Stormwater Management Plan
For
39 Main Street Milton, LLC

A Proposed project with several Mixed-Use Buildings

Situate:
39-53 Main Street, Town of Marborough
Ulster County, New York
Tax Map Number: 103.1-2-44, and 103.1-2-45
+/-0.92ac

Prepared By:

Medenbach and Eggers
Civil Engineering and Land Surveying, PC
4305 US Highway 209
Stone Ridge, New York
Ph: 845-687-0047
www.mecels.com

November 4, 2021

Barry Medenbach, P.E.
NYS License No: 60142

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SECTION 1: General Project Information

1.1 Project Summary:

General Description:

The 39 Main Street Milton LLC proposes a mixed-use building project situated on 0.92 acres. The project proposes to build 8 buildings with retail spaces on the bottom floor. Each retail space will have 4 apartments above each retail space for a total of 32 one-bedroom apartments. The site has municipal water and sewer along main street.
The site slopes down toward Main Street with all the existing stormwater running into the existing stormwater basins along Main Street.

The intent of this stormwater report is to describe the existing site conditions of the proposed site and to provide descriptions for the proposed stormwater structures. The calculations and sizing of the subsurface storage system will be part of a stormwater management plan.

Stormwater management for the project will include temporary erosion controls during construction as well as permanent post construction controls, such as catch basins, stormwater manholes, subsurface detention chambers, and pipe culverts. The stormwater management practices will mitigate the impacts of the proposed development for runoff quantity and quality improvements to remove pollutants from the stormwater before it discharges to the existing stormwater infostructure along Main Street.

The proposed improvements which include the 8 new buildings, a 39 space parking lot and a new driveway entrance onto Milton Turnpike will increase the impervious cover from 6000 SF to 34500 SF. The increase in impervious cover will result in an increase of stormwater from the site. To mitigate this runoff, we are proposing to have storage chambers installed under the parking lot to dissipate the discharge before entering the Town of Marlborough's stormwater collection along Main Street.

The large portion of the site is steep and will need to have a decent amount of rock removed to install the parking lot and the stormwater subsurface storage. The parking lot will be placed at the second floor level of the buildings to help reduce the amount of rock to be removed and to get the best driveway access to the Milton Turnpike. The proposed subsurface storage will consist of five (5) rows of StormTech SC-740 chambers at 85.4 lf each. We are proposing to use the chambers as detention chambers. A catch basin will be provided at each end to collect surface water. All roof and parking lot drainage will be directed to these chambers. The catch basins are both to have 2' sumps that will provide some initial sediment capture for the subsurface chambers. Then the Isolator Row for the chambers will capture more sediment that will need to be periodically checked per the Isolator Row O&M manual in Appendix A. Overflow from the chambers will be a provided in Catch Basin #1 with a 12" culvert that discharges into stormwater manhole #1 that is to be installed between buildings #2 and #3. Then the stormwater will be discharged to stormwater manhole #2 that will be installed between existing catch basin #1 and existing catch basin #2. The StormTech Construction Guide and the Isolator Row O&M Manual are in Appendix A.

The entire site is only 0.92 acres and the total disturbance included disturbance within Main Street is 0.87 acres less than the one-acre requirement requiring coverage under the NYSPDES for site construction.

When all proposed practices are constructed they will reduce all post-development peak flows from the site to less than the peak pre-development rates. Therefore there will be no negative impacts on downstream waters or adjacent lands from the proposed development. We are reviewed one design points for stormwater flowing from the site. See the Pre and Post Development Drainage Area in the Appendix for Design Point Location. Below is a table with the Pre and Post Development total flows for the 1, 10 and 100-year storms:

Total Offsite flow			
Storm	**Pre-development (cfs)**	**Post-development (cfs)**	**% Change**
1 Year	1.4	0.7	-50%
10 Year	3.0	2.8	-7%
100 Year	6.4	5.9	-8%

1.2 Contact Information/Responsible Parties:

SWPPP Contact/Prepared by:

Medenbach & Eggers, Civil Engineering and Land Surveying, P.C.
Barry Medenbach, PE
4305 US Highway 209
Stone Ridge, NY 12484
P: 845-687-0047
F: 845-687-4783
E-mail: Barry@mecels.com

Owner/Operator(s):

Robert Pollock
96 S. Elliot Place
Brooklyn, NY 11217
P: (718) 834-0775
E-mail: roblpollock@gmail.com

Emergency 24-Hour Contact:

Company or Organization:
Name: Robert Pollock
P: (718) 834-0775

1.3 Existing Soils, Slopes, Vegetation and Drainage Patterns:

The existing runoff for the site has been split into 2 watersheds. Watersheds 1 drains directly today Main Street, while watershed 2 drains toward Milton Turnpike. Both watersheds enter the Town of Marlborough's stormwater collection along Main Street. Slopes across the site ranges from moderate to steep. There is exposed rock along the bottom of the site. The site has 2 separate soil classifications as described in the USDA-NRCS soil survey in the appendix. The chart below shows the percentage of each hydrological soil group, the soil survey can be found attached.

Percentage of Each Hydrological Soil Group at the Oakwood Estates Subdivision			
A	B	C	D
0%	0%	50%	50%

1.4 Changes in Cover Estimates:

The following are estimates of the proposed development.

Total project area:	0.92 acres
Approximate construction site area to be disturbed:	±0.87 acres
Percentage impervious area before construction:	15%
Runoff coefficient before construction:	CN = 85
Percentage impervious area after construction:	84%
Runoff coefficient after construction:	CN = 95
Future Impervious Cover:	0.79 acres
Conservation of natural areas:	0 acres

1.5 Receiving Waters:

The stormwater from the site gets collected by the catch basins along Main Street. The Stormwater flows within the Town of Marlborough's drainage system down Brewster Street toward the a Federal wetland area along Dock Road. Eventually the water discharges to the Hudson River.

1.6 Sensitive Site Features to Be Protected:

There are known sensitive features to be protected.

SECTION 2: Erosion and Sediment Control BMPS

2.1 Minimizing Disturbed Areas, Protecting Natural Features and Soil:

Site disturbance and clearing will be kept within the limits of disturbance as indicated on the subdivision plan. Any sensitive areas such as vegetation areas to be preserved will be clearly flagged prior to disturbance. All contractors will be instructed not to disturb these sensitive areas.

All topsoil from disturbed areas will be striped prior to grading and will be removed from the site.

2.2 Temporary BMPS:

The following temporary erosion and sediment controls will be used during construction. The locations and detailed designs of each practice is located within the accompanying construction drawings.

- Silt Fence: to capture sediment in lateral sheet flow leaving disturbed areas
- Stabilized Construction Entrances: to capture sediment from vehicles leaving site
- Temporary Seeding: to stabilize inactive areas or soil stockpiles

2.3 Sequence of Construction Activity:

The following sequence of soil erosion and sediment control measures shall be followed during the duration of the project. In addition, the guidelines in Section 3 of this report shall be implemented where applicable.

1. **Schedule a pre-construction meeting:** a pre-construction meeting shall be held to review plans and inspect site with town officials including the Town Engineer, Contractors, and Project Managers at least one week prior to the start of construction, equipment staging and site disturbance.

2. **Establish Limits of Clearing and Sensitive Areas to be Protected:** Prior to any construction and/or demolition activities commence all vegetation to be persevered shall be protected. In addition the property boundaries and/or limits of clearing shall be clearly marked. A pre-construction meeting shall be held prior to any land disturbance or grading to review plans and inspect site.

3. **Construct Stabilized Access to Site:** Install the stabilized construction entrances along main street and eventually one along Milton Turnpike until all site construction is completed.

4. **Establish Perimeter Controls and Sediment Barriers:** Silt fences will be installed along the perimeters of the limit of disturbance (downhill side of the disturbance and around any topsoil stockpiles. Silt fences will be installed as per the detail on accompanying site plans. Locations of installation are indicated on the soil erosion and sediment control plans for initial clearing and grading of the site.

5. **Land Clearing and Rough Grading:** Begin demolition and clearing activities as per plans. The ground surface shall be cleared of all trees, stumps, brush, weeds, roots, matted leaves, debris, and any other unsuitable material, except as otherwise directed by the engineer. Material accumulated by clearing as described above shall be disposed of by the contractor in a manner satisfactory to the engineer. After clearing and demolition all topsoil shall be stripped and stockpiled for use in final grading as indicated on plans. Excess topsoil not required for final grading may be removed from the site. Once topsoil has been stripped rough grade site and install permanent drainage structures and conveyance system. (inlet protection, rip rap outlet protection, etc.) Bio-retention zones and dry swales shall **not** be constructed until all contributing drainage areas are stabilized (i.e. roadway, and driveways paved and permanent vegetation established) Establish temporary vegetation on any areas which will not be disturbed for a period 14 days or more. Parking and driveway areas may be stabilized with road base material.

6. **Soil Stabilization:** In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within (14) days from the date the current

7. **Building Construction:** During the buildings construction maintain erosion controls.

8. **Landscaping and Final Stabilization:** Place topsoil and landscaping.

9. **Final Inspection and Removal of Temporary BMPS:** Perform final inspection of site to ensure all disturbed areas are stabilized. If all disturbed areas are stabilized temporary erosion control measures shall be removed.

SECTION 3: Good Housekeeping BMPS

3.1 General Construction Equipment and Material Storage Guidelines:

- Large building materials such as framing material may be stored in the staging area. Such materials will be elevated on wood blocks to minimize contact with runoff.

- The storage areas shall be inspected on a weekly basis and after each storm event. Storage areas will be kept clean and well organized to minimize contamination of stormwater runoff.

3.2 General Construction Waste Management Guidelines:

- All waste building and construction waste materials will be collected and disposed of in trash dumpsters located in a central staging area. Dumpsters will be placed away from stormwater conveyances and drains, and meet all local and state solid-waste management regulations. Only trash and construction debris from the site will be deposited in the dumpsters. All personnel working on the jobsite will be instructed regarding the correct procedure for disposal of trash and construction debris. The individual who manages day-to-day site operations will be responsible for seeing that these practices are followed.

- All dumpsters will be inspected on a weekly basis and after large storm events to ensure no debris are entering stormwater runoff.

- Dumpsters will be emptied as needed and no trash will be stored outside a dumpster if it is full.

- All dumpsters will be removed from the site immediately after all waste generating construction activities are complete.

3.3 Hazardous and Sanitary Waste Management Guidelines:

- All hazardous waste materials such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed designated hazardous material storage area(s). Secondary containment will be provided for hazardous materials in these areas in the form of spill pallets.

- All hazardous materials will be disposed of in accordance with local, state and federal regulations. All personnel will be instructed regarding the correct procedure for disposing off hazardous waste. The individual who manages day-to-day site operations will be responsible for seeing that these practices are followed.

- All storage areas will be kept clean, inspected weekly and after storm events, have ample cleanup supplies in the event of a spill, material safety data sheets and the contact numbers of appropriate emergency spill response personnel shall be posted in the construction office.

- If necessary, sanitary facilities will be provided at the site in the form of portable toilets. Toilets will be located away from concentrated stormwater flows and checked daily for leakage. All sanitary waste generated from the toilets will be disposed of offsite in accordance with local laws and regulations.

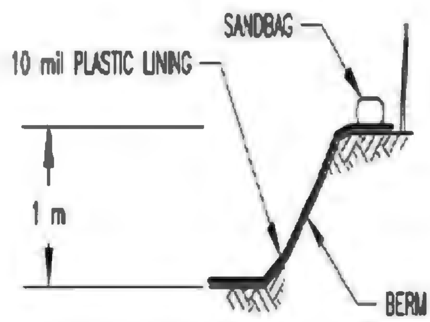
3.4 On-Site Equipment Fueling and Maintenance Guidelines:

- Several types of vehicles and equipment will be used on-site throughout the project, including graders, excavators, loaders, rollers, trucks and trailers, backhoes, etc. All major equipment/vehicle fueling and maintenance will be performed off-site. A small pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets in accordance with Section 3.3. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance.

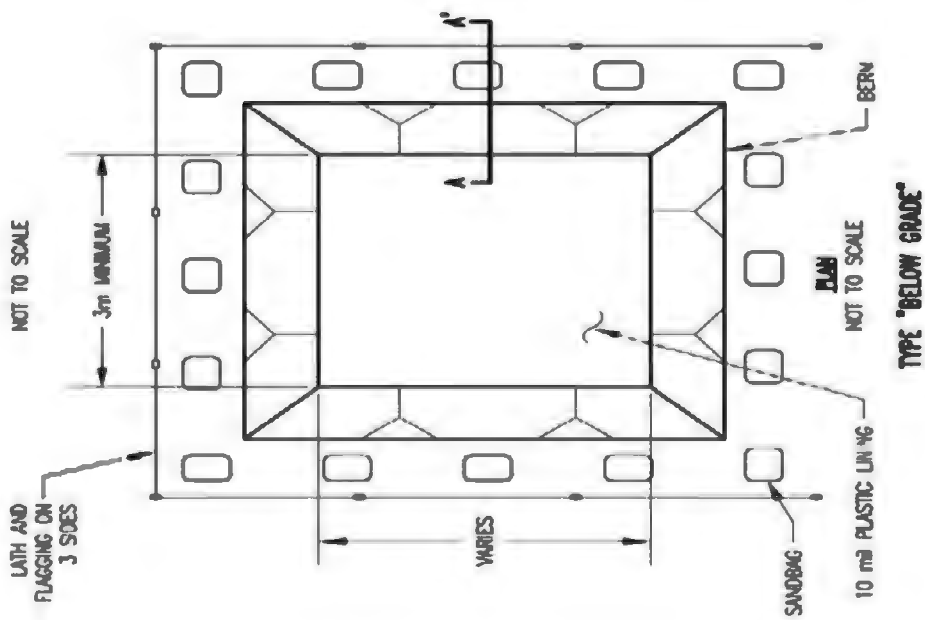
- Equipment/vehicle storage areas and fuel tanks will be inspected weekly and after storm events. Vehicles and equipment will be inspected on each day of use. Leaks will be repaired immediately, or the problem vehicle(s) or equipment will be removed from the project site. Ample supplies of spill-cleanup materials will be kept on-site to immediately clean up any spill.

3.5 Concrete Washouts:

- Designated temporary, below ground concrete washout facilities will be constructed as shown below. Washouts will be centrally located at the discretion of the individuals who manage day to day construction activities. Washouts shall have a minimum length and width of 10 feet but must have sufficient volume to contain all liquid concrete wastes generated from washout operations. The washout areas will be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs will be posted marking the location of the washout areas.



Section A-A



Washout Plan View

- Temporary concrete washout facilities will be located a minimum of (50 feet) from storm drain inlets.

- The washout areas will be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas will be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached the concrete wastes will be allowed to harden, the concrete will be broken up, removed, and disposed in accordance with local regulations. The plastic sheeting will be replaced if tears occur during removal of concrete wastes from the washout area.

SECTION 4: Post-Construction BMPS

4.1 Post-Development Drainage Improvements and Mitigation:

When complete the proposed drainage system will reduce peak runoff rates to less than pre-development levels. The proposed drainage improvements will also reduce pollutant levels in the runoff though several proposed treatment practices. The following sections give a detailed description of the proposed drainage system and on-site mitigations.

4.1.1 Peak Runoff Rate Reduction:

To mitigate the impacts of increased runoff rates after development the project will use stormwater subsurface chambers to reduce post-development runoff rates to less than pre-development rates. Therefore there will be no negative impacts on downstream waters or adjacent lands caused by increased peak flow rates. A detailed description of each practice to be used is provided in section 4.3 Post Development BMP's.

4.1.2 Pre and Post-development Runoff Rate Comparison:

In the table below the changes in pre- and post-development runoff rates for each of the Design Point is shown. Detailed HydroCAD calculations are included in Appendix A.

Total Offsite flow			
Storm	**Pre-development (cfs)**	**Post-development (cfs)**	**% Change**
1 Year	1.4	0.7	-50%
10 Year	3.0	2.8	-7%
100 Year	6.4	5.9	-8%

4.1.3 Runoff Calculation Methodology:

Drainage analyses performed for the 1, 10 and 100 year design storms used the Runoff Curve Method as developed by the Soil Conservation Service (SCS), with peak discharge rates, hydrographs, and routing analyses generated using HydroCAD based upon the SCS TR-20 method. Curve numbers and times of concentration were determined using methodology in the SCS Technical Release 55. These calculations are detailed in Appendix A. Curve numbers were selected from soil type and ground cover which were determined from infield inspections and USGS Soil report. The rain fall depths used in the HydroCAD calculations was taken off the Town of Marlborough's zoning code.

4.2 Post-Development BMP's:

4.2.1 Underground storage System (Subsurface Stormwater Chambers)

- Feasibility: An underground storage system utilizing (60) Stormtech SC-740 chambers will be used to treat runoff from the proposed buildings and parking lot. This practice was selected because of the relatively small contributing drainage areas and its ability to integrate well into the proposed site.

- Conveyance: Runoff will be conveyed to the subsurface chambers from two catch basins. The roof runoff will be piped from the roof downspouts into the catch basins.

- Pretreatment: Pretreatment will be provided in the form a sump pits in the catch basins prior to the subsurface chambers and within the Isolator Row of the subsurface chambers.

- Treatment: Runoff entering the (60) subsurface chambers will be treated by storing the excess stormwater within the chambers and releasing the water through several outlet controls. The primary outlet control will be a 12" culvert that discharges to two manholes and into the Town of Marlborough's stormwater collection system. The second outlet control will be a 3" underdrain placed at the below the subsurface chambers that will discharge into the proposed manholes at a low rate.

- Maintenance: At a minimum, it is recommended to perform annual inspections of the underground subsurface storage system. Initially, the catch basin should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition. Remove sediment/gross solids from catch basin annually or when the depth exceeds 3 inches.

Appendix A1

BMP Construction/Installation Guidelines

SiteASSIST™ by StormTech

FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

StormTech Construction Guide

SC-310/SC-740/DC-780

REQUIRED MATERIALS AND EQUIPMENT LIST

- Acceptable fill materials per Table 1
- Woven and non-woven geotextiles
- StormTech solid end caps and pre-cored end caps
- StormTech chambers
- StormTech manifolds and fittings

IMPORTANT NOTES:

A. This installation guide provides the minimum requirements for proper installation of chambers. Non-adherence to this guide may result in damage to chambers during installation. Replacement of damaged chambers during or after backfilling is costly and very time consuming. It is recommended that all installers are familiar with this guide, and that the contractor inspects the chambers for distortion, damage and joint integrity as work progresses.

B. Use of a dozer to push embedment stone between the rows of chambers may cause damage to chambers and is not an acceptable backfill method. Any chambers damaged by using the "dump and push" method are not covered under the StormTech standard warranty.

C. Care should be taken in the handling of chambers and end caps. Avoid dropping, prying or excessive force on chambers during removal from pallet and initial placement.

Requirements for System Installation

Excavate bed and prepare subgrade per engineer's plans.

Place non-woven geotextile over prepared soils and up excavation walls. Install underdrains if required.

Place clean, crushed, angular stone foundation 6" (150 mm) min. Compact to achieve a flat surface.

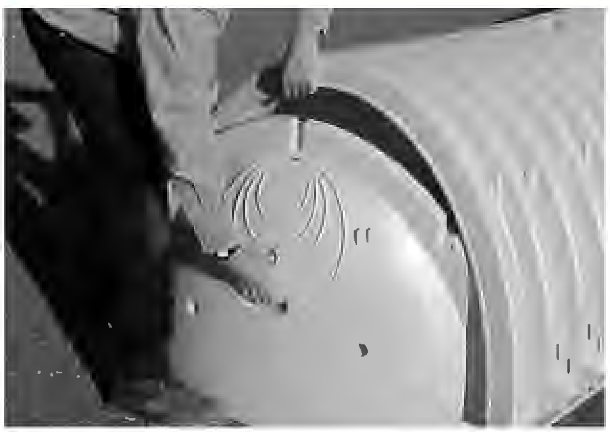
Manifold, Scour Fabric and Chamber Assembly

Install manifolds and lay out woven scour geotextile at inlet rows [min. 12.5 ft (3.8 m)] at each inlet end cap. Place a continuous piece (no seams, double layer) along entire length of Isolator® Row(s).

Align the first chamber and end cap of each row with inlet pipes. Contractor may choose to postpone stone placement around end chambers and leave ends of rows open for easy inspection of chambers during the backfill process.

Continue installing chambers by overlapping chamber end corrugations. Chamber joints are labeled “Lower Joint – Overlap Here” and “Build this direction – Upper Joint” Be sure that the chamber placement does not exceed the reach of the construction equipment used to place the stone. Maintain minimum 6” (150 mm) spacing between rows.

Attaching the End Caps



Lift the end of the chamber a few inches off the ground. With the curved face of the end cap facing outward, place the end cap into the chamber’s end corrugation.

Prefabricated End Caps

24” (600 mm) inlets are the maximum size that can fit into a SC-740/DC-780 end cap and must be prefabricated with a 24” (600 mm) pipe stub. SC-310 chambers with a 12” (300 mm) inlet pipe must use a prefabricated end cap with a 12” (300 mm) pipe stub.

Isolator Row

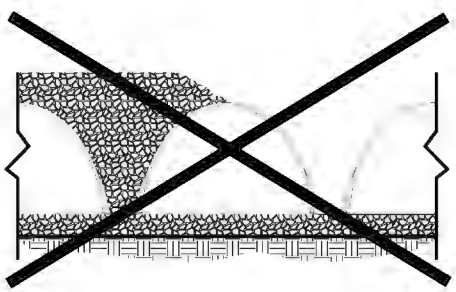
Place two continuous layers of ADS Woven fabric between the foundation stone and the isolator row chambers, making sure the fabric lays flat and extends the entire width of the chamber feet. Drape a strip of ADS non-woven geotextile over the row of chambers (not required over DC-780). This is the same type of non-woven geotextile used as a separation layer around the angular stone of the StormTech system.

Initial Anchoring of Chambers – Embedment Stone

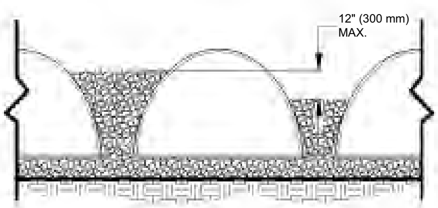

Initial embedment shall be spotted along the centerline of the chamber evenly anchoring the lower portion of the chamber. This is best accomplished with a stone conveyor or excavator reaching along the row.

No equipment shall be operated on the bed at this stage of the installation. Excavators must be located off the bed. Dump trucks shall not dump stone directly on to the bed. Dozers or loaders are not allowed on the bed at this time.

Backfill of Chambers – Embedment Stone

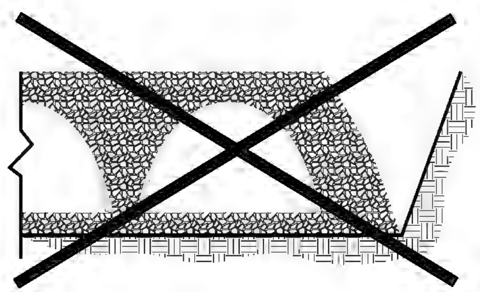


UNEVEN BACKFILL

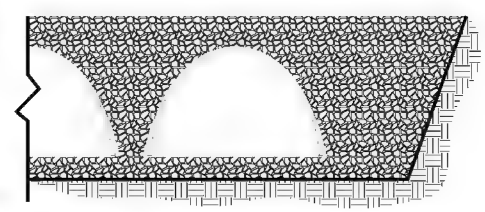


EVEN BACKFILL

Backfill chambers evenly. Stone column height should never differ by more than 12” (300 mm) between adjacent chamber rows or between chamber rows and perimeter.



PERIMETER NOT BACKFILLED



PERIMETER FULLY BACKFILLED

Perimeter stone must be brought up evenly with chamber rows. Perimeter must be fully backfilled, with stone extended horizontally to the excavation wall.

Backfill - Embedment Stone & Cover Stone

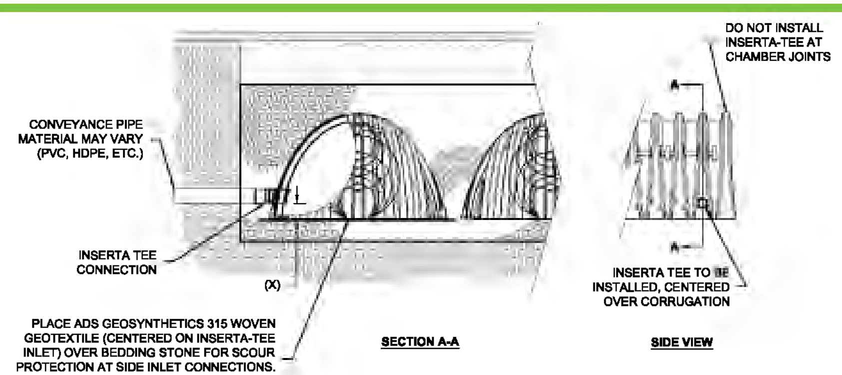
Continue evenly backfilling between rows and around perimeter until embedment stone reaches tops of chambers. Perimeter stone must extend horizontally to the excavation wall for both straight or sloped sidewalls. **Only after chambers have been backfilled to top of chamber and with a minimum 6" (150 mm) of cover stone on top of chambers can small dozers be used over the chambers for backfilling remaining cover stone.**

Small dozers and skid loaders may be used to finish grading stone backfill in accordance with ground pressure limits in Table 2. They must push material parallel to rows only. Never push perpendicular to rows. StormTech recommends that the contractor inspect chambers before placing final backfill. Any chambers damaged by construction shall be removed and replaced.

Final Backfill of Chambers – Fill Material

Install non-woven geotextile over stone. Geotextile must overlap 24" (600 mm) min. where edges meet. Compact each lift of backfill as specified in the site design engineer's drawings. Roller travel parallel with rows.

Inserta Tee Detail



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

StormTech Isolator Row Detail

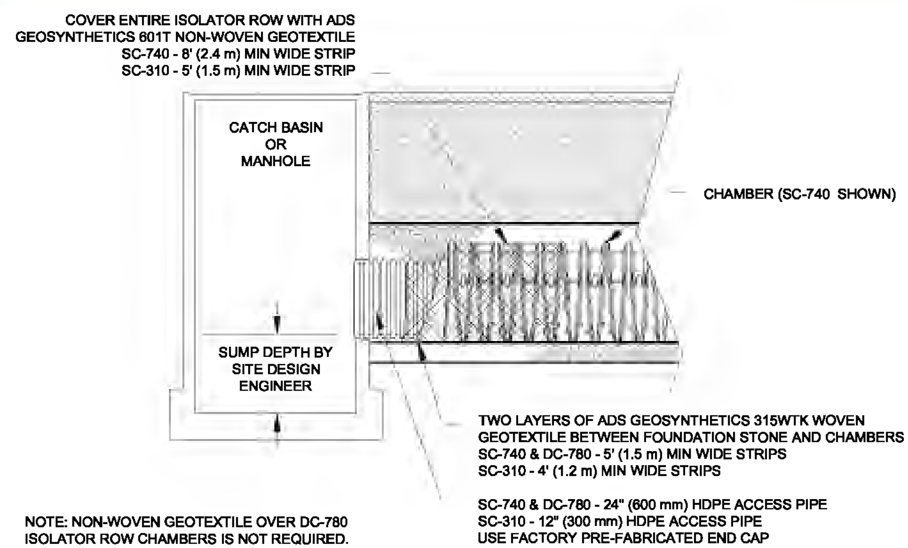


Table 1- Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation[1]	Compaction/Density Requirement
Ⓓ **Final Fill:** Fill Material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement subbase may be part of the 'D' layer.	Any soil/rock materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	Prepare per site design engineer's plans. Paved installations may have stringent material and preparation requirements.
Ⓒ **Initial Fill:** Fill Material for layer 'C' starts from the top of the embedment stone ('B' layer) to 18" (450 mm) above the top of the chamber. Note that pavement subbase may be part of the 'C' layer.	Granular well-graded soil/ aggregate mixtures, <35% fines or processed aggregate. Most pavement subbase materials can be used in lieu of this layer.	AASHTO M45 A-1, A-2-4, A-3 or AASHTO M431 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	Begin compaction after min. 12" (300 mm) of material over the chambers is reached. Compact additional layers in 6" (150 mm) max. lifts to a min. 95% Proctor density for well-graded material and 95% relative density for processed aggregate materials. Roller gross vehicle weight not to exceed 12,000 lbs (53 kN). Dynamic force not to exceed 20,000 lbs (89 kN)
Ⓑ **Embedment Stone:** Embedment Stone surrounding chambers from the foundation stone to the 'C' layer above.	Clean, crushed, angular stone	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	No compaction required.
Ⓐ **Foundation Stone:** Foundation Stone below the chambers from the subgrade up to the foot (bottom) of the chamber.	Clean, crushed, angular stone,	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	Place and compact in 6" (150 mm) lifts using two full coverages with a vibratory compactor.[2,3]

PLEASE NOTE:

1. ***The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state: "clean, crushed, angular no. 4 (AASHTO M43) stone".***
2. ***StormTech compaction requirements are met for 'A' location materials when placed and compacted in 6" (150 mm) (max) lifts using two full coverages with a vibratory compactor.***
3. ***Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact StormTech for compaction requirements.***

Figure 1- Inspection Port Detail

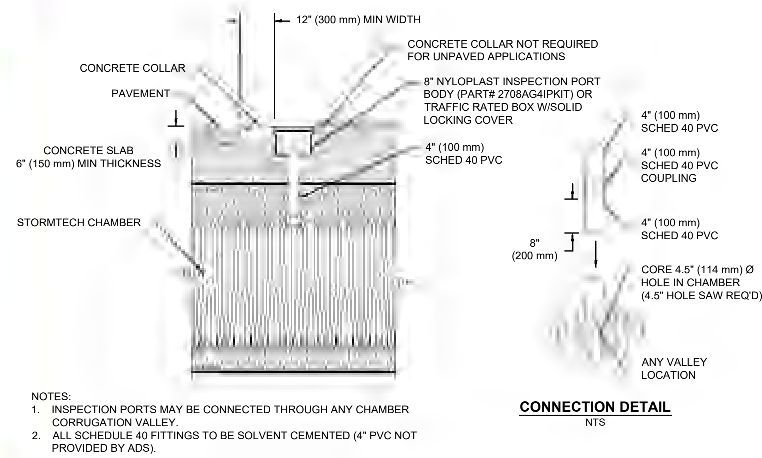
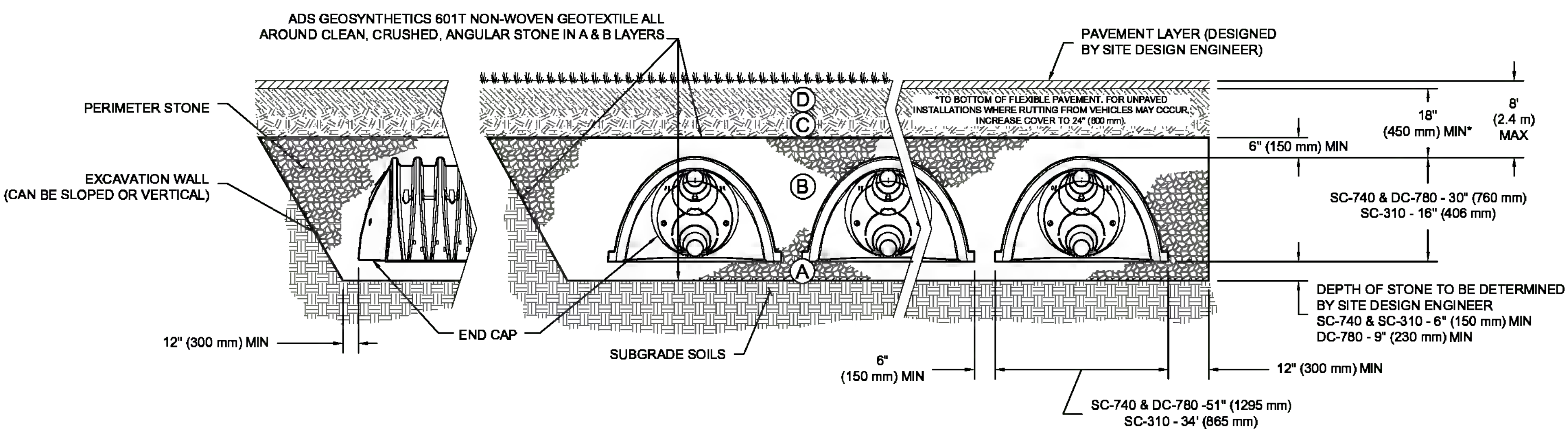


Figure 2 - Fill Material Locations



NOTES:

1. ***36" (900 mm) of stabilized cover materials over the chambers is required for full dump truck travel and dumping.***
2. ***During paving operations, dump truck axle loads on 18" (450 mm) of cover may be necessary. Precautions should be taken to avoid rutting of the road base layer, to ensure that compaction requirements have been met, and that a minimum of 18" (450 mm) of cover exists over the chambers. Contact StormTech for additional guidance on allowable axle loads during paving.***
3. ***Ground pressure for track dozers is the vehicle operating weight divided by total ground contact area for both tracks. Excavators will exert higher ground pressures based on loaded bucket weight and boom extension.***
4. ***Mini-excavators (< 8,000lbs/3,628 kg) can be used with at least 12" (300 mm) of stone over the chambers and are limited by the maximum ground pressures in Table 2 based on a full bucket at maximum boom extension.***
5. ***Storage of materials such as construction materials, equipment, spoils, etc. should not be located over the StormTech system. The use of equipment over the StormTech system not covered in Table 2 (ex. soil mixing equipment, cranes, etc) is limited. Please contact StormTech for more information.***
6. ***Allowable track loads based on vehicle travel only. Excavators shall not operate on chamber beds until the total backfill reaches 3 feet (900 mm) over the entire bed.***

Table 2 - Maximum Allowable Construction Vehicle Loads[5]

Material Location	Fill Depth over Chambers in. [mm]	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads[6]		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs [kN]	Max Wheel Load for Loaders lbs [kN]	Track Width in. [mm]	Max Ground Pressure psf [kPa]	Max Drum Weight or Dynamic Force lbs [kN]
Ⓓ Final Fill Material	36" [900] Compacted	32,000 [142]	16,000 [71]	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	3420 [164] 2350 [113] 1850 [89] 1510 [72] 1310 [63]	38,000 [169]
Ⓒ Initial Fill Material	24" [600] Compacted	32,000 [142]	16,000 [71]	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	2480 [119] 1770 [85] 1430 [68] 1210 [58] 1070 [51]	20,000 [89]
	24" [600] Loose/Dumped	32,000 [142]	16,000 [71]	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	2245 [107] 1625 [78] 1325 [63] 1135 [54] 1010 [48]	20,000 [89] Roller gross vehicle weight not to exceed 12,000 lbs. [53 kN]
	18" [450]	32,000 [142]	16,000 [71]	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	2010 [96] 1480 [71] 1220 [58] 1060 [51] 950 [45]	20,000 [89] Roller gross vehicle weight not to exceed 12,000 lbs. [53 kN]
Ⓑ Embedment Stone	12" [300]	16,000 [71]	NOT ALLOWED	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	1540 [74] 1190 [57] 1010 [48] 910 [43] 840 [40]	20,000 [89] Roller gross vehicle weight not to exceed 12,000 lbs. [53 kN]
	6" [150]	8,000 [35]	NOT ALLOWED	12" [305] 18" [457] 24" [610] 30" [762] 36" [914]	1070 [51] 900 [43] 800 [38] 760 [36] 720 [34]	NOT ALLOWED

Table 3 - Placement Methods and Descriptions

Material Location	Placement Methods/ Restrictions	Wheel Load Restrictions	Track Load Restrictions	Roller Load Restrictions
		See Table 2 for Maximum Construction Loads		
Ⓓ Final Fill Material	A variety of placement methods may be used. All construction loads must not exceed the maximum limits in Table 2.	36" (900 mm) minimum cover required for dump trucks to dump over chambers.	Dozers to push parallel to rows until 36" (900mm) compacted cover is reached.[4]	Roller travel parallel to rows only until 36" (900 mm) compacted cover is reached.
Ⓒ Initial Fill Material	Excavator positioned off bed recommended. Small excavator allowed over chambers. Small dozer allowed.	Asphalt can be dumped into paver when compacted pavement subbase reaches 18" (450 mm) above top of chambers.	Small LGP track dozers & skid loaders allowed to grade cover stone with at least 6" (150 mm) stone under tracks at all times. Equipment must push parallel to rows at all times.	Use dynamic force of roller only after compacted fill depth reaches 12" (300 mm) over chambers. Roller travel parallel to chamber rows only.
Ⓑ Embedment Stone	No equipment allowed on bare chambers. Use excavator or stone conveyor positioned off bed or on foundation stone to evenly fill around all chambers to at least the top of chambers.	No wheel loads allowed. Material must be placed outside the limits of the chamber bed.	No tracked equipment is allowed on chambers until a min. 6" (150 mm) cover stone is in place.	No rollers allowed.
Ⓐ Foundation Stone	No StormTech restrictions. Contractor responsible for any conditions or requirements by others relative to subgrade bearing capacity, dewatering or protection of subgrade.			

Appendix A2

BMP Long-Term Maintenance and Operation Guidelines

StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

THE ISOLATOR® ROW

INTRODUCTION
An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW
The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

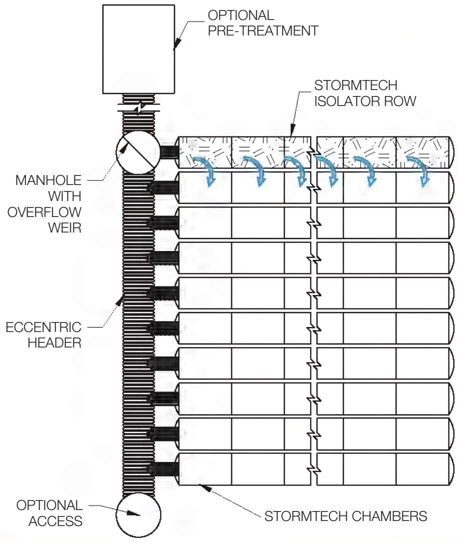
The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

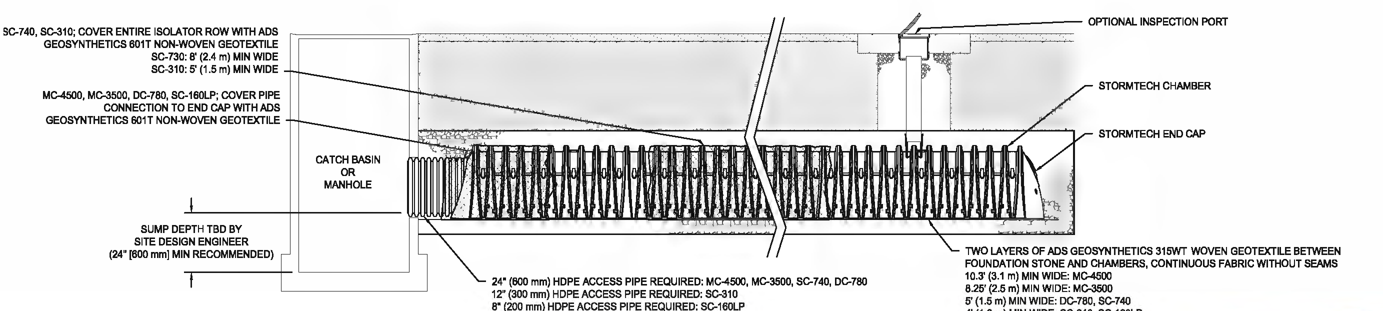
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



ADS

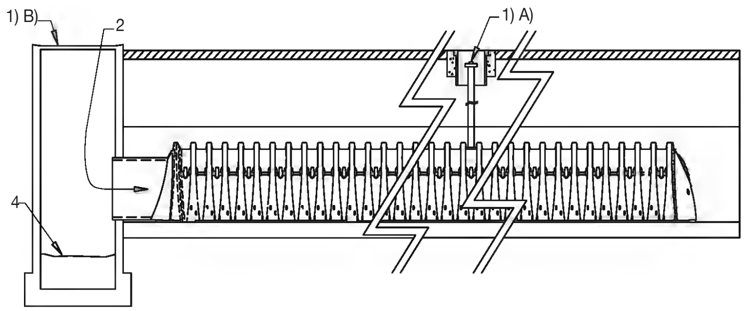
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
A) Inspection ports (if present)
  i. Remove lid from floor box frame
  ii. Remove cap from inspection riser
  iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
B) All Isolator Rows
  i. Remove cover from manhole at upstream end of Isolator Row
  ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings: Fixed point to chamber bottom (1)	Stadia Rod Readings: Fixed point to top of sediment (2)	Sediment Depth (1)–(2)	Observations/Actions	Inspector
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Appendix A3

Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Ulster County, New York

39 Main Street Milton LLC

November 3, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:719 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 20, Aug 29, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BnC	Bath-Nassau complex, 8 to 25 percent slopes	0.3	36.3%
NBF	Nassau-Bath-Rock outcrop complex, very steep	0.6	63.7%
Totals for Area of Interest		**0.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Ulster County, New York

BnC—Bath-Nassau complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9xft
Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 62 inches
Mean annual air temperature: 41 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Bath and similar soils: 50 percent
Nassau and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

H1 - 0 to 6 inches: gravelly silt loam
H2 - 6 to 28 inches: gravelly loam
H3 - 28 to 48 inches: very gravelly loam
H4 - 48 to 52 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 26 to 38 inches to fragipan; 40 to 80 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Typical profile

H1 - 0 to 6 inches: channery silt loam
H2 - 6 to 16 inches: very channery silt loam
H3 - 16 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Manlius

Percent of map unit: 5 percent
Hydric soil rating: No

Cambridge

Percent of map unit: 5 percent
Hydric soil rating: No

Volusia

Percent of map unit: 5 percent
Hydric soil rating: No

Hudson

Percent of map unit: 5 percent
Hydric soil rating: No

NBF—Nassau-Bath-Rock outcrop complex, very steep

Map Unit Setting

National map unit symbol: 9xhh
Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 62 inches
Mean annual air temperature: 41 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Nassau and similar soils: 35 percent
Bath and similar soils: 25 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Typical profile

H1 - 0 to 6 inches: channery silt loam
H2 - 6 to 16 inches: very channery silt loam
H3 - 16 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Bath

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

H1 - 0 to 6 inches: gravelly silt loam
H2 - 6 to 28 inches: gravelly loam
H3 - 28 to 48 inches: very gravelly loam
H4 - 48 to 52 inches: bedrock

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 26 to 38 inches to fragipan; 40 to 80 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F140XY030NY - Well Drained Dense Till
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydric soil rating: Unranked

Minor Components

Arnot

Percent of map unit: 5 percent
Hydric soil rating: No

Hoosic

Percent of map unit: 5 percent
Hydric soil rating: No

Manlius

Percent of map unit: 5 percent
Hydric soil rating: No

Valois

Percent of map unit: 5 percent
Hydric soil rating: No

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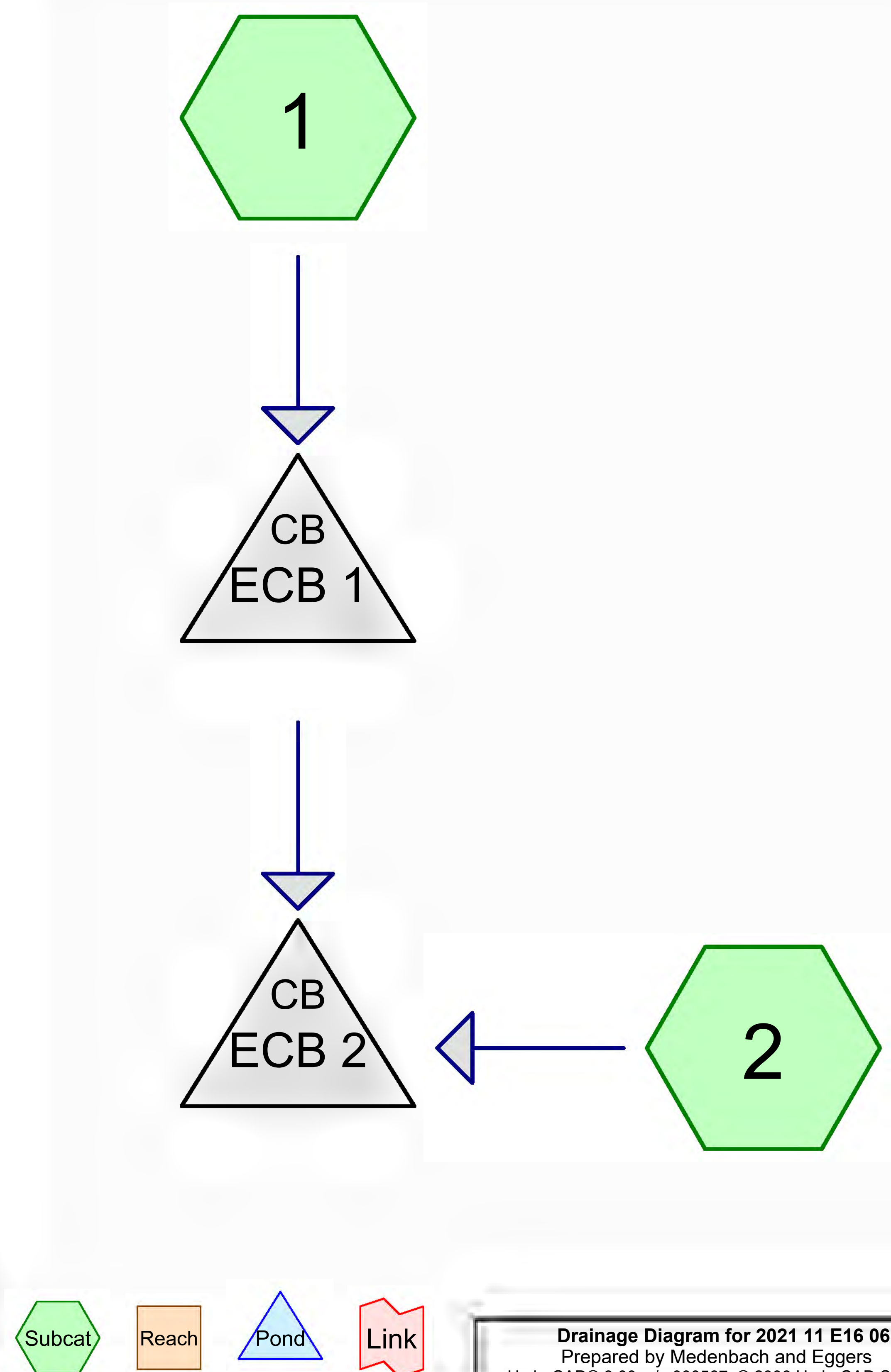
Appendix A4

HydroCAD CAD



Drainage Diagram for 2021 11 E16 065 Pollock PRE
Prepared by Medenbach and Eggers 11/4/2021
HydroCAD® 8.00 s/n 000567 © 2006 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.799	82	Woods/grass comb., Fair, HSG D (1,2)
0.152	98	Paved parking & roofs (1,2)
0.951		

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Pre-development area-1 Runoff Area=32,310 sf Runoff Depth=1.50"
Flow Length=310' Tc=10.5 min CN=85 Runoff=1.12 cfs 0.093 af

Subcatchment 2: Pre-development area 2 Runoff Area=9,100 sf Runoff Depth=1.37"
Flow Length=140' Slope=0.3300 '/' Tc=8.5 min CN=83 Runoff=0.31 cfs 0.024 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=153.04' Inflow=1.12 cfs 0.093 af
15.0" x 103.0' Culvert Outflow=1.12 cfs 0.093 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=151.87' Inflow=1.42 cfs 0.117 af
15.0" x 26.0' Culvert Outflow=1.42 cfs 0.117 af

Total Runoff Area = 0.951 ac Runoff Volume = 0.117 af Average Runoff Depth = 1.47"
84.06% Pervious Area = 0.799 ac 15.94% Impervious Area = 0.152 ac

Subcatchment 1: Pre-development area-1

Runoff = 1.12 cfs @ 12.15 hrs, Volume= 0.093 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
6,000	98	Paved parking & roofs
26,310	82	Woods/grass comb., Fair, HSG D
32,310	85	Weighted Average
26,310		Pervious Area
6,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	40	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
4.9	90	0.5400	0.31		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
1.0	20	0.0220	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.75"
1.1	160	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.5	310	Total			

Subcatchment 2: Pre-development area 2

Runoff = 0.31 cfs @ 12.12 hrs, Volume= 0.024 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
600	98	Paved parking & roofs
8,500	82	Woods/grass comb., Fair, HSG D
9,100	83	Weighted Average
8,500		Pervious Area
600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	140	0.3300	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"

Pond ECB 1: Existing Catch Basin #1

Inflow Area = 0.742 ac, Inflow Depth = 1.50" for 1 Year event
Inflow = 1.12 cfs @ 12.15 hrs, Volume= 0.093 af
Outflow = 1.12 cfs @ 12.15 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.15 hrs, Volume= 0.093 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 153.04' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.12 cfs @ 12.15 hrs HW=153.04' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.12 cfs @ 3.23 fps)

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area = 0.951 ac, Inflow Depth = 1.47" for 1 Year event
Inflow = 1.42 cfs @ 12.14 hrs, Volume= 0.117 af
Outflow = 1.42 cfs @ 12.14 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min
Primary = 1.42 cfs @ 12.14 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 151.87' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=1.42 cfs @ 12.14 hrs HW=151.87' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.42 cfs @ 2.58 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Pre-development area-1 Runoff Area=32,310 sf Runoff Depth=3.14"
Flow Length=310' Tc=10.5 min CN=85 Runoff=2.33 cfs 0.194 af

Subcatchment 2: Pre-development area 2 Runoff Area=9,100 sf Runoff Depth=2.95"
Flow Length=140' Slope=0.3300 '/' Tc=8.5 min CN=83 Runoff=0.66 cfs 0.051 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=153.32' Inflow=2.33 cfs 0.194 af
15.0" x 103.0' Culvert Outflow=2.33 cfs 0.194 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=152.19' Inflow=2.98 cfs 0.245 af
15.0" x 26.0' Culvert Outflow=2.98 cfs 0.245 af

Total Runoff Area = 0.951 ac Runoff Volume = 0.245 af Average Runoff Depth = 3.10"
84.06% Pervious Area = 0.799 ac 15.94% Impervious Area = 0.152 ac

Subcatchment 1: Pre-development area-1

Runoff = 2.33 cfs @ 12.14 hrs, Volume= 0.194 af, Depth= 3.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
6,000	98	Paved parking & roofs
26,310	82	Woods/grass comb., Fair, HSG D
32,310	85	Weighted Average
26,310		Pervious Area
6,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	40	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
4.9	90	0.5400	0.31		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
1.0	20	0.0220	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.75"
1.1	160	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.5	310	Total			

Subcatchment 2: Pre-development area 2

Runoff = 0.66 cfs @ 12.12 hrs, Volume= 0.051 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
600	98	Paved parking & roofs
8,500	82	Woods/grass comb., Fair, HSG D
9,100	83	Weighted Average
8,500		Pervious Area
600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	140	0.3300	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"

Pond ECB 1: Existing Catch Basin #1

Inflow Area = 0.742 ac, Inflow Depth = 3.14" for 10 Year event
Inflow = 2.33 cfs @ 12.14 hrs, Volume= 0.194 af
Outflow = 2.33 cfs @ 12.14 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.14 hrs, Volume= 0.194 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 153.32' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.33 cfs @ 12.14 hrs HW=153.32' (Free Discharge)
↑**1=Culvert** (Barrel Controls 2.33 cfs @ 3.85 fps)

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area = 0.951 ac, Inflow Depth = 3.10" for 10 Year event
Inflow = 2.98 cfs @ 12.14 hrs, Volume= 0.245 af
Outflow = 2.98 cfs @ 12.14 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min
Primary = 2.98 cfs @ 12.14 hrs, Volume= 0.245 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 152.19' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=2.97 cfs @ 12.14 hrs HW=152.18' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.97 cfs @ 3.20 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Pre-development area-1 Runoff Area=32,310 sf Runoff Depth=6.94"
Flow Length=310' Tc=10.5 min CN=85 Runoff=4.99 cfs 0.429 af

Subcatchment 2: Pre-development area 2 Runoff Area=9,100 sf Runoff Depth=6.70"
Flow Length=140' Slope=0.3300 '/' Tc=8.5 min CN=83 Runoff=1.46 cfs 0.117 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=153.91' Inflow=4.99 cfs 0.429 af
15.0" x 103.0' Culvert Outflow=4.99 cfs 0.429 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=153.10' Inflow=6.42 cfs 0.545 af
15.0" x 26.0' Culvert Outflow=6.42 cfs 0.545 af

Total Runoff Area = 0.951 ac Runoff Volume = 0.545 af Average Runoff Depth = 6.89"
84.06% Pervious Area = 0.799 ac 15.94% Impervious Area = 0.152 ac

Subcatchment 1: Pre-development area-1

Runoff = 4.99 cfs @ 12.14 hrs, Volume= 0.429 af, Depth= 6.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
6,000	98	Paved parking & roofs
26,310	82	Woods/grass comb., Fair, HSG D
32,310	85	Weighted Average
26,310		Pervious Area
6,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	40	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
4.9	90	0.5400	0.31		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
1.0	20	0.0220	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.75"
1.1	160	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.5	310	Total			

Subcatchment 2: Pre-development area 2

Runoff = 1.46 cfs @ 12.12 hrs, Volume= 0.117 af, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
600	98	Paved parking & roofs
8,500	82	Woods/grass comb., Fair, HSG D
9,100	83	Weighted Average
8,500		Pervious Area
600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	140	0.3300	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"

Pond ECB 1: Existing Catch Basin #1

Inflow Area = 0.742 ac, Inflow Depth = 6.94" for 100 Year event
Inflow = 4.99 cfs @ 12.14 hrs, Volume= 0.429 af
Outflow = 4.99 cfs @ 12.14 hrs, Volume= 0.429 af, Atten= 0%, Lag= 0.0 min
Primary = 4.99 cfs @ 12.14 hrs, Volume= 0.429 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 153.91' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=4.99 cfs @ 12.14 hrs HW=153.91' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 4.99 cfs @ 4.50 fps)

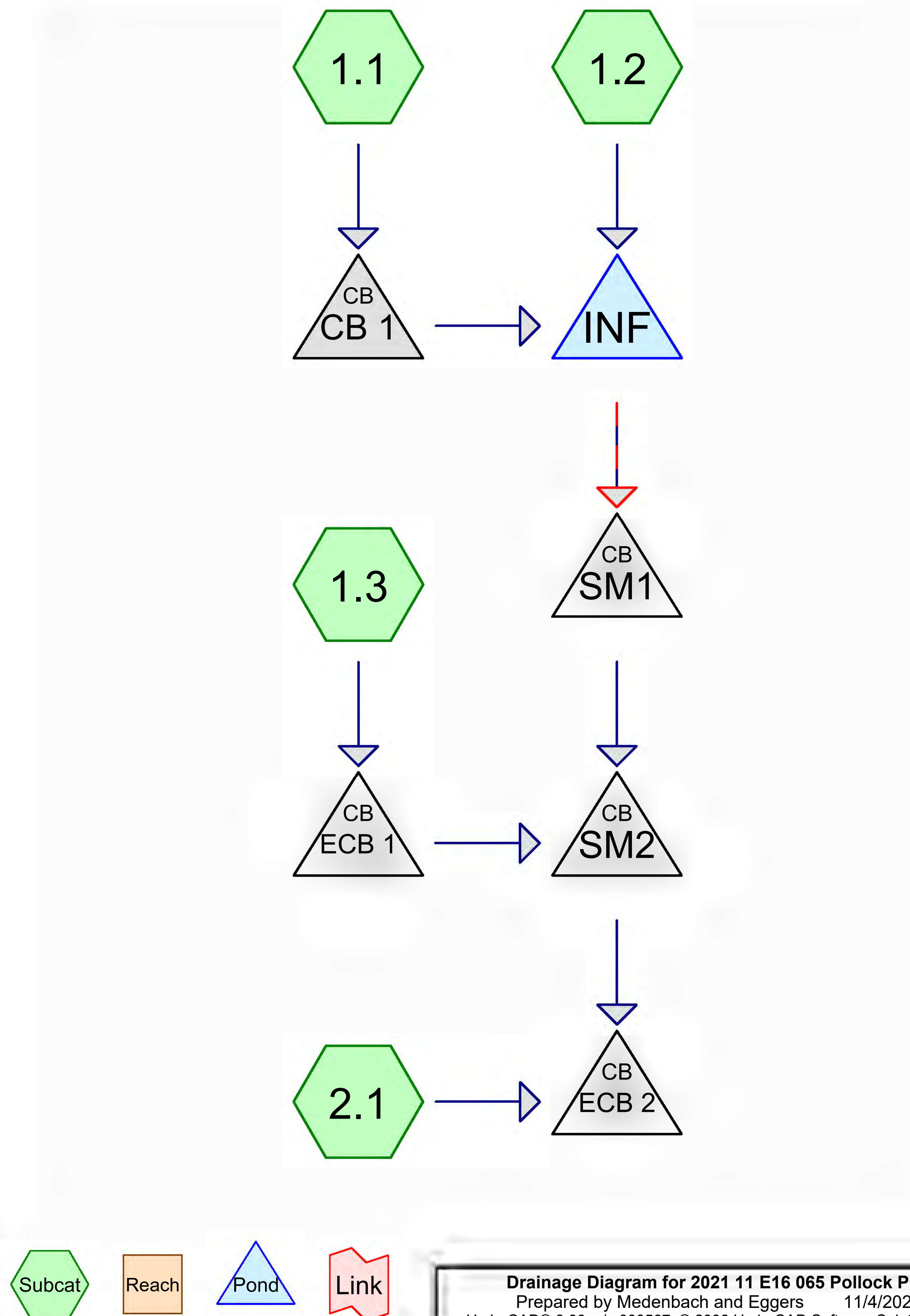
Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area = 0.951 ac, Inflow Depth = 6.89" for 100 Year event
Inflow = 6.42 cfs @ 12.14 hrs, Volume= 0.545 af
Outflow = 6.42 cfs @ 12.14 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min
Primary = 6.42 cfs @ 12.14 hrs, Volume= 0.545 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 153.10' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=6.41 cfs @ 12.14 hrs HW=153.10' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 6.41 cfs @ 5.22 fps)



Drainage Diagram for 2021 11 E16 065 Pollock POST
Prepared by Medenbach and Eggers 11/4/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.158	82	Woods/grass comb., Fair, HSG D (1.1,1.3,2.1)
0.792	98	Paved parking & roofs (1.1,1.2,1.3,2.1)
0.950		

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.1: 1 Runoff Area=19,780 sf Runoff Depth=2.35"
Tc=6.0 min CN=95 Runoff=1.19 cfs 0.089 af

Subcatchment 1.2: Building roofs Runoff Area=10,520 sf Runoff Depth=2.67"
Tc=6.0 min CN=98 Runoff=0.68 cfs 0.054 af

Subcatchment 1.3: Building roofs Runoff Area=5,900 sf Runoff Depth=2.45"
Flow Length=90' Slope=0.1400 '/' Tc=0.5 min CN=96 Runoff=0.44 cfs 0.028 af

Subcatchment 2.1: 2.1 Runoff Area=5,200 sf Runoff Depth=1.89"
Flow Length=160' Slope=0.3000 '/' Tc=6.8 min CN=90 Runoff=0.26 cfs 0.019 af

Pond CB 1: Catch Basin #1 Peak Elev=162.20' Inflow=1.19 cfs 0.089 af
15.0" x 5.0' Culvert Outflow=1.19 cfs 0.089 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=152.83' Inflow=0.44 cfs 0.028 af
15.0" x 103.0' Culvert Outflow=0.44 cfs 0.028 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=151.70' Inflow=0.73 cfs 0.158 af
15.0" x 26.0' Culvert Outflow=0.73 cfs 0.158 af

Pond INF: Subsurface Detention Peak Elev=162.61' Storage=3,403 cf Inflow=1.87 cfs 0.143 af
Primary=0.19 cfs 0.007 af Secondary=0.25 cfs 0.105 af Outflow=0.43 cfs 0.112 af

Pond SM1: Manhole #1 Peak Elev=158.80' Inflow=0.43 cfs 0.112 af
15.0" x 70.0' Culvert Outflow=0.43 cfs 0.112 af

Pond SM2: Storm Manhole #2 Peak Elev=152.18' Inflow=0.57 cfs 0.140 af
15.0" x 67.0' Culvert Outflow=0.57 cfs 0.140 af

Total Runoff Area = 0.950 ac Runoff Volume = 0.189 af Average Runoff Depth = 2.39"
16.62% Pervious Area = 0.158 ac 83.38% Impervious Area = 0.792 ac

Subcatchment 1.1: 1

Runoff = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
16,400	98	Paved parking & roofs
3,380	82	Woods/grass comb., Fair, HSG D
19,780	95	Weighted Average
3,380		Pervious Area
16,400		Impervious Area

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

Subcatchment 1.2: Building roofs

Runoff = 0.68 cfs @ 12.08 hrs, Volume= 0.054 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
10,520	98	Paved parking & roofs
10,520		Impervious Area

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

Subcatchment 1.3: Building roofs

Runoff = 0.44 cfs @ 12.01 hrs, Volume= 0.028 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
5,000	98	Paved parking & roofs
900	82	Woods/grass comb., Fair, HSG D
5,900	96	Weighted Average
900		Pervious Area
5,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.1400	3.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.75"

Subcatchment 2.1: 2.1

Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.019 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Rainfall=2.90"

Area (sf)	CN	Description
2,600	98	Paved parking & roofs
2,600	82	Woods/grass comb., Fair, HSG D
5,200	90	Weighted Average
2,600		Pervious Area
2,600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.3000	0.25		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
0.1	60	0.3000	8.82		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	160	Total			

Pond CB 1: Catch Basin #1

Inflow Area = 0.454 ac, Inflow Depth = 2.35" for 1 Year event
Inflow = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af
Outflow = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 162.20' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.65'	**15.0" x 5.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 161.50' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.19 cfs @ 12.08 hrs HW=162.20' (Free Discharge)
↑**1=Culvert** (Barrel Controls 1.19 cfs @ 3.33 fps)

Pond ECB 1: Existing Catch Basin #1

Inflow Area = 0.135 ac, Inflow Depth = 2.45" for 1 Year event
Inflow = 0.44 cfs @ 12.01 hrs, Volume= 0.028 af
Outflow = 0.44 cfs @ 12.01 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.01 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 152.83' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.44 cfs @ 12.01 hrs HW=152.83' (Free Discharge)
↑**1=Culvert** (Barrel Controls 0.44 cfs @ 2.53 fps)

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area = 0.950 ac, Inflow Depth > 2.00" for 1 Year event
Inflow = 0.73 cfs @ 12.01 hrs, Volume= 0.158 af
Outflow = 0.73 cfs @ 12.01 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.01 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 151.70' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=0.73 cfs @ 12.01 hrs HW=151.70' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.73 cfs @ 2.15 fps)

Pond INF: Subsurface Detention

Inflow Area = 0.696 ac, Inflow Depth = 2.46" for 1 Year event
Inflow = 1.87 cfs @ 12.08 hrs, Volume= 0.143 af
Outflow = 0.43 cfs @ 12.48 hrs, Volume= 0.112 af, Atten= 77%, Lag= 23.6 min
Primary = 0.19 cfs @ 12.48 hrs, Volume= 0.007 af
Secondary = 0.25 cfs @ 12.48 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 162.61' @ 12.48 hrs Surf.Area= 2,200 sf Storage= 3,403 cf

Plug-Flow detention time= 248.0 min calculated for 0.112 af (78% of inflow)
Center-of-Mass det. time= 169.5 min (943.9 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1	160.15'	2,417 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 8,800 cf Overall - 2,756 cf Embedded = 6,044 cf x 40.0% Voids
#2	161.15'	2,756 cf	**44.6"W x 30.0"H x 7.12'L StormTech SC-740** x 60 Inside #1
		5,174 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.15	2,200	0	0
164.15	2,200	8,800	8,800

Device	Routing	Invert	Outlet Devices
#1	Secondary	161.40'	**3.0" Vert. Low Flow** C= 0.600
#2	Primary	162.40'	**12.0" x 30.0' long Primary Outlet** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 160.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.18 cfs @ 12.48 hrs HW=162.61' (Free Discharge)
↑—**2=Primary Outlet** (Inlet Controls 0.18 cfs @ 1.55 fps)

Secondary OutFlow Max=0.25 cfs @ 12.48 hrs HW=162.61' (Free Discharge)
↑—**1=Low Flow** (Orifice Controls 0.25 cfs @ 5.01 fps)

Pond SM1: Manhole #1

Inflow Area = 0.696 ac, Inflow Depth > 1.93" for 1 Year event
Inflow = 0.43 cfs @ 12.48 hrs, Volume= 0.112 af
Outflow = 0.43 cfs @ 12.48 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 12.48 hrs, Volume= 0.112 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 158.80' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.50'	**15.0" x 70.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0957 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=0.43 cfs @ 12.48 hrs HW=158.80' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.43 cfs @ 1.88 fps)

Pond SM2: Storm Manhole #2

Inflow Area = 0.831 ac, Inflow Depth > 2.02" for 1 Year event
Inflow = 0.57 cfs @ 12.01 hrs, Volume= 0.140 af
Outflow = 0.57 cfs @ 12.01 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.01 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 152.18' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.80'	**15.0" x 67.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.30' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.57 cfs @ 12.01 hrs HW=152.18' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.57 cfs @ 2.75 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.1: 1 Runoff Area=19,780 sf Runoff Depth=4.17"
Tc=6.0 min CN=95 Runoff=2.05 cfs 0.158 af

Subcatchment 1.2: Building roofs Runoff Area=10,520 sf Runoff Depth=4.51"
Tc=6.0 min CN=98 Runoff=1.12 cfs 0.091 af

Subcatchment 1.3: Building roofs Runoff Area=5,900 sf Runoff Depth=4.28"
Flow Length=90' Slope=0.1400 '/' Tc=0.5 min CN=96 Runoff=0.75 cfs 0.048 af

Subcatchment 2.1: 2.1 Runoff Area=5,200 sf Runoff Depth=3.64"
Flow Length=160' Slope=0.3000 '/' Tc=6.8 min CN=90 Runoff=0.48 cfs 0.036 af

Pond CB 1: Catch Basin #1 Peak Elev=162.42' Inflow=2.05 cfs 0.158 af
15.0" x 5.0' Culvert Outflow=2.05 cfs 0.158 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=152.94' Inflow=0.75 cfs 0.048 af
15.0" x 103.0' Culvert Outflow=0.75 cfs 0.048 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=152.15' Inflow=2.79 cfs 0.302 af
15.0" x 26.0' Culvert Outflow=2.79 cfs 0.302 af

Pond INF: Subsurface Detention Peak Elev=163.14' Storage=4,181 cf Inflow=3.17 cfs 0.249 af
Primary=1.83 cfs 0.068 af Secondary=0.30 cfs 0.150 af Outflow=2.14 cfs 0.218 af

Pond SM1: Manhole #1 Peak Elev=159.22' Inflow=2.14 cfs 0.218 af
15.0" x 70.0' Culvert Outflow=2.14 cfs 0.218 af

Pond SM2: Storm Manhole #2 Peak Elev=152.64' Inflow=2.40 cfs 0.266 af
15.0" x 67.0' Culvert Outflow=2.40 cfs 0.266 af

Total Runoff Area = 0.950 ac Runoff Volume = 0.333 af Average Runoff Depth = 4.21"
16.62% Pervious Area = 0.158 ac 83.38% Impervious Area = 0.792 ac

Subcatchment 1.1: 1

Runoff = 2.05 cfs @ 12.08 hrs, Volume= 0.158 af, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
16,400	98	Paved parking & roofs
3,380	82	Woods/grass comb., Fair, HSG D
19,780	95	Weighted Average
3,380		Pervious Area
16,400		Impervious Area

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

Subcatchment 1.2: Building roofs

Runoff = 1.12 cfs @ 12.08 hrs, Volume= 0.091 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
10,520	98	Paved parking & roofs
10,520		Impervious Area

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

Subcatchment 1.3: Building roofs

Runoff = 0.75 cfs @ 12.01 hrs, Volume= 0.048 af, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
5,000	98	Paved parking & roofs
900	82	Woods/grass comb., Fair, HSG D
5,900	96	Weighted Average
900		Pervious Area
5,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.1400	3.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.75"

Subcatchment 2.1: 2.1

Runoff = 0.48 cfs @ 12.10 hrs, Volume= 0.036 af, Depth= 3.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.75"

Area (sf)	CN	Description
2,600	98	Paved parking & roofs
2,600	82	Woods/grass comb., Fair, HSG D
5,200	90	Weighted Average
2,600		Pervious Area
2,600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.3000	0.25		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
0.1	60	0.3000	8.82		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	160	Total			

Pond CB 1: Catch Basin #1

Inflow Area = 0.454 ac, Inflow Depth = 4.17" for 10 Year event
Inflow = 2.05 cfs @ 12.08 hrs, Volume= 0.158 af
Outflow = 2.05 cfs @ 12.08 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.08 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 162.42' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.65'	**15.0" x 5.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 161.50' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.04 cfs @ 12.08 hrs HW=162.42' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.04 cfs @ 3.68 fps)

Pond ECB 1: Existing Catch Basin #1

Inflow Area = 0.135 ac, Inflow Depth = 4.28" for 10 Year event
Inflow = 0.75 cfs @ 12.01 hrs, Volume= 0.048 af
Outflow = 0.75 cfs @ 12.01 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
Primary = 0.75 cfs @ 12.01 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 152.94' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.74 cfs @ 12.01 hrs HW=152.94' (Free Discharge)
↑**1=Culvert** (Barrel Controls 0.74 cfs @ 2.91 fps)

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area = 0.950 ac, Inflow Depth = 3.82" for 10 Year event
Inflow = 2.79 cfs @ 12.15 hrs, Volume= 0.302 af
Outflow = 2.79 cfs @ 12.15 hrs, Volume= 0.302 af, Atten= 0%, Lag= 0.0 min
Primary = 2.79 cfs @ 12.15 hrs, Volume= 0.302 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 152.15' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=2.78 cfs @ 12.15 hrs HW=152.15' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.78 cfs @ 3.14 fps)

Pond INF: Subsurface Detention

Inflow Area = 0.696 ac, Inflow Depth = 4.29" for 10 Year event
Inflow = 3.17 cfs @ 12.08 hrs, Volume= 0.249 af
Outflow = 2.14 cfs @ 12.17 hrs, Volume= 0.218 af, Atten= 33%, Lag= 5.1 min
Primary = 1.83 cfs @ 12.17 hrs, Volume= 0.068 af
Secondary = 0.30 cfs @ 12.17 hrs, Volume= 0.150 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 163.14' @ 12.17 hrs Surf.Area= 2,200 sf Storage= 4,181 cf

Plug-Flow detention time= 183.4 min calculated for 0.218 af (88% of inflow)
Center-of-Mass det. time= 126.7 min (888.7 - 762.0)

Volume	Invert	Avail.Storage	Storage Description
#1	160.15'	2,417 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 8,800 cf Overall - 2,756 cf Embedded = 6,044 cf x 40.0% Voids
#2	161.15'	2,756 cf	**44.6"W x 30.0"H x 7.12'L StormTech SC-740** x 60 Inside #1
		5,174 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.15	2,200	0	0
164.15	2,200	8,800	8,800

Device	Routing	Invert	Outlet Devices
#1	Secondary	161.40'	**3.0" Vert. Low Flow** C= 0.600
#2	Primary	162.40'	**12.0" x 30.0' long Primary Outlet** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 160.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.83 cfs @ 12.17 hrs HW=163.14' (Free Discharge)
↑—**2=Primary Outlet** (Inlet Controls 1.83 cfs @ 2.93 fps)

Secondary OutFlow Max=0.30 cfs @ 12.17 hrs HW=163.14' (Free Discharge)
↑—**1=Low Flow** (Orifice Controls 0.30 cfs @ 6.12 fps)

Pond SM1: Manhole #1

Inflow Area = 0.696 ac, Inflow Depth = 3.76" for 10 Year event
Inflow = 2.14 cfs @ 12.17 hrs, Volume= 0.218 af
Outflow = 2.14 cfs @ 12.17 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.0 min
Primary = 2.14 cfs @ 12.17 hrs, Volume= 0.218 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 159.22' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.50'	**15.0" x 70.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0957 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=2.13 cfs @ 12.17 hrs HW=159.22' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.13 cfs @ 2.90 fps)

Pond SM2: Storm Manhole #2

Inflow Area = 0.831 ac, Inflow Depth = 3.84" for 10 Year event
Inflow = 2.40 cfs @ 12.16 hrs, Volume= 0.266 af
Outflow = 2.40 cfs @ 12.16 hrs, Volume= 0.266 af, Atten= 0%, Lag= 0.0 min
Primary = 2.40 cfs @ 12.16 hrs, Volume= 0.266 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 152.64' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.80'	**15.0" x 67.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.30' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.40 cfs @ 12.16 hrs HW=152.64' (Free Discharge)
└─**1=Culvert** (Barrel Controls 2.40 cfs @ 3.87 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.1: 1 Runoff Area=19,780 sf Runoff Depth=8.15"
Tc=6.0 min CN=95 Runoff=3.86 cfs 0.308 af

Subcatchment 1.2: Building roofs Runoff Area=10,520 sf Runoff Depth=8.51"
Tc=6.0 min CN=98 Runoff=2.08 cfs 0.171 af

Subcatchment 1.3: Building roofs Runoff Area=5,900 sf Runoff Depth=8.27"
Flow Length=90' Slope=0.1400 '/' Tc=0.5 min CN=96 Runoff=1.40 cfs 0.093 af

Subcatchment 2.1: 2.1 Runoff Area=5,200 sf Runoff Depth=7.54"
Flow Length=160' Slope=0.3000 '/' Tc=6.8 min CN=90 Runoff=0.95 cfs 0.075 af

Pond CB 1: Catch Basin #1 Peak Elev=162.81' Inflow=3.86 cfs 0.308 af
15.0" x 5.0' Culvert Outflow=3.86 cfs 0.308 af

Pond ECB 1: Existing Catch Basin #1 Peak Elev=153.11' Inflow=1.40 cfs 0.093 af
15.0" x 103.0' Culvert Outflow=1.40 cfs 0.093 af

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1) Peak Elev=152.92' Inflow=5.88 cfs 0.617 af
15.0" x 26.0' Culvert Outflow=5.88 cfs 0.617 af

Pond INF: Subsurface Detention Peak Elev=164.10' Storage=5,127 cf Inflow=5.94 cfs 0.480 af
Primary=4.14 cfs 0.214 af Secondary=0.38 cfs 0.235 af Outflow=4.52 cfs 0.449 af

Pond SM1: Manhole #1 Peak Elev=159.70' Inflow=4.52 cfs 0.449 af
15.0" x 70.0' Culvert Outflow=4.52 cfs 0.449 af

Pond SM2: Storm Manhole #2 Peak Elev=153.22' Inflow=5.03 cfs 0.542 af
15.0" x 67.0' Culvert Outflow=5.03 cfs 0.542 af

Total Runoff Area = 0.950 ac Runoff Volume = 0.648 af Average Runoff Depth = 8.18"
16.62% Pervious Area = 0.158 ac 83.38% Impervious Area = 0.792 ac

Subcatchment 1.1: 1

Runoff = 3.86 cfs @ 12.08 hrs, Volume= 0.308 af, Depth= 8.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
16,400	98	Paved parking & roofs
3,380	82	Woods/grass comb., Fair, HSG D
19,780	95	Weighted Average
3,380		Pervious Area
16,400		Impervious Area

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

Subcatchment 1.2: Building roofs

Runoff = 2.08 cfs @ 12.08 hrs, Volume= 0.171 af, Depth= 8.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
10,520	98	Paved parking & roofs
10,520		Impervious Area

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

Subcatchment 1.3: Building roofs

Runoff = 1.40 cfs @ 12.01 hrs, Volume= 0.093 af, Depth= 8.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
5,000	98	Paved parking & roofs
900	82	Woods/grass comb., Fair, HSG D
5,900	96	Weighted Average
900		Pervious Area
5,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	90	0.1400	3.18		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.75"

Subcatchment 2.1: 2.1

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 7.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.75"

Area (sf)	CN	Description
2,600	98	Paved parking & roofs
2,600	82	Woods/grass comb., Fair, HSG D
5,200	90	Weighted Average
2,600		Pervious Area
2,600		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.3000	0.25		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.75"
0.1	60	0.3000	8.82		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	160	Total			

Pond CB 1: Catch Basin #1

Inflow Area = 0.454 ac, Inflow Depth = 8.15" for 100 Year event
Inflow = 3.86 cfs @ 12.08 hrs, Volume= 0.308 af
Outflow = 3.86 cfs @ 12.08 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min
Primary = 3.86 cfs @ 12.08 hrs, Volume= 0.308 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 162.81' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.65'	**15.0" x 5.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 161.50' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.86 cfs @ 12.08 hrs HW=162.81' (Free Discharge)
1=Culvert (Barrel Controls 3.86 cfs @ 4.22 fps)

Pond ECB 1: Existing Catch Basin #1

Inflow Area =	0.135 ac, Inflow Depth = 8.27"	for 100 Year event	
Inflow =	1.40 cfs @ 12.01 hrs, Volume=	0.093 af	
Outflow =	1.40 cfs @ 12.01 hrs, Volume=	0.093 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.40 cfs @ 12.01 hrs, Volume=	0.093 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 153.11' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**15.0" x 103.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.39 cfs @ 12.01 hrs HW=153.11' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.39 cfs @ 3.41 fps)

Pond ECB 2: Existing Catch Basin #2 (Discharge Point 1)

Inflow Area =	0.950 ac, Inflow Depth = 7.79"	for 100 Year event	
Inflow =	5.88 cfs @ 12.13 hrs, Volume=	0.617 af	
Outflow =	5.88 cfs @ 12.13 hrs, Volume=	0.617 af,	Atten= 0%, Lag= 0.0 min
Primary =	5.88 cfs @ 12.13 hrs, Volume=	0.617 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 152.92' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.30'	**15.0" x 26.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 150.06' S= 0.0477 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=5.88 cfs @ 12.13 hrs HW=152.92' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 5.88 cfs @ 4.79 fps)

Pond INF: Subsurface Detention

Inflow Area =	0.696 ac, Inflow Depth = 8.27"	for 100 Year event	
Inflow =	5.94 cfs @ 12.08 hrs, Volume=	0.480 af	
Outflow =	4.52 cfs @ 12.15 hrs, Volume=	0.449 af,	Atten= 24%, Lag= 4.0 min
Primary =	4.14 cfs @ 12.15 hrs, Volume=	0.214 af	
Secondary =	0.38 cfs @ 12.15 hrs, Volume=	0.235 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 164.10' @ 12.15 hrs Surf.Area= 2,200 sf Storage= 5,127 cf

Plug-Flow detention time= 131.1 min calculated for 0.449 af (94% of inflow)
Center-of-Mass det. time= 95.2 min (845.0 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1	160.15'	2,417 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 8,800 cf Overall - 2,756 cf Embedded = 6,044 cf x 40.0% Voids
#2	161.15'	2,756 cf	**44.6"W x 30.0"H x 7.12'L StormTech SC-740** x 60 Inside #1
		5,174 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.15	2,200	0	0
164.15	2,200	8,800	8,800

Device	Routing	Invert	Outlet Devices
#1	Secondary	161.40'	**3.0" Vert. Low Flow** C= 0.600
#2	Primary	162.40'	**12.0" x 30.0' long Primary Outlet** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 160.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=4.14 cfs @ 12.15 hrs HW=164.10' (Free Discharge)
↑—**2=Primary Outlet** (Inlet Controls 4.14 cfs @ 5.27 fps)

Secondary OutFlow Max=0.38 cfs @ 12.15 hrs HW=164.10' (Free Discharge)
↑—**1=Low Flow** (Orifice Controls 0.38 cfs @ 7.72 fps)

Pond SM1: Manhole #1

Inflow Area = 0.696 ac, Inflow Depth = 7.74" for 100 Year event
Inflow = 4.52 cfs @ 12.15 hrs, Volume= 0.449 af
Outflow = 4.52 cfs @ 12.15 hrs, Volume= 0.449 af, Atten= 0%, Lag= 0.0 min
Primary = 4.52 cfs @ 12.15 hrs, Volume= 0.449 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 159.70' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.50'	**15.0" x 70.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.80' S= 0.0957 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

Primary OutFlow Max=4.52 cfs @ 12.15 hrs HW=159.70' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.52 cfs @ 3.73 fps)

Pond SM2: Storm Manhole #2

Inflow Area = 0.831 ac, Inflow Depth = 7.83" for 100 Year event
Inflow = 5.03 cfs @ 12.15 hrs, Volume= 0.542 af
Outflow = 5.03 cfs @ 12.15 hrs, Volume= 0.542 af, Atten= 0%, Lag= 0.0 min
Primary = 5.03 cfs @ 12.15 hrs, Volume= 0.542 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

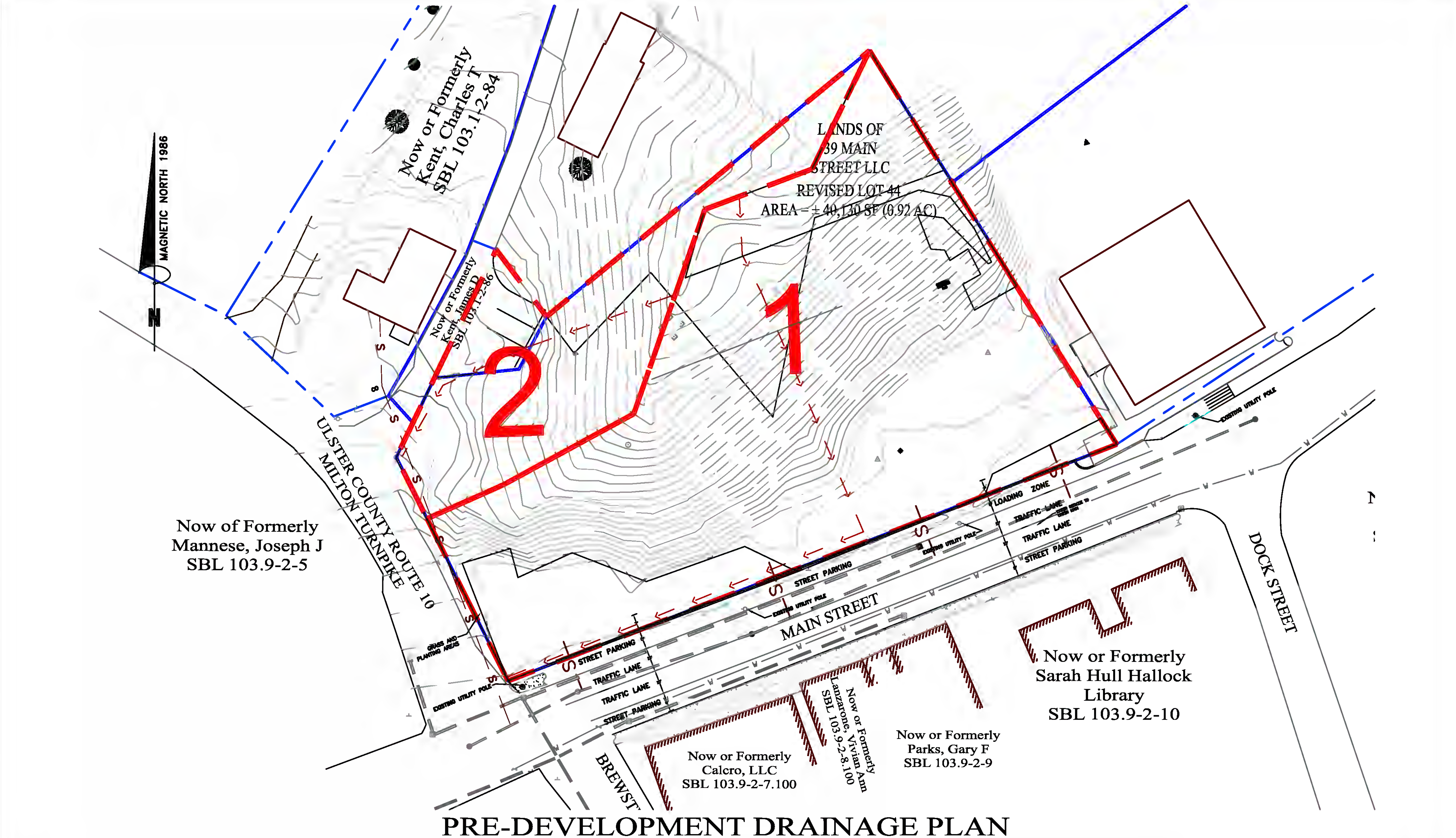
Peak Elev= 153.22' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.80'	**15.0" x 67.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 151.30' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.03 cfs @ 12.15 hrs HW=153.22' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 5.03 cfs @ 4.51 fps)

Appendix A5

Drainage Area Maps



PRE-DEVELOPMENT DRAINAGE PLAN

40 20 0 40 80 120

Scale: 1" = 40'

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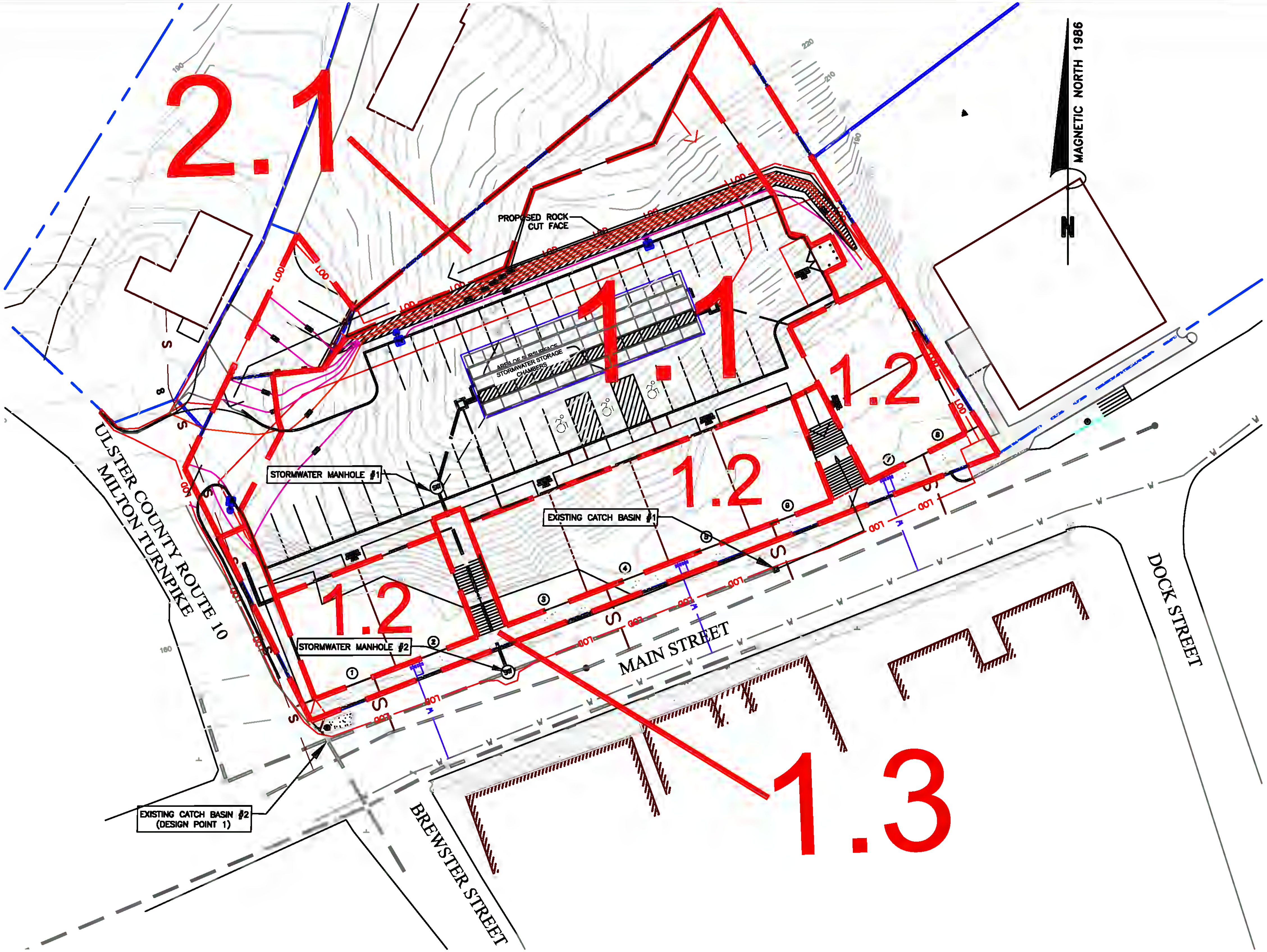

POST-DEVELOPMENT DRAINAGE PLAN

40 20 0 40 80 120

Scale: 1" = 40'

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Appendix A6

Site Plans