**
Surface Elevation **884±**
Job No. **C21581-1**
Sheet **1** of **1**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	Probe (in.)
						12± in. TOPSOIL Fill *USDA: 10YR 3/1 Silt Loam (Fill)*					
						FILL: Tan Gravelly Sand, Some Silt *USDA: 10YR 6/4 Very Gravelly Sandy Loam (Fill)*					
			M			Tan SILT, Interbedded with Brown Lean Clay Seams (ML/CL) *USDA: 10YR 7/4; 5/4 Silt Loam, Interbedded Silty Clay Loam Seams*					
					5						
			M			Tan Fine SAND, Trace Silt (SP) *USDA: 10YR 7/3 Fine Sand* %P200 (Near 6 ft): 10.8					
						Tan Silty Fine SAND, Interbedded Silt Seams (SM) *USDA: 10YR 7/3 Fine Sandy Loam, Interbedded Silt Loam Seams*					
			M		10						
						End Test Pit at 11.5± ft Backfilled with Excavation Spoils					
					15						

WATER LEVEL OBSERVATIONS

While Excavating ▽ **NW** Upon Completion of Drilling **NW**
Time After Excavating
Depth to Water ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/16/21** End **12/16/21**
Driller **HBE** Chief **Brad**
Logger **RJP** Editor **RJP**
Equip. Used: **Takeuchi TB290**

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	6.7	4.1	9.6	44.7	31.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
3/4	96.7		
1/2	94.7		
3/8	93.6		
#4	90.0		
#8	86.7		
#10	85.9		
#16	83.6		
#30	79.9		
#40	76.3		
#50	68.8		
#80	52.0		
#100	46.5		
#200	31.6		

* (no specification provided)

Material Description

Brown Fine to Medium Sand, Some Silt, Little Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.7311 D_{85}= 1.6632 D_{60}= 0.2281
D_{50}= 0.1691 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: P1 **Depth:** 9'

Date: 12/21/21

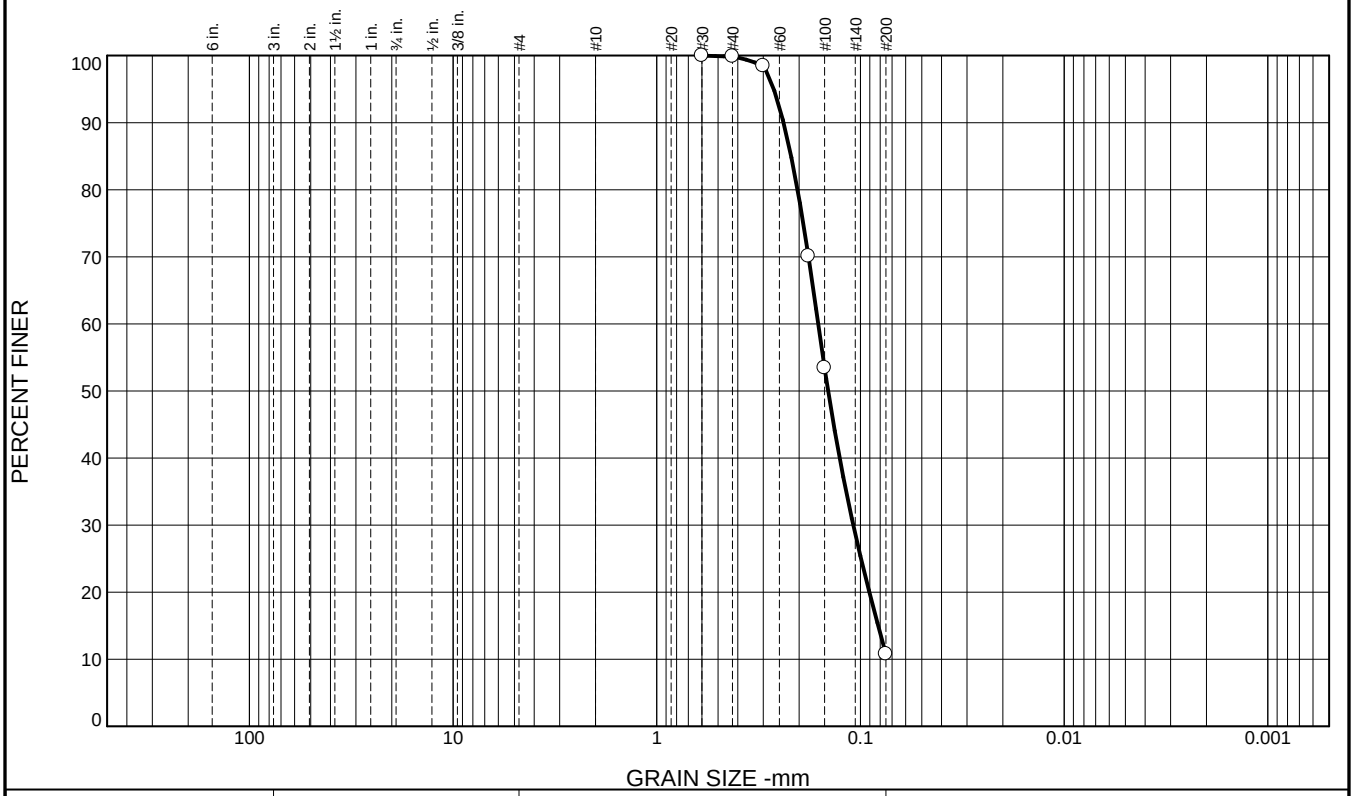
CGC,Inc.

Client: Isthmus Montessori Academy
Project: Isthmus Montessori Academy

Project No: C21581-1 **Figure**

Tested By: DRW **Checked By:** RJP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	89.1	10.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#30	100.0		
#40	99.9		
#50	98.5		
#80	70.1		
#100	53.4		
#200	10.8		

* (no specification provided)

Material Description

Brown Fine Sand, Little Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2385 D_{85}= 0.2189 D_{60}= 0.1612
D_{50}= 0.1441 D_{30}= 0.1085 D_{15}= 0.0818
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO=

Remarks

Sample Number: P4 **Depth:** 6'

Date: 12/21/21

CGC,Inc.

Client: Isthmus Montessori Academy
Project: Isthmus Montessori Academy

Project No: C21581-1 **Figure**

Tested By: DRW **Checked By:** RJP