DRAINAGE ANALYSIS
&
EROSION AND SEDIMENT
CONTROL PLAN

Knox Marsh Road, Madbury
Tax Map 9, Lots 3 & 4

Prepared for:

LandCare Associates, LLC
282 Knox Marsh Road
Madbury, NH 03823

Land of

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&

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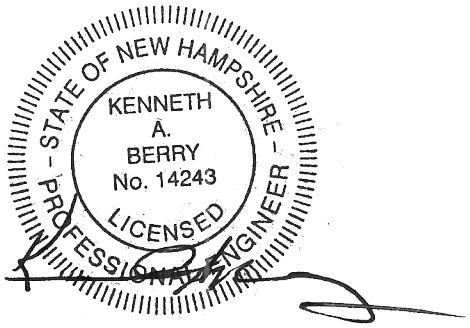

Project Number:
DB 2020-083

April 26, 2022

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Map by NH GRANIT

Legend

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- State
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Map Scale

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Notes

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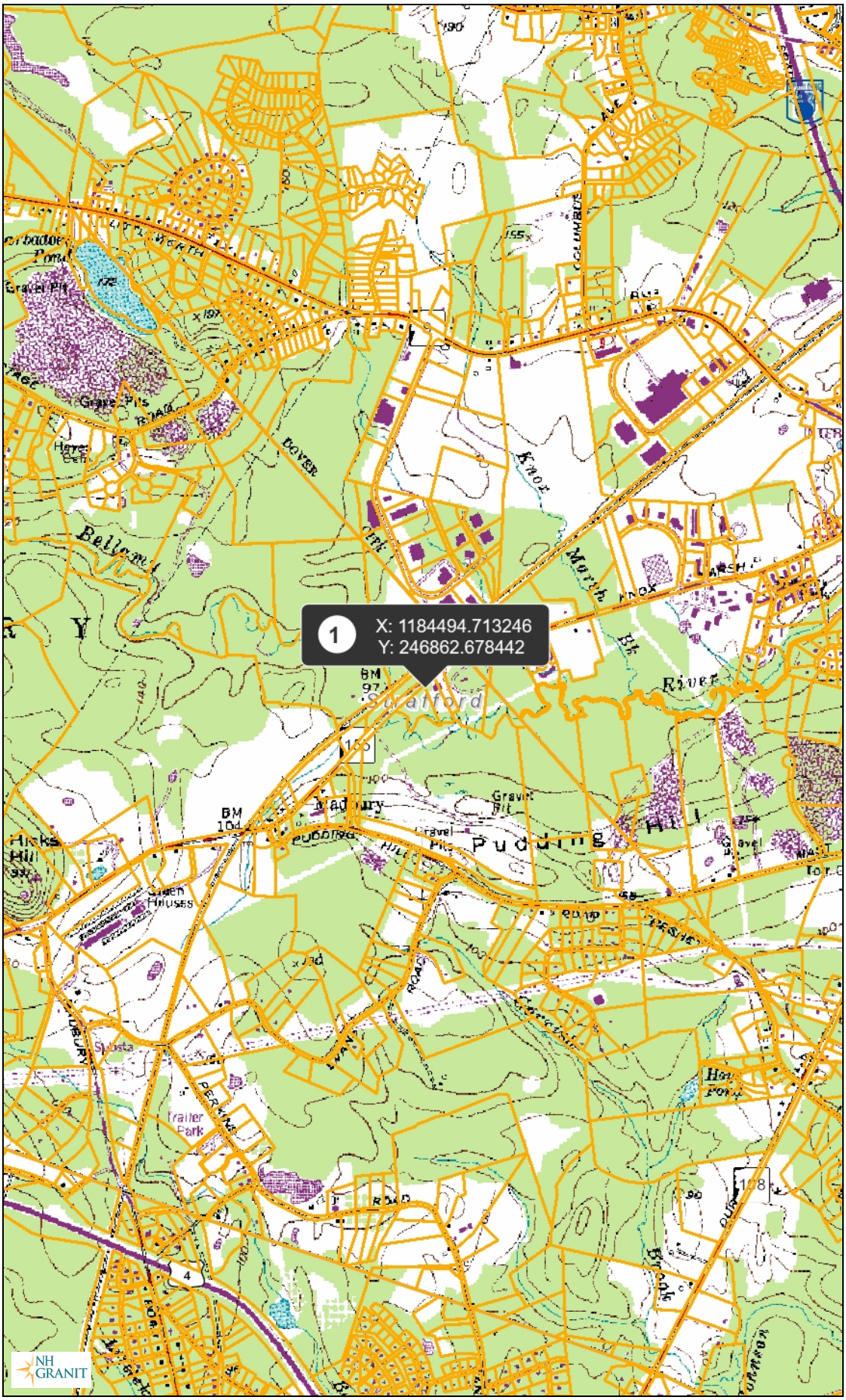

Legend

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DESIGN METHOD OBJECTIVES

The applicant, LandCare Associates, LLC, is proposing to implement a stormwater best management practice (BMP) to become compliant with Madbury, NH Site Review Regulations and more nearly conforming with Shoreland Regulations. LandCare Associates is proposing a reduction in gravel impervious surface to achieve this.

An intensive topographical survey was conducted on site during the existing conditions survey. On-site soil types, in the area of the proposed development, were established by Site Specific Soil Survey mapping by Certified Soil Scientist as reflected on that plan. Off-site soils were determined by USDA / NRCS Websoil for Strafford County. The area of the parcel is 8.22 acres and the area of the drainage analysis is 8.34 acres.

Existing and Proposed Conditions analyses were conducted for the purpose of estimating the peak rate of stormwater run-off and to subsequently design adequate mitigation of drainage. There are three existing drainage discharge points which were identified in the existing analysis and duplicated in the proposed conditions analysis. Designing two watershed models we have compared the differences in these rates of peak run-off and surface water volume. Sheet W-1 outlines the characteristics of the site in its existing or pre-construction conditions. The second analysis displays the proposed (post-construction) conditions (See Sheet W-2). The analysis was conducted using data for; 2 Yr – 24 Hr (3.60”), 10 Yr – 24 Hr (5.44”), 25 Yr -24 Hr (6.89”), 50 Yr – 24 Hr (8.23”), and 100 Yr-24 Hr (9.86) storm events. With Madbury considered a coastal community the precipitation totals have been increased by 15%. Storm event analysis was accomplished using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment and rainfall quantities are based on the Extreme Precipitation Table for this location from the Northeast Regional Climate Center / Cornell University (http://precip.eas.cornell.edu), in accordance with Alteration of Terrain Administrative Code, ENV-Wq (Attached in Appendix 3).

1.0 Existing Analysis:

Reference: W-1 Sheets - Existing Conditions Watershed Plan (Enclosed)
Sheet 3 Existing Conditions Plan
Sheet 4 Site Specific Soil Survey Map

The existing parcels consisting of 8.22 acres, has been used as commercial property with gravel, field, and woods. There is one commercial structure and several out-buildings. The property generally slopes from Knox Marsh Road to the southwest. There is one infiltrating catch basin on site. The runoff from this parcel flows over land to the following watershed: NHRIV600030903-08 Bellamy River – Kelly Brook – Knox Marsh Brook.

The soils on the parcel consist of Hydrologic Soil Groups A-D with previously disturbed soils in open gravel areas. Sandy materials are located in the eastern portion of the site and mixed alluvial soils to the west.

The analysis area consisting of 6.43 acres is being evaluated at three locations along the Bellamy River (Final Reaches #100, 400, & 500). All three reaches are non-point discharges at intermediate points along the river. The western portion of the parcel is not affected by this proposal and is therefore not being analyzed.

Reach #100:

Subcatchment #1 consists of a majority of the westernmost portion of the locus parcel abutting a wetland on the parcel and contributes runoff to that wetland, evaluated as Final Reach #100. This area is entirely woodland.

Reach #400:

Subcatchment #3 consists of land largely within the locus parcel with the watershed spanning from the central portion of the parcel to Knox Marsh Road. Runoff flows to **Reach #400** through a series of overland reaches (**Reaches #3a & #4**). During larger storm events when the culvert is overwhelmed excess runoff flows toward **Reach #400** over land (**Reach #3b**).

Subcatchment #4 consists of land largely within the locus parcel with the watershed spanning from the Bellamy River to Knox Marsh Road on the western side of the parcel. Runoff flows through onsite wetlands to the Bellamy River at **Reach #400**.

Subcatchment #6 consists of a portion of land on the edge of the locus parcel with the watershed extending from an easterly point on Knox Marsh Road onto the locus parcel where a leaching catch basin collects runoff with overflow runoff flowing toward the wetlands in **Subcatchment #3** through an overland reach (**Reach #6**). **Final Reach #400**

Final Reach #500:

Subcatchment #5 consists of land on the eastern and southern edges of the locus parcel extending from the rear of the main building south to the Bellamy River. This land area is mostly developed consisting largely of gravel. Runoff flows south over the property toward the river (**Final Reach #500**).

2.0 Proposed Analysis:

Reference: W-2 Sheets - Proposed Conditions Watershed Plan (Enclosed)
Sheet 11, Gravel Wetland

The proposed Site Plan results in one additional subcatchment for Gravel Wetland #101. The BMP is proposed to be located at the southwestern corner of the proposed disturbance, at the topographical low point on the site. The majority or gravel area flows overland into a sediment forebay where the WQV is treated and higher flows are dischanged from the BMP using a stage-discharge system. Flow is discharged to a level spreader and existing wetland before flow joins the Bellamy River. The same three evaluation points from the existing analysis are being evaluated in the proposed conditions.

Final Reach #100:

Subcatchment #1 and **Final Reach #100** remain unchanged.

Final Reach #400:

Subcatchment #3 is unchanged in size due to the construction of the Subsurface Gravel Wetland (**Pond #101**). Runoff accumulated in the existing wetland (**Pond #3**) flows to a culvert which is directed at the Subsurface Gravel Wetland (**Pond #101**).

Subcatchment #4 is changed in size and area due to the construction of a subsurface gravel wetland (**Pond #101**). Runoff still flows directly to **Reach #400**.

Subcatchment #6 and the catch basin it drains to (**Pond #6**) remain unchanged.

Subcatchment #11 consists of a portion of the existing parking area and the existing commercial building. A large portion of the central site flows to the gravel wetland (**Pond #101**) where it is treated and directed toward **Reach #400 & Final Reach #500** through an outlet structure, a level concrete pipe, level spreader, and a pair series of reaches (**Reaches #101b & #101c**).

Final Reach #500:

Subcatchment #5 is greatly decreased in size due to the construction of **Pond #101**, runoff still flows directly to **Final Reach #500**.

3.1 FULL COMPARATIVE ANALYSIS:

ANALYSIS	COMPONENT	PEAK RATE DISCHARGE (Cubic Feet / Second)				
		2 Yr.	10 Yr.	25 Yr.	50 Yr.	100 Yr.
Reach #100	Existing	2.45	5.20	7.17	8.82	10.71
	Proposed	1.48	3.87	5.21	7.90	10.44
Reach #400	Existing	1.85	3.01	3.91	4.74	5.75
	Proposed	0.74	2.22	3.23	3.73	4.39
Final Reach #500	Existing	4.23	7.84	10.75	13.44	16.71
	Proposed	0.00	0.01	1.23	4.43	9.36

ANALYSIS	COMPONENT	VOLUME (Acre Feet)				
		2 Yr.	10 Yr.	25 Yr.	50 Yr.	100 Yr.
Reach #100	Existing	0.516	1.006	1.419	1.810	2.203
	Proposed	0.535	0.977	1.309	1.604	1.936
Reach #400	Existing	0.134	0.224	0.297	0.365	0.542
	Proposed	0.265	0.600	0.873	1.025	1.208
Final Reach #500	Existing	0.309	0.575	0.796	1.006	1.264
	Proposed	0.000	0.003	0.053	0.228	0.487
Total	Existing	0.959				
	Proposed	0.800				

4.0 EROSION & SEDIMENT CONTROL PLANS BEST MANAGEMENT PRACTICES (BMP's):

Reference: Proposed Site Plan and Grading Plan
Erosion & Sediment Control Plan
Erosion & Sediment Control Details, E-101 & E-102

The proposed site development is protected from erosion and the abutting properties are protected from sediment by the use of Best Management Practices as outlined in the New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design (December 2008, NHDES & US EPA). Any area disturbed by construction will be re-stabilized within 30 days and abutting properties will not be adversely affected by this development. All swales and drainage structures will be constructed and stabilized prior to having run-off directed to them. Reference is also made to the Stormwater System Operation and Maintenance Plan / Inspection & Maintenance Manual which has been written specifically for this project and available to the owner.

Silt Fence / Perimeter Control:

The plan set demonstrates the location of silt fence for sediment control. The Erosion and Sediment Control Details, Sheet E-101, has the specifications for installation and maintenance of the silt fence. Silt fence is rated to be effective for 100 linear feet of fence to capture runoff from one-quarter acre or basically 100 feet of land sloping toward the fence. Filtrexx silt soxx have a variable area and depth, see Filtrexx supporting documents. The NHDES Stormwater Manual requires that the maximum spacing for support stakes is six-feet.

Filtrexx Silt Soxx, or approve equal, has been specified in numerous locations within the plan set and silt fence is not a substitution for silt soxx. Multiple sizes of this product have been specified for use.

EPA CGP 2017: "You must install sediment control along those perimeter areas of your site that will receive stormwater from earth disturbing activity."

In accordance with EPA CGP 2.1.2.1, Provide Natural Buffers or Equivalent Sediment Controls, and CGP Appendix G, Table G-3, and Table G-7, slopes between 3% and 6% with soils that are Fine Sandy Loams, there is a High Risk Factor and it is required to Double Perimeter Control and 7-Day Site Stabilization.

Erosion Control Mix Berm:

As an alternative to the Silt Fence, an Erosion Control Mix Berm can be utilized as a perimeter control. The specifications can be found on Sheet E-101, Detail E6.

Subsurface Gravel Wetland

Description: A Gravel Wetland (NHDES SWM 4-3 Treatment Practice 2D) or Subsurface Gravel Wetland consists of a forebay and multiple flow-through treatment cells. During smaller rain events, the surface water runoff is intended to pass from the forebay, into the gravel media through perforated pipes and structures where it passes through an anaerobic environment where the Water Quality Volume will have 24-72 hours of contact time. The forebay is required to contain 10% of the WQV and each of the two cells must contain 45% of the WQV. During larger storm events, the system works as a detention pond. The design of a Subsurface Gravel Wetland will be constructed in accordance with the most current version of the Design Specifications provided by the UNH Stormwater Center.
Maintenance Considerations: The outlet configuration of the anaerobic subsurface gravel consists of a small discharge orifice that is located in a threaded cap. This goose-neck feature is designed to be disassembled to allow cleaning. This outlet orifice is located within a concrete outlet structure that also contains a control stack used to control and detain runoff in the system. Although this is designed to be "clean water" after the filtering process, the outlet structure in general is going to require periodic maintenance to ensure that it is discharging runoff properly. If the Subsurface Gravel Wetland retains runoff on the surface for more than 72 hours the performance is not correct and maintenance is required.
Debris will need to be removed from the inlet and outlet structures as well as any buildup of sediment. The surface of the ponded area is intended to have wetland plants which may require periodic replanting, depending on the sediment loading. Sediment buildup in the forebay must be removed to maintain the minimum required volume. See also 9 and 10 of the attached UNHSC Subsurface Gravel Wetland Design Specifications 2009, and / or UNHSC Subsurface Gravel Wetland Design Specifications 2016 with Maintenance Guidelines and Checklist.

Rolled Erosion Control Blanket:

Description: Rolled Erosion Control Blankets, such as North American Green Bionet S150, SC150, SC125 (or equal) or turf reinforcement such as North American Green V-Max C-350 (or equal) consist of interlocking fiber mesh, bio-degradable or permanent, used to stabilize sloping earth while vegetation is being established. The product comes in rolls that are laid out over the earth, normally over-lapped, and secured to the soil by the use of anchors or staples. The RECB may be anchored in the earth at the top of the slope to prevent wash-out. Construction specifications are included in the plan set and New Hampshire Stormwater Manual, Volume 3, 4-1 Erosion Control Practices, Temporary Erosion Control Blanket

Construction Considerations: It is recommended that the blanket be installed in the same direction as the water flow or perpendicular to the slope. The manufacturer will recommend the amount of over-lap from one row to the next and on longer slopes between sections. Care must be taken that the RECB is laid directly on the earth / topsoil and that any existing vegetation not cause tenting as this will cause an issue

with the blanket not staying in place. The staples or stakes are to be placed according to the manufacturer based on the slope of the receiving soil and forces that may be encountered. Care must be taken to utilize the correct product as specified. The choice of product are all different and in most cases are not interchangeable. NHDES or NH F&G may specify that some RECBs not be used in some applications.

Maintenance Considerations: RECBs will be inspected during the regular inspection schedule and any construction corrections made if the blanket is compromised.

Vegetated Stabilization:

All areas that are disturbed during construction will be stabilized with vegetated material within 30 days of breaking ground. Construction will be managed in such a manner that erosion is prevented and that no abutter's property will be subjected to any siltation, unless otherwise permitted. All areas to be planted with grass for long-term cover will follow the specification and on Sheet E-102 using seeding mixture C, as follows:

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	24	0.55
Creeping Red Fescue	24	0.55
Total	48	1.10

Conservation Mix

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	15	0.35
Creeping Red Fescue	15	0.35
Annual Ryegrass	5	0.12
Perennial Ryegrass	5	0.12
Kentucky Bluegrass	15	0.35
White Clover	7	0.16
Total	**62**	**1.45**

Conservation Mix will used to stabilize all 2:1 slopes and all land area disturbed within the wetland buffer. (Buffer not applicable to this project)

Subsurface Gravel Wetland Mix:

The grass that is planted within a Subsurface Gravel Wetland will be a diverse mix of species to provide food and cover as well as erosion control in the seasonally flooded conditions such as Ernst Seeds Seasonally Flooded Wildlife Mix ERNMX-128.

Stabilized Construction Entrance:

A temporary gravel construction entrance provides an area where mud can be dislodged from tires before the vehicle leaves the construction site to reduce the amount of mud and sediment transported onto paved municipal and state roads. The stone size for the pad should be 3-inch coarse aggregate, and the pad itself constructed to a minimum length of 75' for the full width of the access road. The aggregate should be placed at least six inches thick. A plan view and profile are shown on Sheet E-102- Erosion and Sediment Control Detail Plan. Alternatives to the length and berm are demonstrated on the detail.

Environmental Dust Control:

Dust will be controlled on the site by the use of multiple Best Management Practices. Mulching and temporary seeding will be the first line of protection to be utilized where problems occur. If dust problems are not solved by these applications, the use of water and calcium chloride can be applied. Calcium chloride will be applied at a rate that will keep the surface moist but not cause pollution.

Drainage Swales / Stormwater Conveyance Channels:

Drainage swales will be stabilized with vegetation for long term cover as outlined below, and on Sheet E-102 using seed mixture C. As a general rule, velocities in the swale should not exceed 3.0 feet per second for a vegetated swale although velocities as high as 4.5 FPS are allowed under certain soil conditions.

Outlet Protection:

Outlet Protection consists of a riprap apron or preformed scour hole that is designed to provide velocity reduction of the surface water run-off that is leaving a culvert. The design is dependent on the culvert size, soil conditions, velocity, and quantity of the run-off. There are to be no bend or curves at the intersection of the conduit and apron. See sheet E-102 for details. North American Green turf reinforcement is proposed on the outlet berms of the rain garden. To be maintained two to three times annually without the use of a mower.

Rip Rap Level Spreader / Stone Berm Level Spreader:

The purpose of the level spreader is to convert concentrated flow into sheet flow, for example from a rip rap outlet protection at the end of a culvert discharge pipe prior to discharge overland through a filter strip or buffer. Each level spreader is specifically designed based on the amount of flow and specified on the grading plan. Details for the level spreader can be found on Sheet E-102, detail E12 and page 162 in the referenced NH Stormwater Manual, Volume 2. The level spreader should be inspected after it is installed and stabilized for the deposit of sediment. Any sediment build-up will be removed and transported to a suitable location. North American Green turf

reinforcement is proposed on the outlet berms of the rain garden. To be maintained two to three times annually without the use of a mower.

Stockpiled Sediment or Soil:

Stockpiled materials including topsoil, excavated materials, borrow materials imported onto the site, construction aggregates, and sediment removed from temporary sediment traps will be located in designated areas at least 50 feet away form concentrated flows. All stockpiles will have erosion protection in the form of silt fence and diversion swales will be applied to protect the material and surrounding areas. Inactive stockpiles will be seeded for temporary stabilization. Erosion control measures will be inspected in accordance with the schedule for all other activities on site.

At a minimum, you must comply with following (EPA 2012 CGP Part 2.1.2.4d) "Do no hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance (unless connected to a sediment basin, sediment trap, or similar effective control,) storm drain inlet, or surface water."

Dewatering Practices:

If during construction dewatering becomes required, an addendum will be published specific for the requirements. As a general rule, ground water that needs to be removed from an excavation will be pumped to a sediment basin or a storm drain inlet prior to discharge from the site.

At a minimum, you must comply with following (EPA 2012 CGP Part 2.1.3.4) "With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications."

Regarding dewatering practices in the State of New Hampshire, specifically see Construction General Permit Section 9.1.1 NHR12000 State of New Hampshire and "Clarification of Section 9.1.1 … and other New Hampshire specific information for the U.S. EPA 2012 NPDES Construction General Permit (CGP), January 20, 2017"

Construction Sequence:

1. Cut and remove trees in construction areas as directed or required.

2. Install Silt Fence and construct and/or install temporary and permanent sediment erosion and detention control facilities (Vegetated swales, level spreaders, and constructed filter strips), as required. Erosion, sediment and facilities shall be installed and stabilized prior to any earth moving operation, and prior to directing run-off to them.

3. Clear, grub, and dispose of debris in approved facilities.

4. Excavate and stockpile topsoil / loam. All disturbed areas shall be stabilized immediately after grading.

5. Construct the strormwater BMP and its associated drainage structures.

6. Begin permanent and temporary seeding and mulching. All cut and fill slopes and disturbed areas shall be seeded and mulched as required, or directed.

7. Daily, or as required, construct temporary berms, drainage ditches, sediment traps, etc. to prevent erosion on the site and prevent any siltation of abutting waters or property.

8. Inspect and maintain all erosion and sediment control measures during construction.

9. Complete permanent seeding and landscaping.

10. Remove temporary erosion control measures after seeding areas have established themselves and site improvements are complete. Smooth and re-vegetate all disturbed areas.

11. All swales and drainage structures will be constructed and stabilized prior to having run-off being directed to them.

Temporary Erosion Control Measures:

1. The smallest practical area of land shall be exposed at any one time.

2. Erosion, sediment control measures shall be installed as shown on the plans and at locations as required, or directed by the engineer.

3. All disturbed areas shall be returned to original grades and elevations. Disturbed areas shall be loamed with a minimum of 4" of loam and seeded with not less than 1.10 pound of seed per 1,000 square feet (48 pounds per acre) of area.

4. Silt fences and other barriers shall be inspected periodically and after every rainstorm during the life of the project. All damaged areas shall be repaired, sediment deposits shall periodically be removed and properly disposed of.

5. After all disturbed areas have been stabilized, the temporary erosion control measures are to be removed and the area disturbed by the removal smoothed and re-vegetated.

6. Areas must be seeded and mulched within 5 days of final grading, permanently stabilized within 15 days of final grading, or temporarily stabilized within 30 days of initial disturbance of soil.

Inspection and Maintenance Schedule:

Perimeter fencing will be inspected during and after storm events to ensure that the fence still has integrity and is not allowing sediment to pass. Depending on SWPPP / SWMP criteria, all controls will be inspected once every 7 days and after storm events greater than 0.25 inches. Inspection reports must be submitted to Town of Madbury, Public Works Department within 24 hours of the completion of the inspection. Sediment build-up in swales and level spreaders will be removed if it is deeper than six inches. See also Stormwater System Operation & Maintenance Plan and Inspection & Maintenance Manual published separately also by Berry Surveying & Engineering. See also Stormwater Pollution Prevention Plan / Stormwater Management Plan to be published by Berry Surveying & Engineering prior to the pre-construction meeting.

Corrective Action measures will be made in accordance with SWPPP requirements and records maintained on site by the Contractor.

5.0 CONCLUSION:

The peak rate of runoff been reduced at all of the analysis points for the five storm events. The Bellamy River is a 4th order water body, therefore channel protection requirements are satisfied by the reduction in the 2 Yr.-24 Hr. peak rates at Final Reaches #400 & #500.

One subsurface gravel wetland is proposed to treat the surface water runoff from the entire site.

A Site Specific, Terrain Alteration Permit (RSA 485: A-17) IS NOT required for this site plan. The impact for this site will require an EPA Notice of Intent as the impact is greater than one acre.

Respectfully Submitted,
BERRY SURVEYING & ENGINEERING

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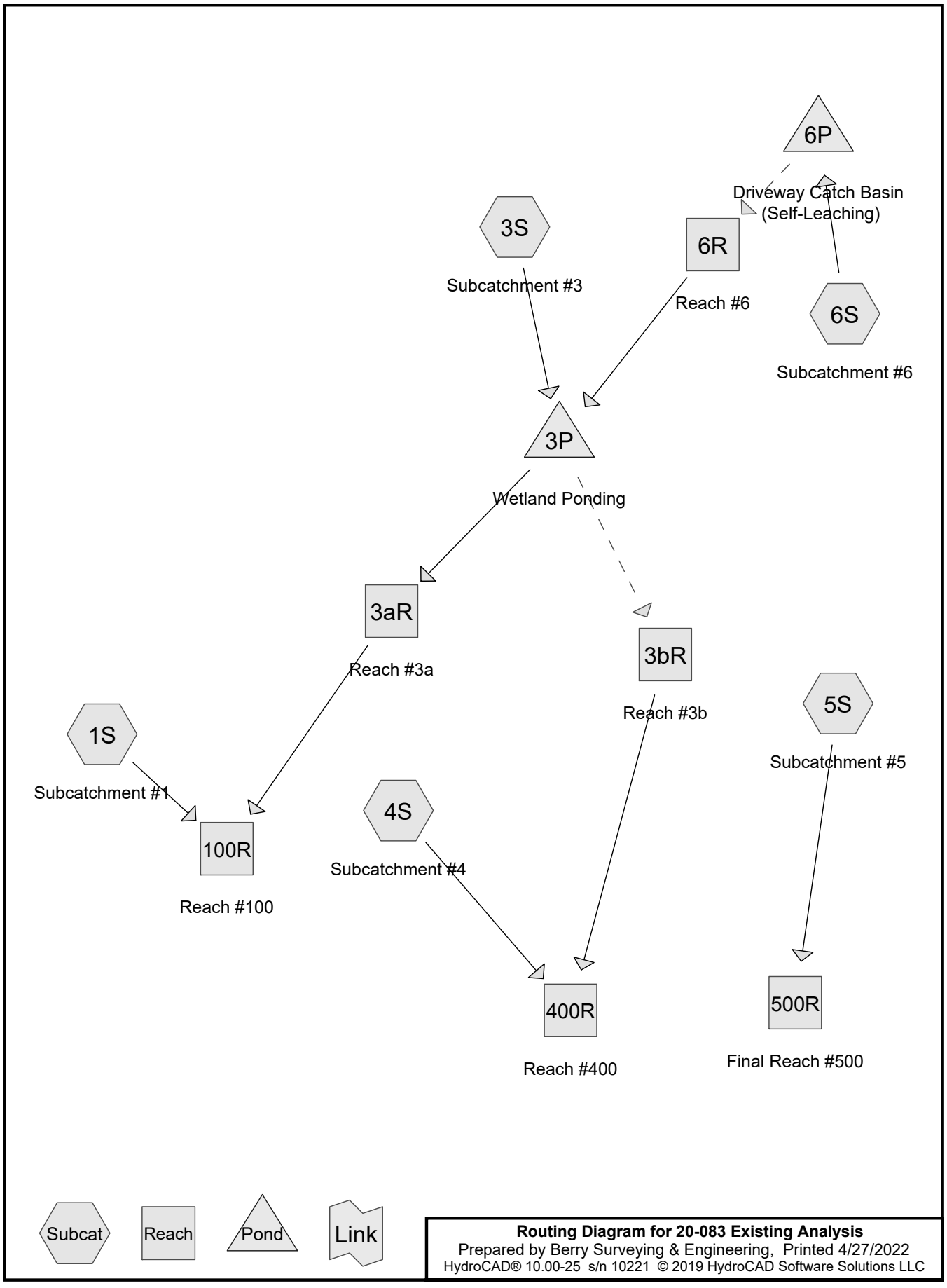


Routing Diagram for 20-083 Existing Analysis
Prepared by Berry Surveying & Engineering, Printed 4/27/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.067	39	>75% Grass cover, Good, HSG A (3S, 6S)
0.031	61	>75% Grass cover, Good, HSG B (3S, 6S)
0.293	80	>75% Grass cover, Good, HSG D (1S, 3S)
0.563	96	Gravel surface, HSG A (3S, 5S, 6S)
2.241	96	Gravel surface, HSG B (1S, 3S, 4S, 5S)
0.013	96	Gravel surface, HSG C (1S, 3S)
0.058	96	Gravel surface, HSG D (1S, 3S, 4S)
0.062	98	Paved parking, HSG B (6S)
0.109	98	Unconnected pavement, HSG A (3S, 6S)
0.381	98	Unconnected pavement, HSG B (3S, 4S, 5S)
0.312	98	Unconnected pavement, HSG D (1S, 3S)
0.028	98	Unconnected roofs, HSG A (5S)
0.214	98	Unconnected roofs, HSG B (3S, 5S)
0.396	30	Woods, Good, HSG A (5S)
0.808	55	Woods, Good, HSG B (1S, 3S, 4S)
0.114	70	Woods, Good, HSG C (1S, 3S)
0.744	77	Woods, Good, HSG D (1S, 3S, 4S, 5S)
6.435	**83**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.163	HSG A	3S, 5S, 6S
3.737	HSG B	1S, 3S, 4S, 5S, 6S
0.128	HSG C	1S, 3S
1.407	HSG D	1S, 3S, 4S, 5S
0.000	Other	
6.435		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.067	0.031	0.000	0.293	0.000	0.391	>75% Grass cover, Good	1S, 3S, 6S
0.563	2.241	0.013	0.058	0.000	2.876	Gravel surface	1S, 3S, 4S, 5S, 6S
0.000	0.062	0.000	0.000	0.000	0.062	Paved parking	6S
0.109	0.381	0.000	0.312	0.000	0.803	Unconnected pavement	1S, 3S, 4S, 5S, 6S
0.028	0.214	0.000	0.000	0.000	0.241	Unconnected roofs	3S, 5S
0.396	0.808	0.114	0.744	0.000	2.062	Woods, Good	1S, 3S, 4S, 5S
1.163	**3.737**	**0.128**	**1.407**	**0.000**	**6.435**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	88.12	85.95	140.5	0.0154	0.012	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>4.47"
Flow Length=131' Tc=20.4 min CN=79 Runoff=4.60 cfs 0.489 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>4.58"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=9.23 cfs 0.878 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>5.83"
Flow Length=214' Tc=6.0 min CN=91 Runoff=3.91 cfs 0.297 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>4.81"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=10.75 cfs 0.796 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>5.47"
Flow Length=197' Tc=14.5 min CN=88 Runoff=1.05 cfs 0.101 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.41' Max Vel=0.52 fps Inflow=3.18 cfs 0.932 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=3.18 cfs 0.930 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=0.00 cfs 0.000 af

Reach 6R: Reach #6 Avg. Flow Depth=0.11' Max Vel=1.24 fps Inflow=1.04 cfs 0.087 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=1.02 cfs 0.086 af

Reach 100R: Reach #100 Inflow=7.17 cfs 1.419 af
Outflow=7.17 cfs 1.419 af

Reach 400R: Reach #400 Inflow=3.91 cfs 0.297 af
Outflow=3.91 cfs 0.297 af

Reach 500R: Final Reach #500 Inflow=10.75 cfs 0.796 af
Outflow=10.75 cfs 0.796 af

Pond 3P: Wetland Ponding Peak Elev=89.33' Storage=15,322 cf Inflow=10.23 cfs 0.965 af
Discarded=0.00 cfs 0.003 af Primary=3.18 cfs 0.932 af Secondary=0.00 cfs 0.000 af Outflow=3.18 cfs 0.934 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.14' Storage=293 cf Inflow=1.05 cfs 0.101 af
Discarded=0.01 cfs 0.009 af Secondary=1.04 cfs 0.087 af Outflow=1.05 cfs 0.095 af

Total Runoff Area = 6.435 ac Runoff Volume = 2.561 af Average Runoff Depth = 4.78"
82.81% Pervious = 5.329 ac 17.19% Impervious = 1.106 ac

Summary for Subcatchment 1S: Subcatchment #1

CarlsonPlanXYPos|1184131.4605|246470.6080|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

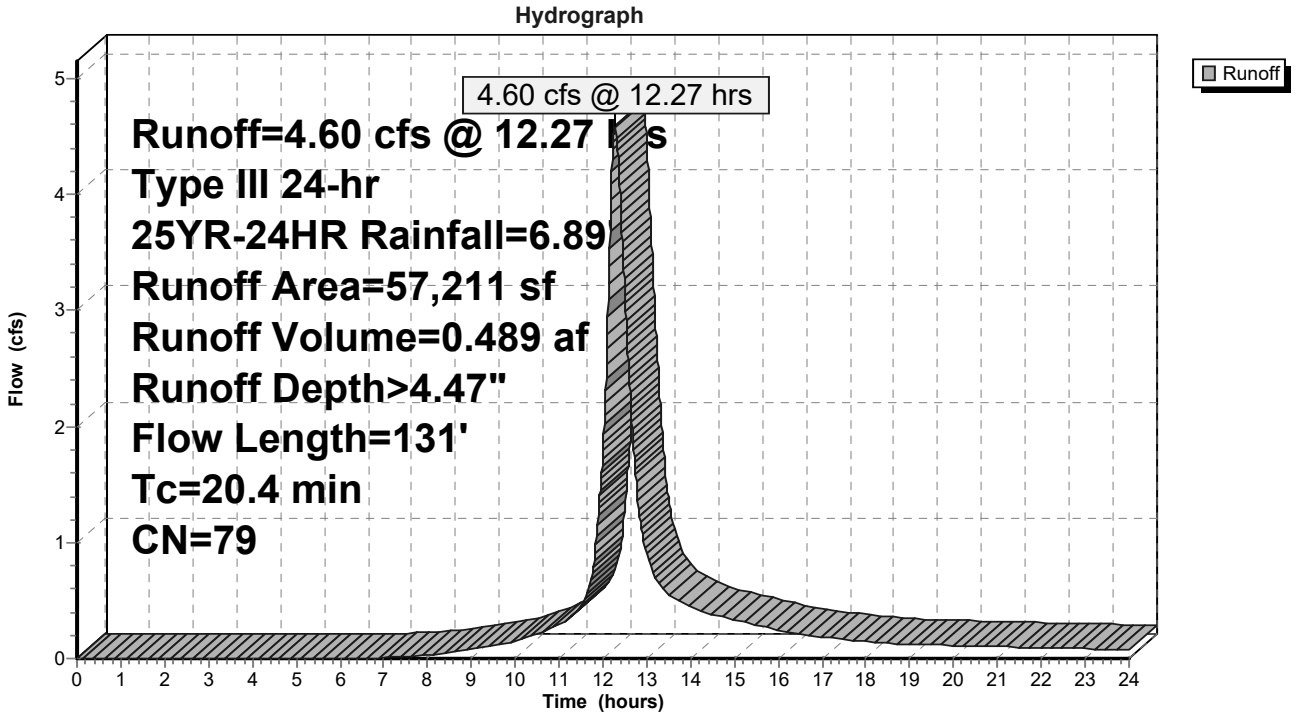
Runoff = 4.60 cfs @ 12.27 hrs, Volume= 0.489 af, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
11,443	55	Woods, Good, HSG B
1,939	70	Woods, Good, HSG C
18,512	77	Woods, Good, HSG D
14,560	96	Gravel surface, HSG B
520	96	Gravel surface, HSG C
497	96	Gravel surface, HSG D
4,405	98	Unconnected pavement, HSG D
5,335	80	>75% Grass cover, Good, HSG D
57,211	79	Weighted Average
52,806		92.30% Pervious Area
4,405		7.70% Impervious Area
4,405		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	100	0.0250	0.08		**Sheet Flow, Segment #1** Woods: Light underbrush n= 0.400 P2= 3.13"
0.5	31	0.0492	1.11		**Shallow Concentrated Flow, Segment #2** Woodland Kv= 5.0 fps
20.4	131	Total			

Subcatchment 1S: Subcatchment #1



Summary for Subcatchment 3S: Subcatchment #3

CarlsonPlanXYPos|1184417.2870|246737.1339|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

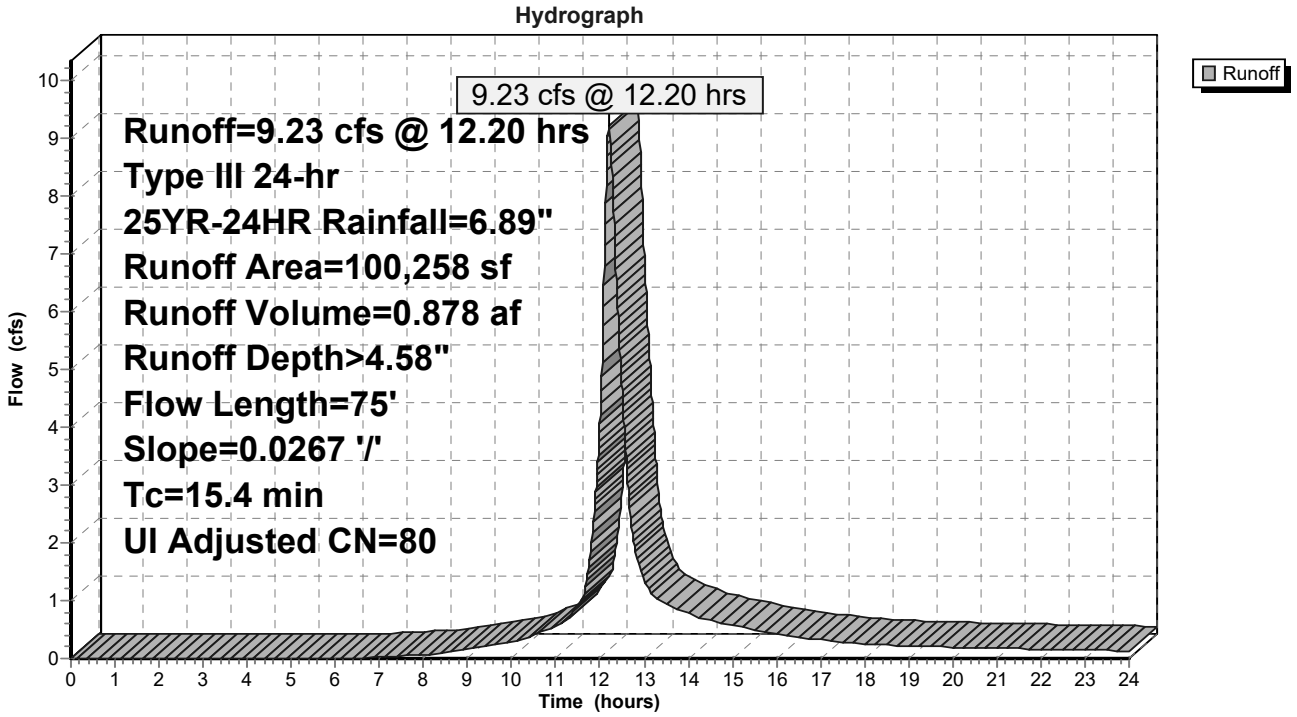
Runoff = 9.23 cfs @ 12.20 hrs, Volume= 0.878 af, Depth> 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Adj	Description
1,448	39		>75% Grass cover, Good, HSG A
602	98		Unconnected pavement, HSG A
211	96		Gravel surface, HSG A
3,464	98		Unconnected roofs, HSG B
1,040	61		>75% Grass cover, Good, HSG B
10,897	98		Unconnected pavement, HSG B
22,601	55		Woods, Good, HSG B
29,396	96		Gravel surface, HSG B
3,045	70		Woods, Good, HSG C
53	96		Gravel surface, HSG C
7,413	80		>75% Grass cover, Good, HSG D
9,201	98		Unconnected pavement, HSG D
9,381	77		Woods, Good, HSG D
1,506	96		Gravel surface, HSG D
100,258	82	80	Weighted Average, UI Adjusted
76,094			75.90% Pervious Area
24,164			24.10% Impervious Area
24,164			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	75	0.0267	0.08		**Sheet Flow, Segment #1** Woods: Light underbrush n= 0.400 P2= 3.13"

Subcatchment 3S: Subcatchment #3



Summary for Subcatchment 4S: Subcatchment #4

CarlsonPlanXYPos|1184429.8280|246621.8224|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

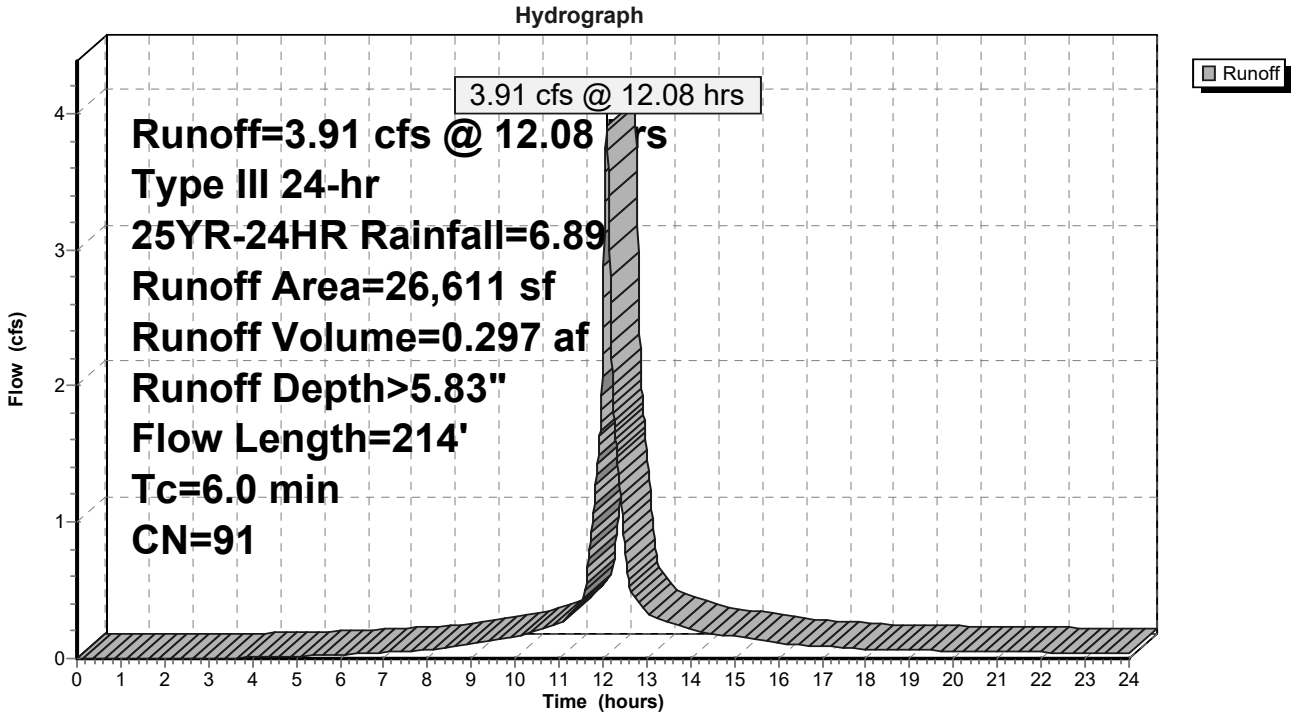
Runoff = 3.91 cfs @ 12.08 hrs, Volume= 0.297 af, Depth> 5.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
1,163	55	Woods, Good, HSG B
511	98	Unconnected pavement, HSG B
19,919	96	Gravel surface, HSG B
4,479	77	Woods, Good, HSG D
539	96	Gravel surface, HSG D
26,611	91	Weighted Average
26,100		98.08% Pervious Area
511		1.92% Impervious Area
511		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0325	1.65		**Sheet Flow, Segment #1** Smooth surfaces n= 0.011 P2= 3.13"
0.6	79	0.0127	2.29		**Shallow Concentrated Flow, Segment #2** Paved Kv= 20.3 fps
0.5	35	0.0580	1.20		**Shallow Concentrated Flow, Segment #3** Woodland Kv= 5.0 fps
2.1	214	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: Subcatchment #4



Summary for Subcatchment 5S: Subcatchment #5

CarlsonPlanXYPos|1184708.1212|246526.5243|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

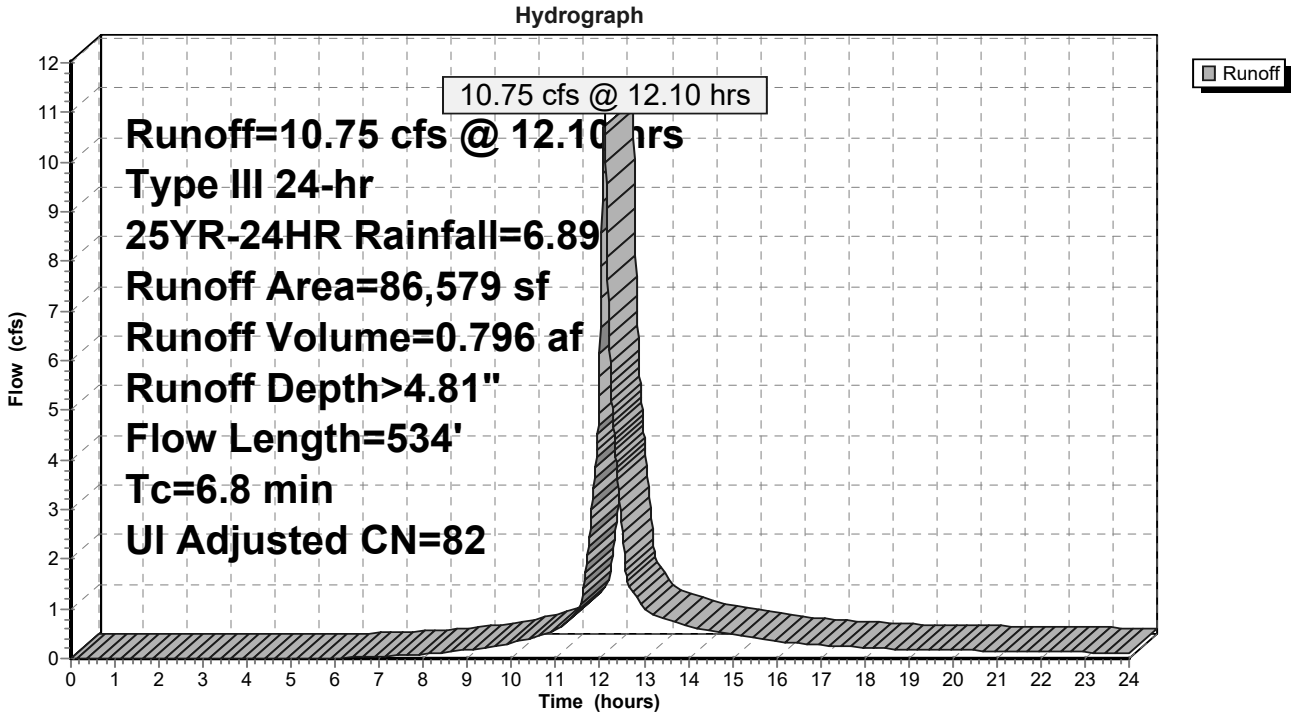
Runoff = 10.75 cfs @ 12.10 hrs, Volume= 0.796 af, Depth> 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Adj	Description
1,203	98		Unconnected roofs, HSG A
17,244	30		Woods, Good, HSG A
23,312	96		Gravel surface, HSG A
5,840	98		Unconnected roofs, HSG B
5,190	98		Unconnected pavement, HSG B
33,762	96		Gravel surface, HSG B
28	77		Woods, Good, HSG D
86,579	83	82	Weighted Average, UI Adjusted
74,346			85.87% Pervious Area
12,233			14.13% Impervious Area
12,233			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0115	1.09		**Sheet Flow, Segment #1** Smooth surfaces n= 0.011 P2= 3.13"
0.7	115	0.0173	2.67		**Shallow Concentrated Flow, Segment #2** Paved Kv= 20.3 fps
2.6	213	0.0047	1.39		**Shallow Concentrated Flow, Segment #3** Paved Kv= 20.3 fps
1.4	54	0.0170	0.65		**Shallow Concentrated Flow, Segment #4** Woodland Kv= 5.0 fps
0.6	52	0.0925	1.52		**Shallow Concentrated Flow, Segment #5** Woodland Kv= 5.0 fps
6.8	534	Total			

Subcatchment 5S: Subcatchment #5



Summary for Subcatchment 6S: Subcatchment #6

CarlsonPlanXYPos|1184661.9163|246992.9891|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

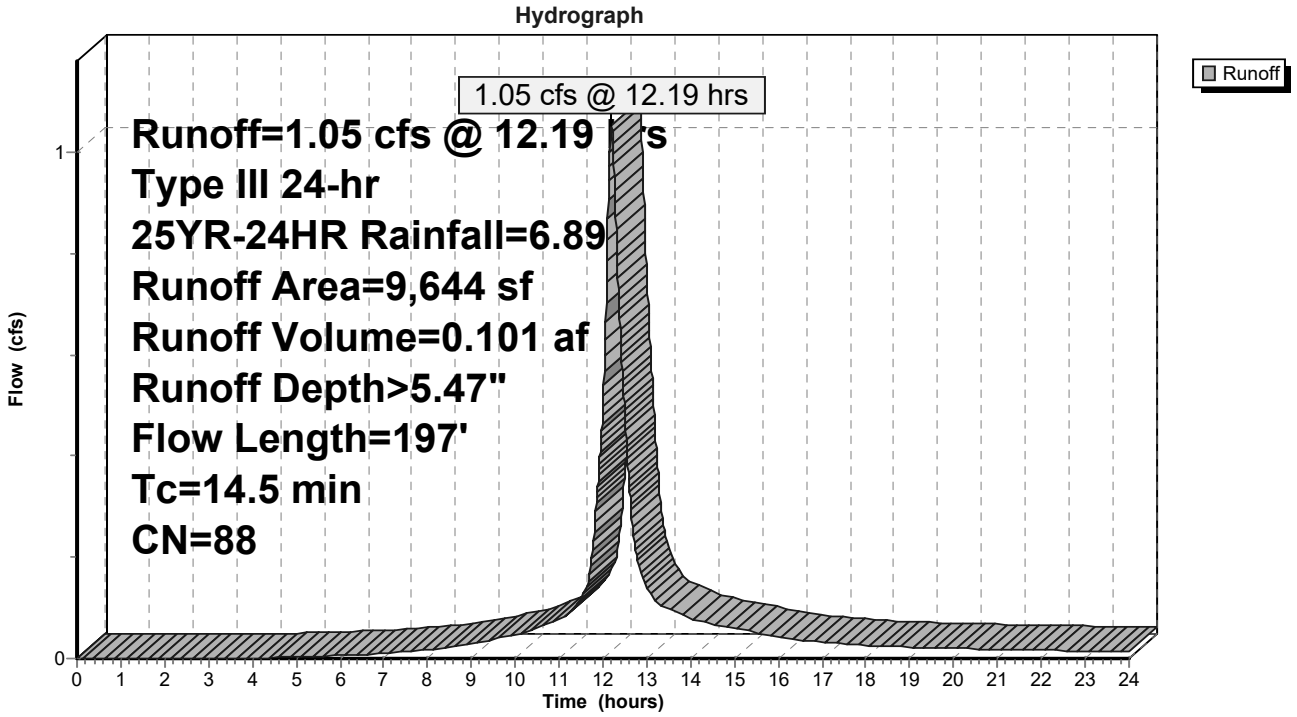
Runoff = 1.05 cfs @ 12.19 hrs, Volume= 0.101 af, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
1,477	39	>75% Grass cover, Good, HSG A
4,157	98	Unconnected pavement, HSG A
1,000	96	Gravel surface, HSG A
299	61	>75% Grass cover, Good, HSG B
2,711	98	Paved parking, HSG B
9,644	88	Weighted Average
2,776		28.78% Pervious Area
6,868		71.22% Impervious Area
4,157		60.53% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0127	0.14		**Sheet Flow, Segment #1** Grass: Short n= 0.150 P2= 3.13"
2.3	73	0.0055	0.52		**Shallow Concentrated Flow, Segment #2** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0055	1.51		**Shallow Concentrated Flow, Segment #3** Paved Kv= 20.3 fps
14.5	197	Total			

Subcatchment 6S: Subcatchment #6



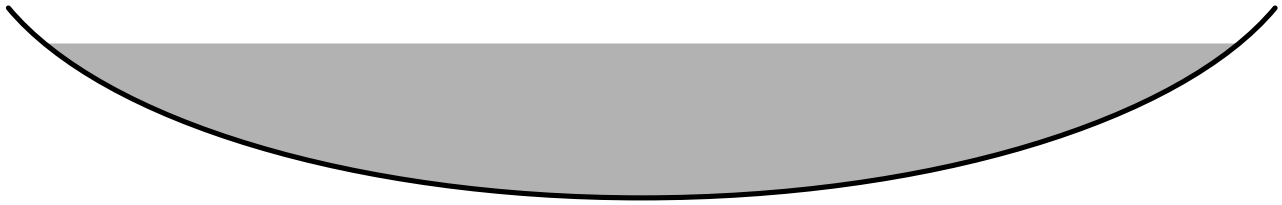
Summary for Reach 3aR: Reach #3a

Inflow Area = 2.302 ac, 24.10% Impervious, Inflow Depth > 4.86" for 25YR-24HR event
Inflow = 3.18 cfs @ 12.65 hrs, Volume= 0.932 af
Outflow = 3.18 cfs @ 12.69 hrs, Volume= 0.930 af, Atten= 0%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.52 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 5.9 min

Peak Storage= 610 cf @ 12.69 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 0.50' Flow Area= 8.3 sf, Capacity= 4.99 cfs

25.00' x 0.50' deep Parabolic Channel, n= 0.080 Earth, long dense weeds
Length= 100.0' Slope= 0.0045 '/'
Inlet Invert= 85.95', Outlet Invert= 85.50'



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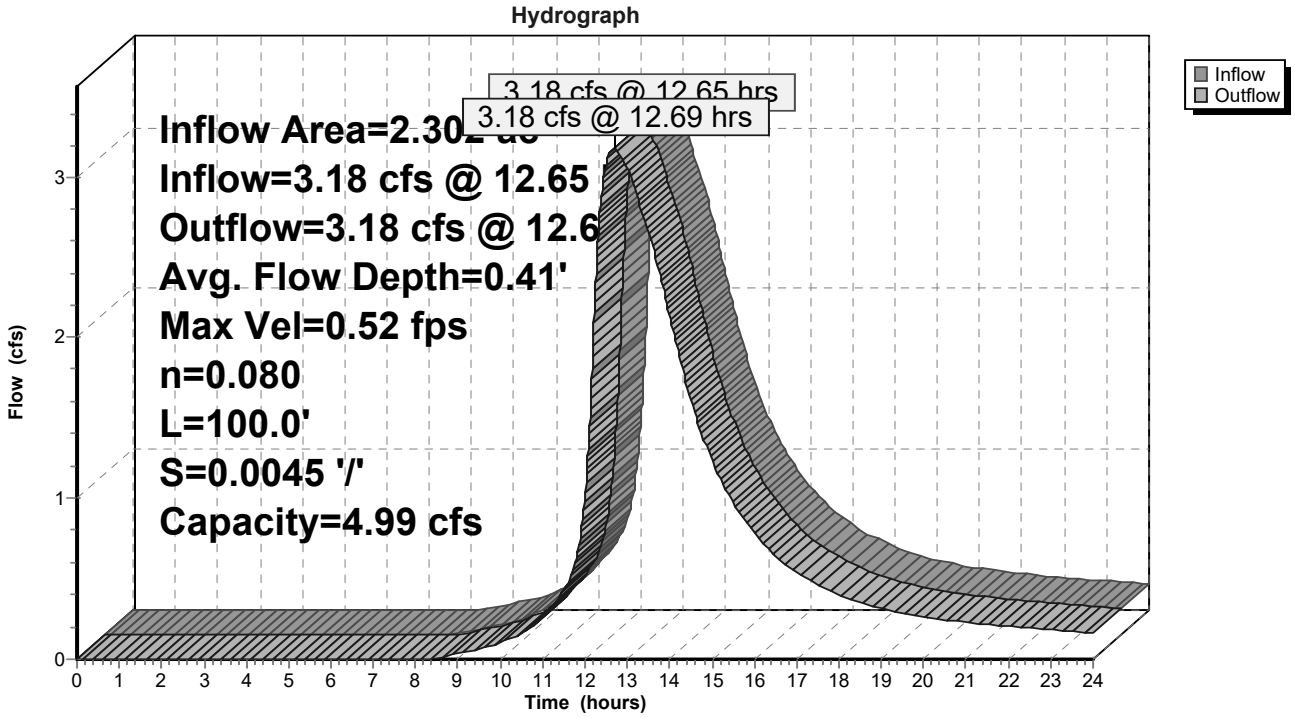
Reach 3aR: Reach #3a



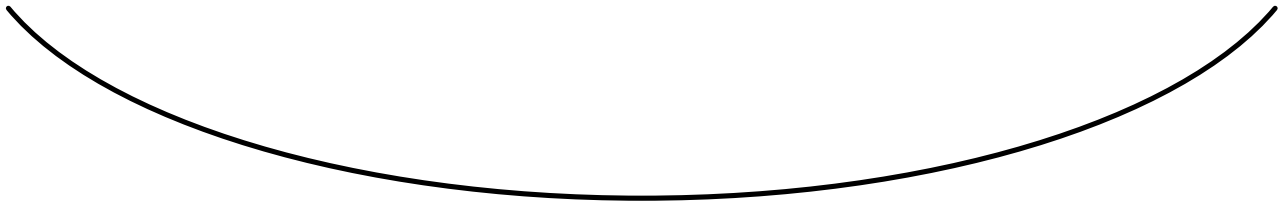
Summary for Reach 3bR: Reach #3b

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.50' Flow Area= 6.7 sf, Capacity= 30.70 cfs

20.00' x 0.50' deep Parabolic Channel, n= 0.025 Earth, clean & winding
Length= 172.9' Slope= 0.0260 '/'
Inlet Invert= 89.50', Outlet Invert= 85.00'



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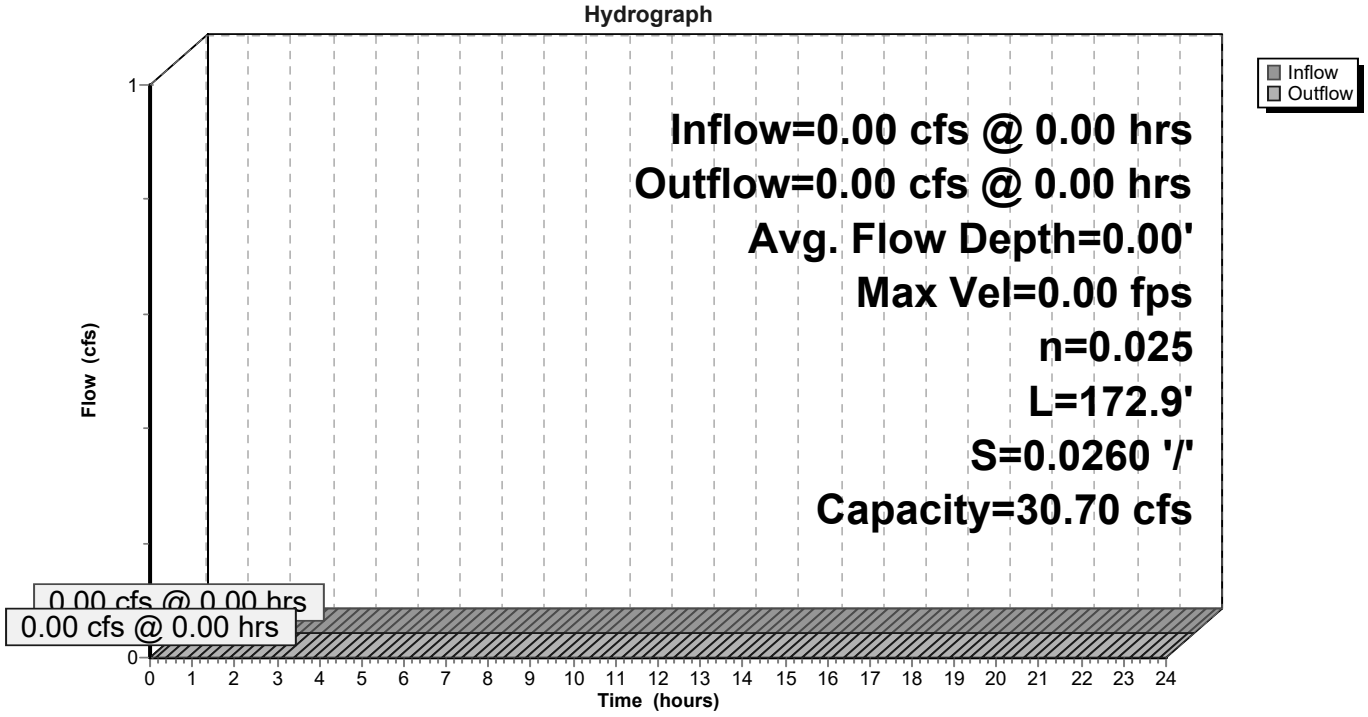
Reach 3bR: Reach #3b



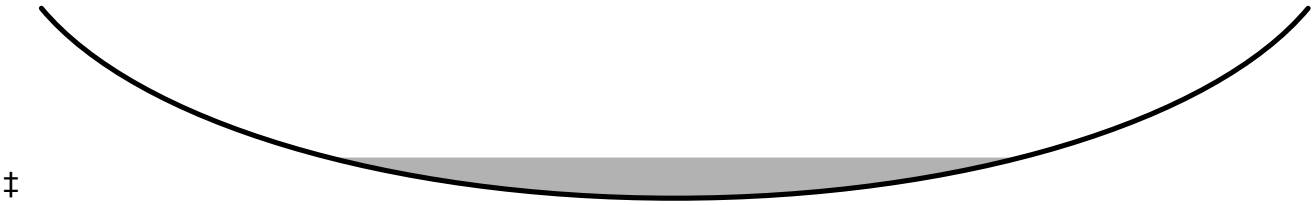
Summary for Reach 6R: Reach #6

Inflow = 1.04 cfs @ 12.20 hrs, Volume= 0.087 af
Outflow = 1.02 cfs @ 12.23 hrs, Volume= 0.086 af, Atten= 2%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.24 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 6.3 min

Peak Storage= 144 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 8.3 sf, Capacity= 28.91 cfs

25.00' x 0.50' deep Parabolic Channel, n= 0.022 Earth, clean & straight
Length= 175.0' Slope= 0.0114 '/'
Inlet Invert= 92.00', Outlet Invert= 90.00'



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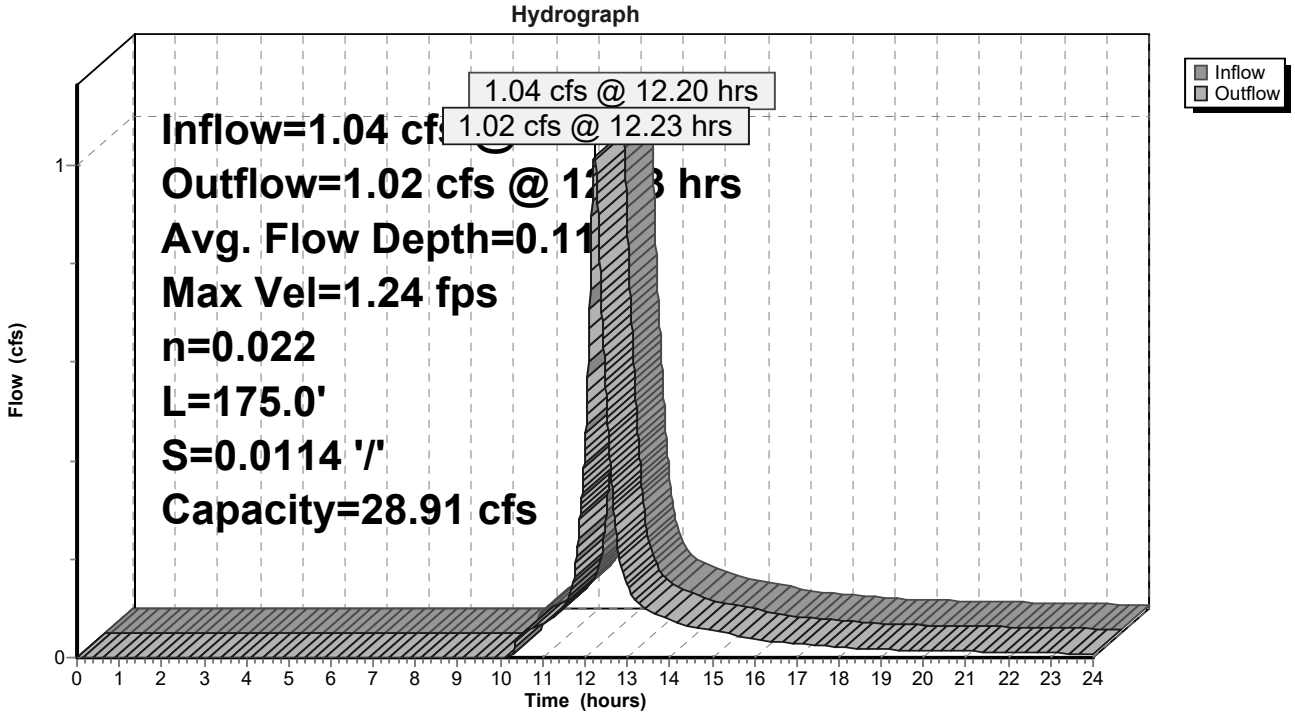
Reach 6R: Reach #6



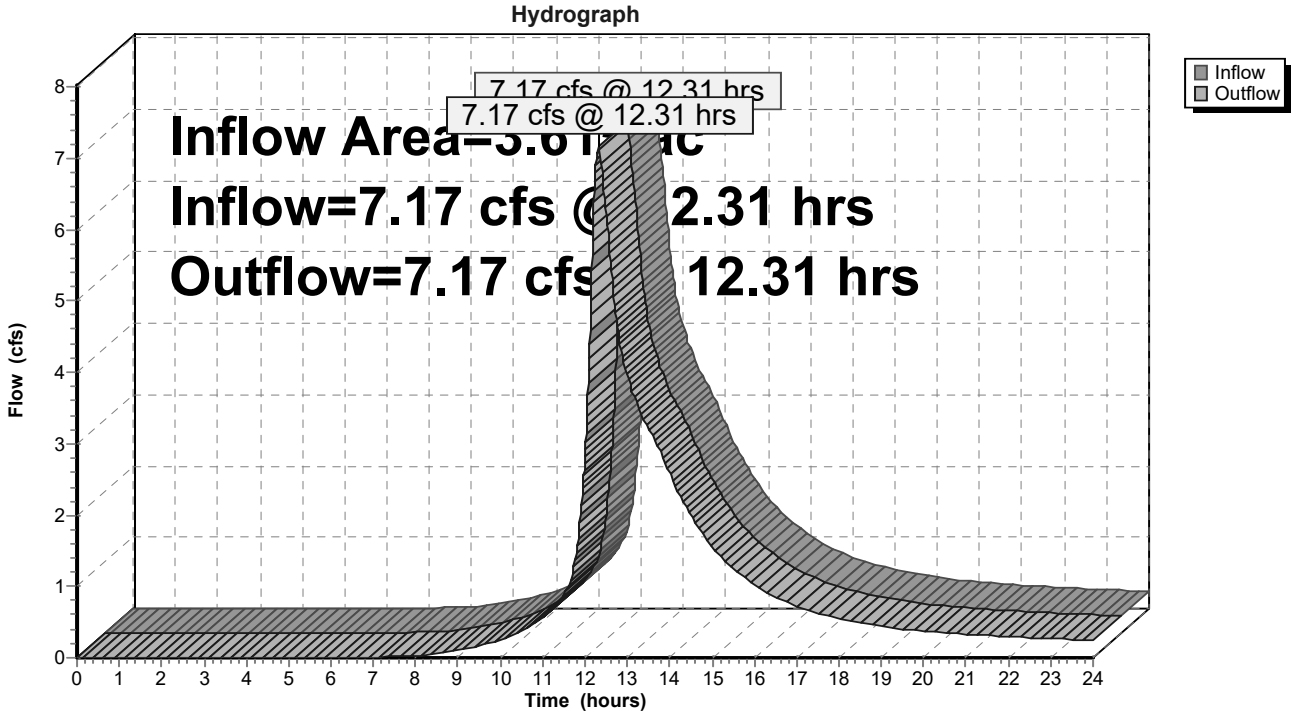
Summary for Reach 100R: Reach #100

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.615 ac, 18.14% Impervious, Inflow Depth > 4.71" for 25YR-24HR event
Inflow = 7.17 cfs @ 12.31 hrs, Volume= 1.419 af
Outflow = 7.17 cfs @ 12.31 hrs, Volume= 1.419 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 100R: Reach #100



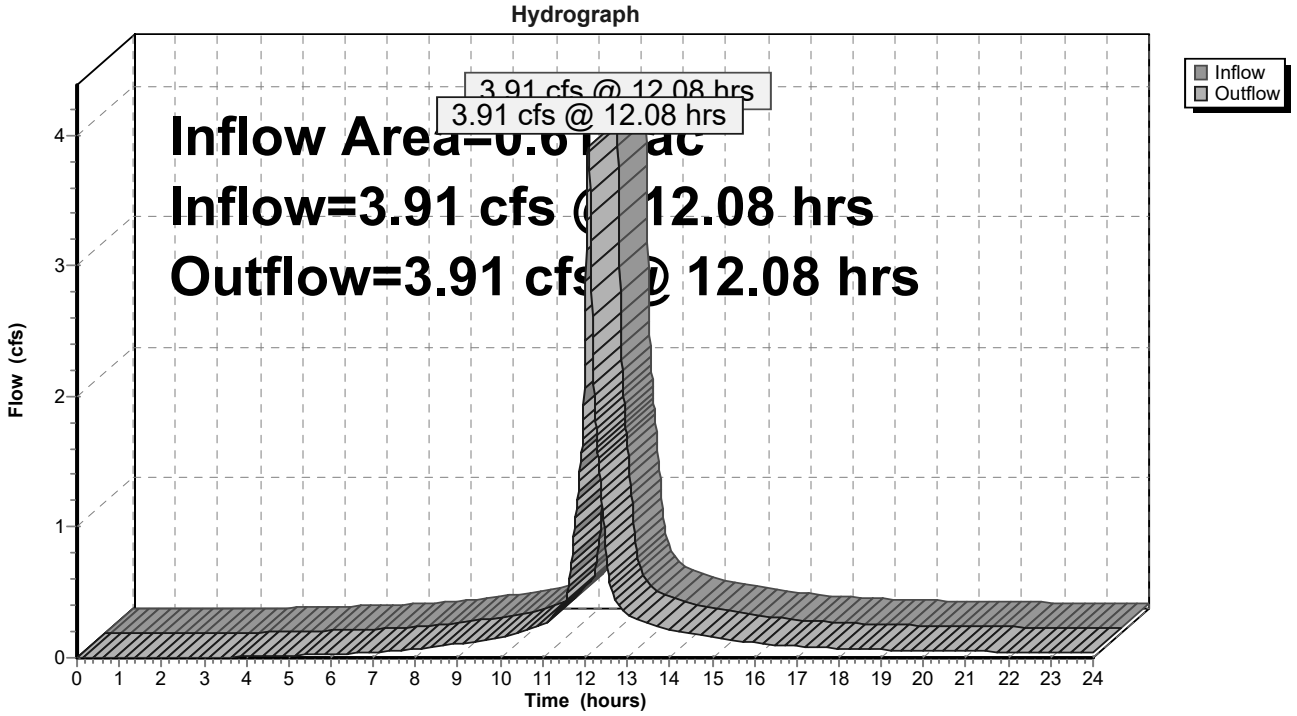
Summary for Reach 400R: Reach #400

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.611 ac, 1.92% Impervious, Inflow Depth > 5.83" for 25YR-24HR event
Inflow = 3.91 cfs @ 12.08 hrs, Volume= 0.297 af
Outflow = 3.91 cfs @ 12.08 hrs, Volume= 0.297 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 400R: Reach #400



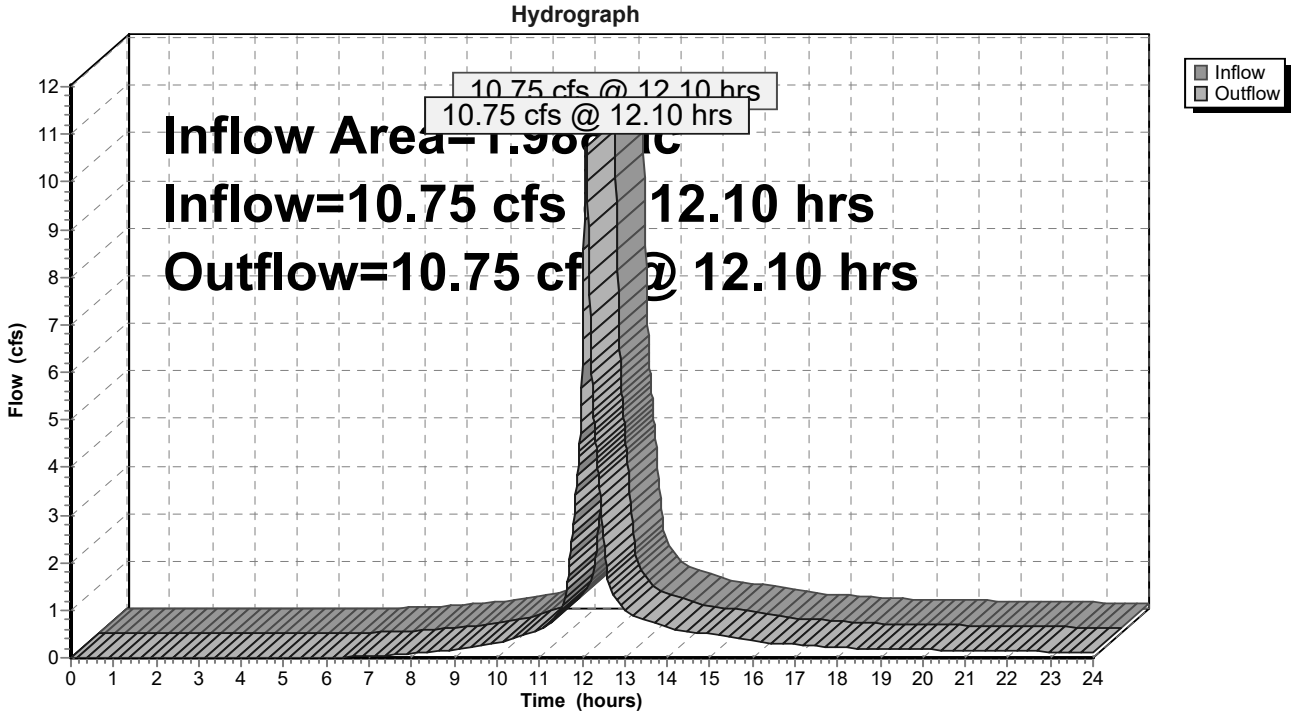
Summary for Reach 500R: Final Reach #500

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.988 ac, 14.13% Impervious, Inflow Depth > 4.81" for 25YR-24HR event
Inflow = 10.75 cfs @ 12.10 hrs, Volume= 0.796 af
Outflow = 10.75 cfs @ 12.10 hrs, Volume= 0.796 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 500R: Final Reach #500



Summary for Pond 3P: Wetland Ponding

Inflow Area = 2.302 ac, 24.10% Impervious, Inflow Depth > 5.03" for 25YR-24HR event
Inflow = 10.23 cfs @ 12.21 hrs, Volume= 0.965 af
Outflow = 3.18 cfs @ 12.65 hrs, Volume= 0.934 af, Atten= 69%, Lag= 26.5 min
Discarded = 0.00 cfs @ 9.56 hrs, Volume= 0.003 af
Primary = 3.18 cfs @ 12.65 hrs, Volume= 0.932 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.33' @ 12.65 hrs Surf.Area= 1,720 sf Storage= 15,322 cf

Plug-Flow detention time= 81.5 min calculated for 0.934 af (97% of inflow)
Center-of-Mass det. time= 63.6 min (878.3 - 814.8)

Volume	Invert	Avail.Storage	Storage Description
#1	88.12'	30,193 cf	**Open Water (Irregular)**Listed below (Recalc) -Impervious
#2	87.66'	371 cf	**Exfil Area (Irregular)**Listed below (Recalc)
		30,564 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.12	4	10.9	0	0	4
88.25	8,542	528.0	378	378	22,179
89.00	15,213	723.8	8,789	9,167	41,690
89.50	23,054	802.7	9,499	18,666	51,282
90.00	23,054	802.7	11,527	30,193	51,683

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.66	15	20.0	0	0	15
88.00	645	142.0	86	86	1,588
88.25	1,720	208.0	285	371	3,427

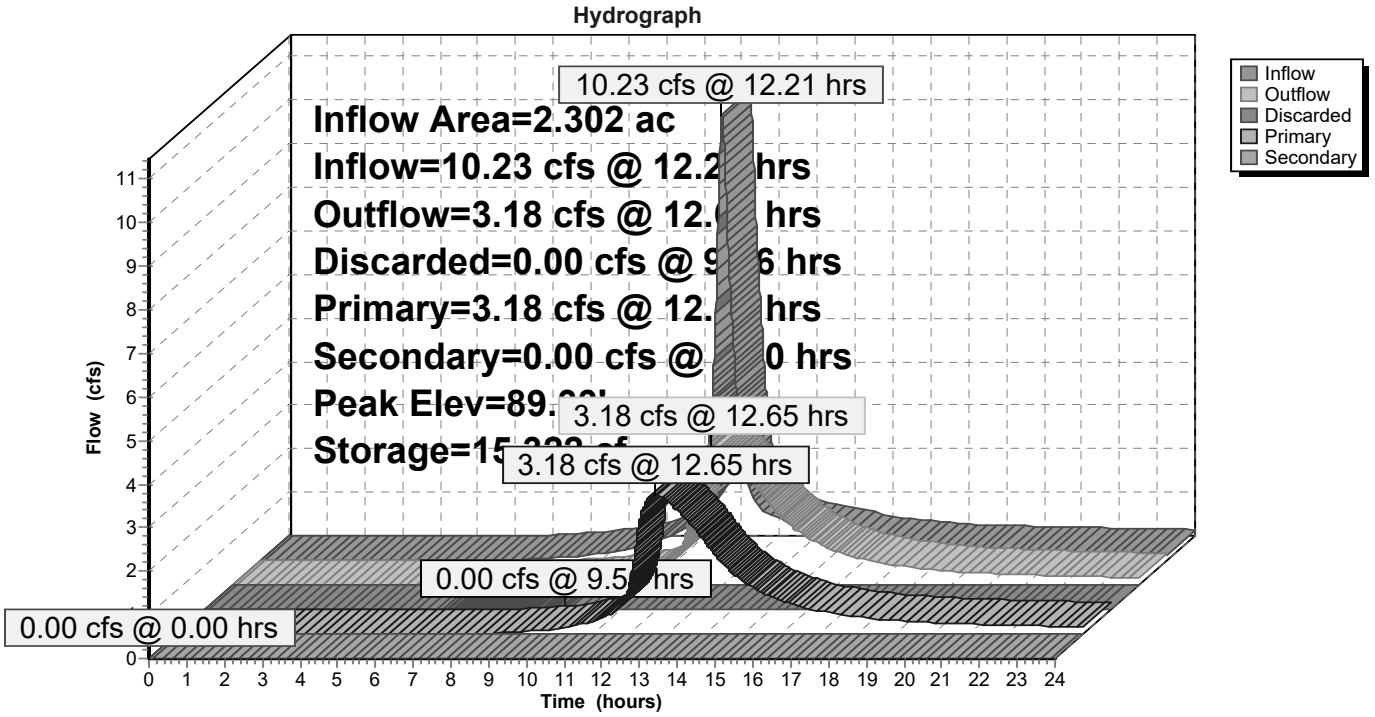
Device	Routing	Invert	Outlet Devices
#1	Primary	88.12'	**12.0" Round 12" HDPE N-12** L= 140.5' Ke= 0.500 Inlet / Outlet Invert= 88.12' / 85.95' S= 0.0154 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	89.50'	**20.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	87.66'	**0.050 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 9.56 hrs HW=88.25' (Free Discharge)
3=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.18 cfs @ 12.65 hrs HW=89.33' TW=86.36' (Dynamic Tailwater)
1=12" HDPE N-12 (Inlet Controls 3.18 cfs @ 4.05 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=87.66' TW=89.50' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Wetland Ponding



Summary for Pond 6P: Driveway Catch Basin (Self-Leaching)

[58] Hint: Peaked 0.28' above defined flood level

Inflow Area = 0.221 ac, 71.22% Impervious, Inflow Depth > 5.47" for 25YR-24HR event
Inflow = 1.05 cfs @ 12.19 hrs, Volume= 0.101 af
Outflow = 1.05 cfs @ 12.20 hrs, Volume= 0.095 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 6.56 hrs, Volume= 0.009 af
Secondary = 1.04 cfs @ 12.20 hrs, Volume= 0.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.14' @ 12.21 hrs Surf.Area= 79 sf Storage= 293 cf
Flood Elev= 91.86' Surf.Area= 79 sf Storage= 243 cf

Plug-Flow detention time= 47.6 min calculated for 0.095 af (94% of inflow)
Center-of-Mass det. time= 16.2 min (809.4 - 793.2)

Volume	Invert	Avail.Storage	Storage Description
#1	85.61'	79 cf	**4.00'D x 6.25'H Vertical Cylinder** Inside #2
#2	85.61'	165 cf	**10.00'D x 6.25'H Vertical Cylinder Stone** 491 cf Overall - 79 cf Embedded = 412 cf x 40.0% Voids
#3	91.86'	353 cf	**Flooding Ponding (Irregular)** Listed below (Recalc) -Impervious
		596 cf	Total Available Storage

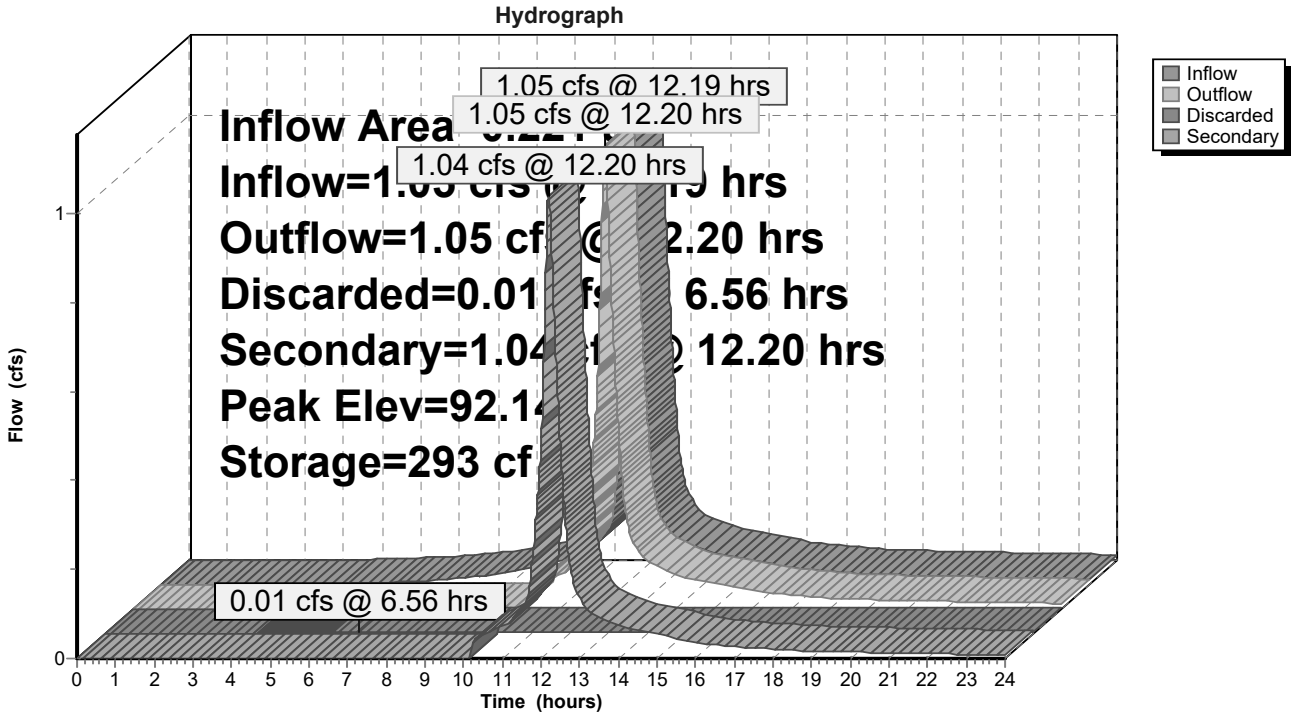
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.86	4	8.0	0	0	4
92.00	187	60.4	10	10	289
92.50	1,364	139.6	343	353	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.61'	**3.000 in/hr Exfiltration over Surface area**
#2	Secondary	92.00'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.01 cfs @ 6.56 hrs HW=85.68' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Secondary OutFlow Max=1.04 cfs @ 12.20 hrs HW=92.14' TW=92.11' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Weir Controls 1.04 cfs @ 0.64 fps)

Pond 6P: Driveway Catch Basin (Self-Leaching)



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>1.64"
Flow Length=131' Tc=20.4 min CN=79 Runoff=1.67 cfs 0.179 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>1.71"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=3.44 cfs 0.328 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>2.63"
Flow Length=214' Tc=6.0 min CN=91 Runoff=1.85 cfs 0.134 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>1.86"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=4.23 cfs 0.309 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>2.35"
Flow Length=197' Tc=14.5 min CN=88 Runoff=0.47 cfs 0.043 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.27' Max Vel=0.39 fps Inflow=1.29 cfs 0.338 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=1.29 cfs 0.337 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=0.00 cfs 0.000 af

Reach 6R: Reach #6 Avg. Flow Depth=0.07' Max Vel=0.96 fps Inflow=0.46 cfs 0.030 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=0.44 cfs 0.030 af

Reach 100R: Reach #100 Inflow=2.45 cfs 0.516 af
Outflow=2.45 cfs 0.516 af

Reach 400R: Reach #400 Inflow=1.85 cfs 0.134 af
Outflow=1.85 cfs 0.134 af

Reach 500R: Final Reach #500 Inflow=4.23 cfs 0.309 af
Outflow=4.23 cfs 0.309 af

Pond 3P: Wetland Ponding Peak Elev=88.72' Storage=5,649 cf Inflow=3.88 cfs 0.358 af
Discarded=0.00 cfs 0.002 af Primary=1.29 cfs 0.338 af Secondary=0.00 cfs 0.000 af Outflow=1.30 cfs 0.341 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.09' Storage=275 cf Inflow=0.47 cfs 0.043 af
Discarded=0.01 cfs 0.007 af Secondary=0.46 cfs 0.030 af Outflow=0.46 cfs 0.038 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>3.17"
Flow Length=131' Tc=20.4 min CN=79 Runoff=3.28 cfs 0.347 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>3.27"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=6.62 cfs 0.627 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>4.41"
Flow Length=214' Tc=6.0 min CN=91 Runoff=3.01 cfs 0.224 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>3.47"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=7.84 cfs 0.575 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>4.08"
Flow Length=197' Tc=14.5 min CN=88 Runoff=0.80 cfs 0.075 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.37' Max Vel=0.49 fps Inflow=2.57 cfs 0.661 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=2.57 cfs 0.659 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=0.00 cfs 0.000 af

Reach 6R: Reach #6 Avg. Flow Depth=0.09' Max Vel=1.14 fps Inflow=0.78 cfs 0.061 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=0.77 cfs 0.061 af

Reach 100R: Reach #100 Inflow=5.20 cfs 1.006 af
Outflow=5.20 cfs 1.006 af

Reach 400R: Reach #400 Inflow=3.01 cfs 0.224 af
Outflow=3.01 cfs 0.224 af

Reach 500R: Final Reach #500 Inflow=7.84 cfs 0.575 af
Outflow=7.84 cfs 0.575 af

Pond 3P: Wetland Ponding Peak Elev=89.08' Storage=10,720 cf Inflow=7.38 cfs 0.688 af
Discarded=0.00 cfs 0.003 af Primary=2.57 cfs 0.661 af Secondary=0.00 cfs 0.000 af Outflow=2.57 cfs 0.663 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.12' Storage=285 cf Inflow=0.80 cfs 0.075 af
Discarded=0.01 cfs 0.008 af Secondary=0.78 cfs 0.061 af Outflow=0.79 cfs 0.069 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>4.47"
Flow Length=131' Tc=20.4 min CN=79 Runoff=4.60 cfs 0.489 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>4.58"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=9.23 cfs 0.878 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>5.83"
Flow Length=214' Tc=6.0 min CN=91 Runoff=3.91 cfs 0.297 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>4.81"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=10.75 cfs 0.796 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>5.47"
Flow Length=197' Tc=14.5 min CN=88 Runoff=1.05 cfs 0.101 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.41' Max Vel=0.52 fps Inflow=3.18 cfs 0.932 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=3.18 cfs 0.930 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=0.00 cfs 0.000 af

Reach 6R: Reach #6 Avg. Flow Depth=0.11' Max Vel=1.24 fps Inflow=1.04 cfs 0.087 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=1.02 cfs 0.086 af

Reach 100R: Reach #100 Inflow=7.17 cfs 1.419 af
Outflow=7.17 cfs 1.419 af

Reach 400R: Reach #400 Inflow=3.91 cfs 0.297 af
Outflow=3.91 cfs 0.297 af

Reach 500R: Final Reach #500 Inflow=10.75 cfs 0.796 af
Outflow=10.75 cfs 0.796 af

Pond 3P: Wetland Ponding Peak Elev=89.33' Storage=15,322 cf Inflow=10.23 cfs 0.965 af
Discarded=0.00 cfs 0.003 af Primary=3.18 cfs 0.932 af Secondary=0.00 cfs 0.000 af Outflow=3.18 cfs 0.934 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.14' Storage=293 cf Inflow=1.05 cfs 0.101 af
Discarded=0.01 cfs 0.009 af Secondary=1.04 cfs 0.087 af Outflow=1.05 cfs 0.095 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>5.70"
Flow Length=131' Tc=20.4 min CN=79 Runoff=5.83 cfs 0.624 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>5.83"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=11.66 cfs 1.117 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>7.15"
Flow Length=214' Tc=6.0 min CN=91 Runoff=4.74 cfs 0.364 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>6.07"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=13.44 cfs 1.006 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>6.78"
Flow Length=197' Tc=14.5 min CN=88 Runoff=1.29 cfs 0.125 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.43' Max Vel=0.54 fps Inflow=3.62 cfs 1.188 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=3.61 cfs 1.186 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.03' Max Vel=0.77 fps Inflow=0.10 cfs 0.002 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=0.09 cfs 0.002 af

Reach 6R: Reach #6 Avg. Flow Depth=0.12' Max Vel=1.32 fps Inflow=1.28 cfs 0.110 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=1.25 cfs 0.110 af

Reach 100R: Reach #100 Inflow=8.82 cfs 1.810 af
Outflow=8.82 cfs 1.810 af

Reach 400R: Reach #400 Inflow=4.74 cfs 0.365 af
Outflow=4.74 cfs 0.365 af

Reach 500R: Final Reach #500 Inflow=13.44 cfs 1.006 af
Outflow=13.44 cfs 1.006 af

Pond 3P: Wetland Ponding Peak Elev=89.53' Storage=19,837 cf Inflow=12.90 cfs 1.227 af
Discarded=0.00 cfs 0.003 af Primary=3.62 cfs 1.188 af Secondary=0.10 cfs 0.002 af Outflow=3.72 cfs 1.193 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.15' Storage=300 cf Inflow=1.29 cfs 0.125 af
Discarded=0.01 cfs 0.009 af Secondary=1.28 cfs 0.110 af Outflow=1.28 cfs 0.119 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=57,211 sf 7.70% Impervious Runoff Depth>7.23"
Flow Length=131' Tc=20.4 min CN=79 Runoff=7.34 cfs 0.792 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 24.10% Impervious Runoff Depth>7.37"
Flow Length=75' Slope=0.0267 '/' Tc=15.4 min UI Adjusted CN=80 Runoff=14.62 cfs 1.413 af

Subcatchment 4S: Subcatchment #4 Runoff Area=26,611 sf 1.92% Impervious Runoff Depth>8.76"
Flow Length=214' Tc=6.0 min CN=91 Runoff=5.75 cfs 0.446 af

Subcatchment 5S: Subcatchment #5 Runoff Area=86,579 sf 14.13% Impervious Runoff Depth>7.63"
Flow Length=534' Tc=6.8 min UI Adjusted CN=82 Runoff=16.71 cfs 1.264 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>8.38"
Flow Length=197' Tc=14.5 min CN=88 Runoff=1.57 cfs 0.155 af

Reach 3aR: Reach #3a Avg. Flow Depth=0.45' Max Vel=0.56 fps Inflow=3.92 cfs 1.414 af
n=0.080 L=100.0' S=0.0045 '/' Capacity=4.99 cfs Outflow=3.91 cfs 1.411 af

Reach 3bR: Reach #3b Avg. Flow Depth=0.16' Max Vel=2.17 fps Inflow=2.66 cfs 0.096 af
n=0.025 L=172.9' S=0.0260 '/' Capacity=30.70 cfs Outflow=2.65 cfs 0.096 af

Reach 6R: Reach #6 Avg. Flow Depth=0.13' Max Vel=1.41 fps Inflow=1.56 cfs 0.139 af
n=0.022 L=175.0' S=0.0114 '/' Capacity=28.91 cfs Outflow=1.54 cfs 0.139 af

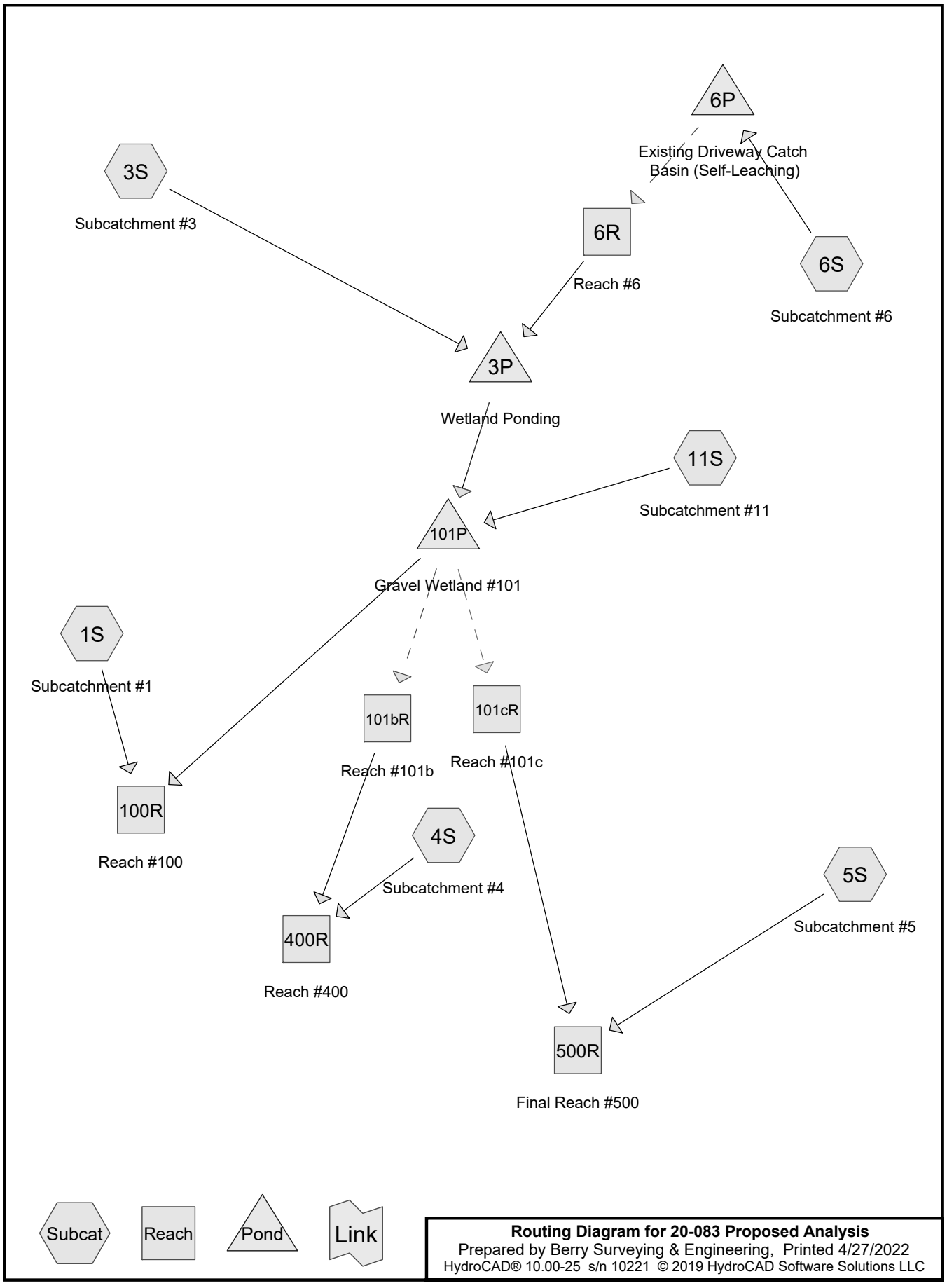
Reach 100R: Reach #100 Inflow=10.71 cfs 2.203 af
Outflow=10.71 cfs 2.203 af

Reach 400R: Reach #400 Inflow=5.75 cfs 0.542 af
Outflow=5.75 cfs 0.542 af

Reach 500R: Final Reach #500 Inflow=16.71 cfs 1.264 af
Outflow=16.71 cfs 1.264 af

Pond 3P: Wetland Ponding Peak Elev=89.69' Storage=23,509 cf Inflow=16.14 cfs 1.552 af
Discarded=0.00 cfs 0.003 af Primary=3.92 cfs 1.414 af Secondary=2.66 cfs 0.096 af Outflow=6.58 cfs 1.513 af

Pond 6P: Driveway Catch Basin (Self-Leaching) Peak Elev=92.17' Storage=309 cf Inflow=1.57 cfs 0.155 af
Discarded=0.01 cfs 0.009 af Secondary=1.56 cfs 0.139 af Outflow=1.57 cfs 0.149 af



Routing Diagram for 20-083 Proposed Analysis
Prepared by Berry Surveying & Engineering, Printed 4/27/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.235	39	>75% Grass cover, Good, HSG A (3S, 5S, 6S, 11S)
0.512	61	>75% Grass cover, Good, HSG B (1S, 3S, 4S, 5S, 6S, 11S)
0.001	74	>75% Grass cover, Good, HSG C (1S)
0.570	80	>75% Grass cover, Good, HSG D (1S, 3S, 4S, 11S)
0.185	96	Gravel surface, HSG A (3S, 6S, 11S)
1.933	96	Gravel surface, HSG B (1S, 3S, 11S)
0.096	96	Gravel surface, HSG C (1S, 3S, 11S)
0.035	96	Gravel surface, HSG D (1S, 3S)
0.062	98	Paved parking, HSG B (6S)
0.101	98	Paved parking, HSG D (1S)
0.181	98	Unconnected pavement, HSG A (3S, 6S, 11S)
0.592	98	Unconnected pavement, HSG B (3S, 11S)
0.234	98	Unconnected pavement, HSG D (3S)
0.347	98	Unconnected roofs, HSG B (3S, 11S)
0.562	30	Woods, Good, HSG A (5S)
0.290	55	Woods, Good, HSG B (1S, 3S, 4S, 5S)
0.030	70	Woods, Good, HSG C (1S, 3S)
0.467	77	Woods, Good, HSG D (1S, 3S, 4S, 5S)
6.435	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.163	HSG A	3S, 5S, 6S, 11S
3.737	HSG B	1S, 3S, 4S, 5S, 6S, 11S
0.128	HSG C	1S, 3S, 11S
1.407	HSG D	1S, 3S, 4S, 5S, 11S
0.000	Other	
6.435		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.235	0.512	0.001	0.570	0.000	1.318	>75% Grass cover, Good	1S, 3S, 4S, 5S, 6S, 11S
0.185	1.933	0.096	0.035	0.000	2.249	Gravel surface	1S, 3S, 6S, 11S
0.000	0.062	0.000	0.101	0.000	0.163	Paved parking	1S, 6S
0.181	0.592	0.000	0.234	0.000	1.008	Unconnected pavement	3S, 6S, 11S
0.000	0.347	0.000	0.000	0.000	0.347	Unconnected roofs	3S, 11S
0.562	0.290	0.030	0.467	0.000	1.350	Woods, Good	1S, 3S, 4S, 5S
1.163	**3.737**	**0.128**	**1.407**	**0.000**	**6.435**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	88.12	87.25	125.0	0.0070	0.012	12.0	0.0	0.0
2	101P	86.67	86.50	14.5	0.0117	0.012	12.0	0.0	0.0
3	101P	88.25	88.25	14.0	0.0000	0.012	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>4.58"
Flow Length=90' Tc=15.5 min CN=80 Runoff=2.79 cfs 0.266 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>5.47"
Flow Length=178' Tc=14.6 min CN=88 Runoff=10.90 cfs 1.050 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>3.00"
Flow Length=113' Tc=21.8 min CN=65 Runoff=0.63 cfs 0.070 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth>0.29"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.03 cfs 0.016 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>5.48"
Flow Length=182' Tc=13.0 min CN=88 Runoff=1.09 cfs 0.101 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>5.48"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=13.99 cfs 1.038 af

Reach 6R: Reach #6 Avg. Flow Depth=0.20' Max Vel=0.46 fps Inflow=1.04 cfs 0.086 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=0.96 cfs 0.086 af

Reach 100R: Reach #100 Inflow=5.21 cfs 1.309 af
Outflow=5.21 cfs 1.309 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.18' Max Vel=1.82 fps Inflow=2.66 cfs 0.803 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=2.66 cfs 0.803 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.12' Max Vel=1.50 fps Inflow=1.23 cfs 0.037 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=1.22 cfs 0.037 af

Reach 400R: Reach #400 Inflow=3.23 cfs 0.873 af
Outflow=3.23 cfs 0.873 af

Reach 500R: Final Reach #500 Inflow=1.23 cfs 0.053 af
Outflow=1.23 cfs 0.053 af

Pond 3P: Wetland Ponding Peak Elev=89.68' Storage=23,104 cf Inflow=11.80 cfs 1.135 af
Discarded=0.00 cfs 0.003 af Primary=1.82 cfs 0.847 af Secondary=3.61 cfs 0.193 af Outflow=4.57 cfs 1.044 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.31' Storage=391 cf Inflow=1.09 cfs 0.101 af
Discarded=0.01 cfs 0.009 af Secondary=1.04 cfs 0.086 af Outflow=1.04 cfs 0.094 af

Pond 101P: Gravel Wetland #101 Peak Elev=89.57' Storage=20,072 cf Inflow=13.99 cfs 2.079 af
Primary=3.24 cfs 1.043 af Secondary=2.66 cfs 0.803 af Tertiary=1.23 cfs 0.037 af Outflow=7.13 cfs 1.883 af

Total Runoff Area = 6.435 ac Runoff Volume = 2.540 af Average Runoff Depth = 4.74"
76.39% Pervious = 4.916 ac 23.61% Impervious = 1.519 ac

Summary for Subcatchment 1S: Subcatchment #1

CarlsonPlanXYPos|1184131.4605|246470.6080|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

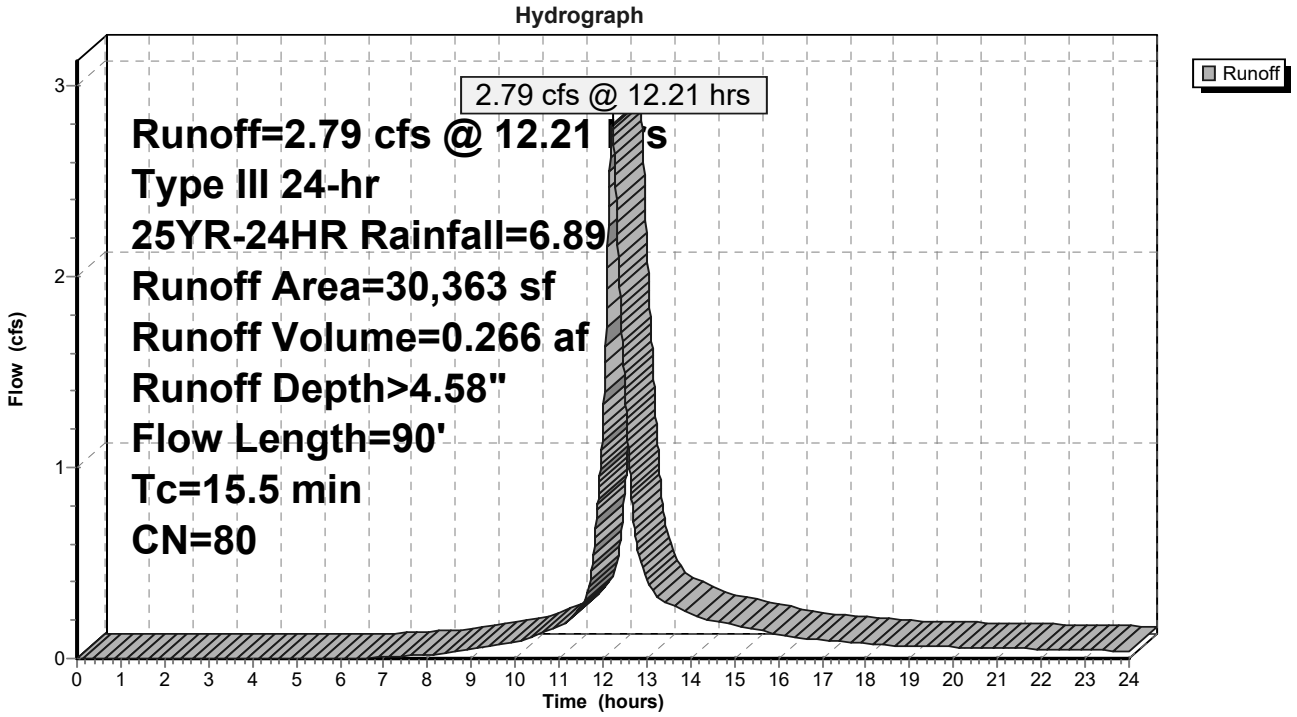
Runoff = 2.79 cfs @ 12.21 hrs, Volume= 0.266 af, Depth> 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
751	55	Woods, Good, HSG B
1,205	70	Woods, Good, HSG C
10,206	77	Woods, Good, HSG D
1,563	61	>75% Grass cover, Good, HSG B
63	74	>75% Grass cover, Good, HSG C
10,947	80	>75% Grass cover, Good, HSG D
4,405	98	Paved parking, HSG D
866	96	Gravel surface, HSG B
108	96	Gravel surface, HSG C
249	96	Gravel surface, HSG D
30,363	80	Weighted Average
25,958		85.49% Pervious Area
4,405		14.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	43	0.0700	0.11		**Sheet Flow, Segment #1** Woods: Light underbrush n= 0.400 P2= 3.13"
8.8	47	0.0426	0.09		**Sheet Flow, Segment #2** Woods: Light underbrush n= 0.400 P2= 3.13"
15.5	90	Total			

Subcatchment 1S: Subcatchment #1



Summary for Subcatchment 3S: Subcatchment #3

CarlsonPlanXYPos|1184417.2870|246737.1339|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

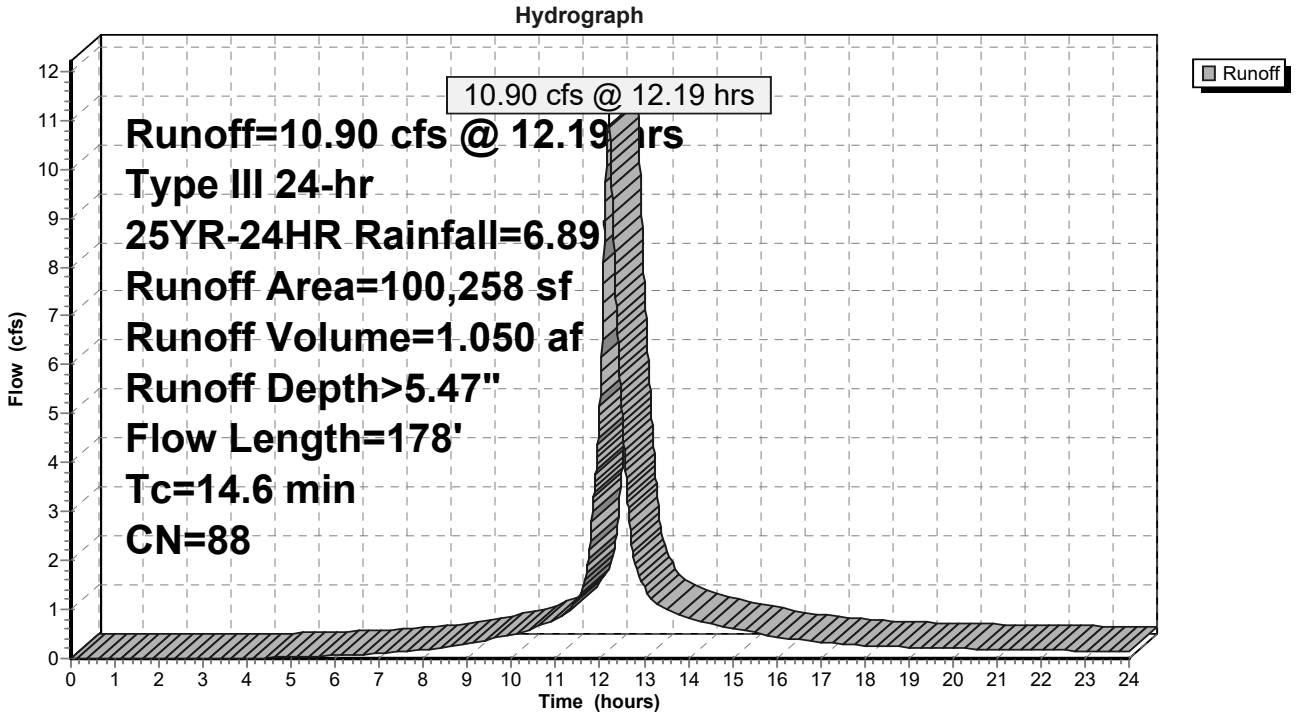
Runoff = 10.90 cfs @ 12.19 hrs, Volume= 1.050 af, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
1,681	39	>75% Grass cover, Good, HSG A
490	98	Unconnected pavement, HSG A
90	96	Gravel surface, HSG A
3,367	98	Unconnected roofs, HSG B
5,002	55	Woods, Good, HSG B
6,900	61	>75% Grass cover, Good, HSG B
17,420	98	Unconnected pavement, HSG B
34,709	96	Gravel surface, HSG B
107	70	Woods, Good, HSG C
2,991	96	Gravel surface, HSG C
10,776	80	>75% Grass cover, Good, HSG D
10,214	98	Unconnected pavement, HSG D
1,256	96	Gravel surface, HSG D
5,255	77	Woods, Good, HSG D
100,258	88	Weighted Average
68,767		68.59% Pervious Area
31,491		31.41% Impervious Area
31,491		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow, Segment #1** Grass: Short n= 0.150 P2= 3.13"
0.5	34	0.0293	1.20		**Shallow Concentrated Flow, Segment #2** Short Grass Pasture Kv= 7.0 fps
1.0	44	0.0228	0.75		**Shallow Concentrated Flow, Segment #3** Woodland Kv= 5.0 fps
14.6	178	Total			

Subcatchment 3S: Subcatchment #3



Summary for Subcatchment 4S: Subcatchment #4

CarlsonPlanXYPos|1184429.8280|246621.8224|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

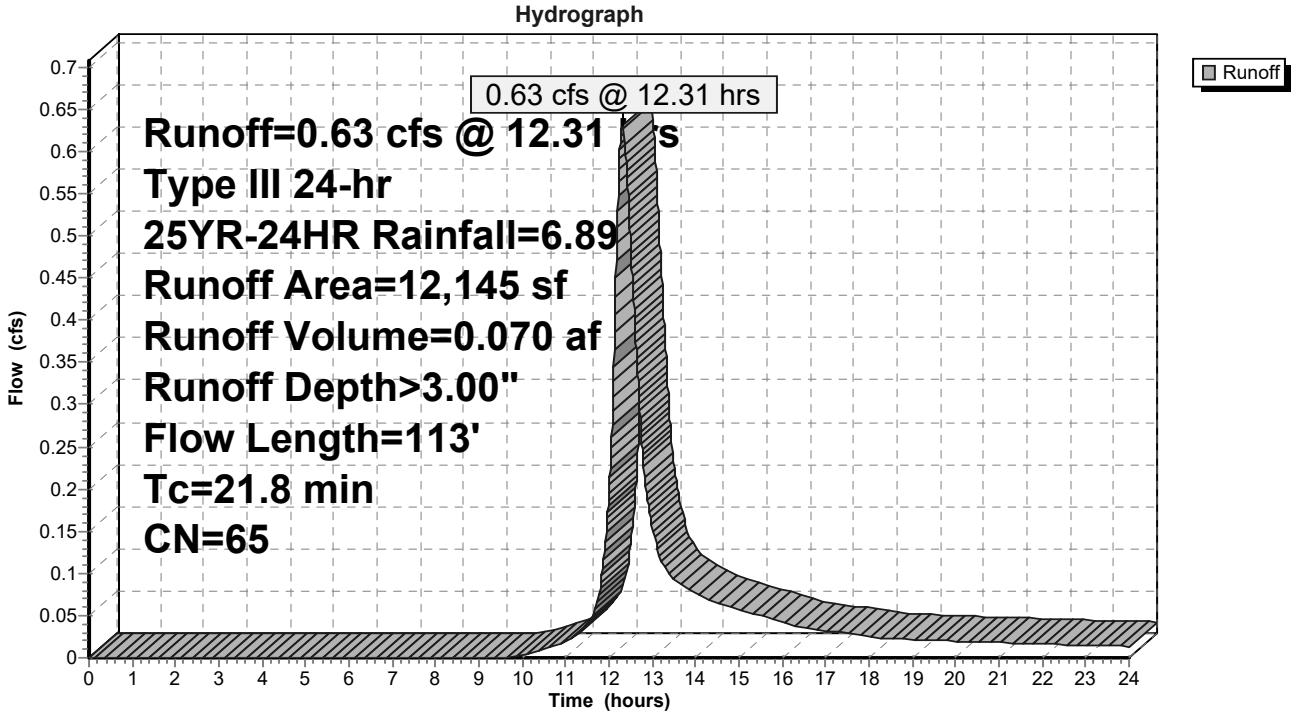
Runoff = 0.63 cfs @ 12.31 hrs, Volume= 0.070 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
1,425	61	>75% Grass cover, Good, HSG B
148	80	>75% Grass cover, Good, HSG D
5,702	55	Woods, Good, HSG B
4,870	77	Woods, Good, HSG D
12,145	65	Weighted Average
12,145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	94	0.0179	0.07		**Sheet Flow, Segment #1** Woods: Light underbrush n= 0.400 P2= 3.13"
0.2	19	0.1561	1.98		**Shallow Concentrated Flow, Segment #2** Woodland Kv= 5.0 fps
21.8	113	Total			

Subcatchment 4S: Subcatchment #4



Summary for Subcatchment 5S: Subcatchment #5

CarlsonPlanXYPos|1184708.1212|246526.5243|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

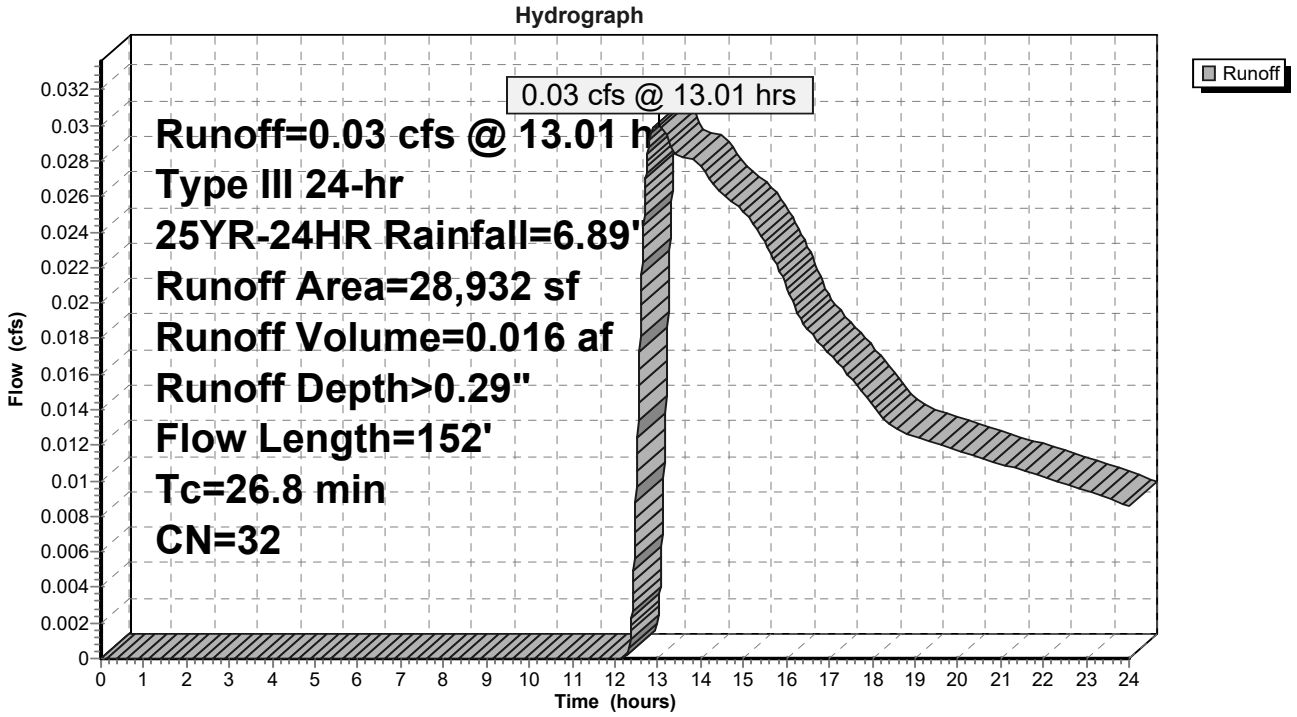
Runoff = 0.03 cfs @ 13.01 hrs, Volume= 0.016 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
2,933	39	>75% Grass cover, Good, HSG A
24,485	30	Woods, Good, HSG A
311	61	>75% Grass cover, Good, HSG B
1,175	55	Woods, Good, HSG B
28	77	Woods, Good, HSG D
28,932	32	Weighted Average
28,932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.2	100	0.0125	0.06		**Sheet Flow, Segment #1** Woods: Light underbrush n= 0.400 P2= 3.13"
0.6	52	0.0770	1.39		**Shallow Concentrated Flow, Segment #2** Woodland Kv= 5.0 fps
26.8	152	Total			

Subcatchment 5S: Subcatchment #5



Summary for Subcatchment 6S: Subcatchment #6

CarlsonPlanXYPos|1184661.9163|246992.9891|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

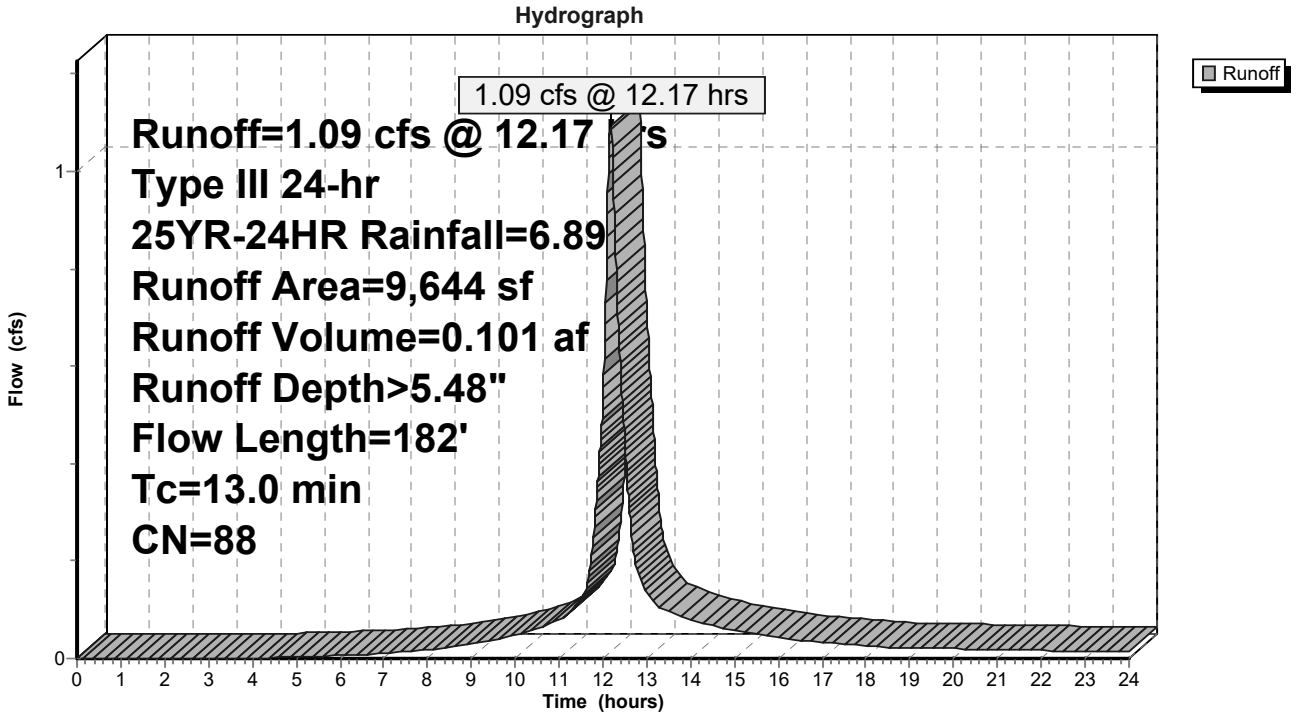
Runoff = 1.09 cfs @ 12.17 hrs, Volume= 0.101 af, Depth> 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Description
1,477	39	>75% Grass cover, Good, HSG A
4,157	98	Unconnected pavement, HSG A
1,000	96	Gravel surface, HSG A
299	61	>75% Grass cover, Good, HSG B
2,711	98	Paved parking, HSG B
9,644	88	Weighted Average
2,776		28.78% Pervious Area
6,868		71.22% Impervious Area
4,157		60.53% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	96	0.0104	0.13		**Sheet Flow, Segment #1** Grass: Short n= 0.150 P2= 3.13"
0.5	86	0.0232	3.09		**Shallow Concentrated Flow, Segment #2** Paved Kv= 20.3 fps
13.0	182	Total			

Subcatchment 6S: Subcatchment #6



Summary for Subcatchment 11S: Subcatchment #11

CarlsonPlanXYPos|1184417.2870|246737.1339|
CarlsonSurface|M:\Office Network\2020 Projects\20-083 Madbury - LandCare Associates\DTM\TIN\Existing\20-083 TIN.tin|

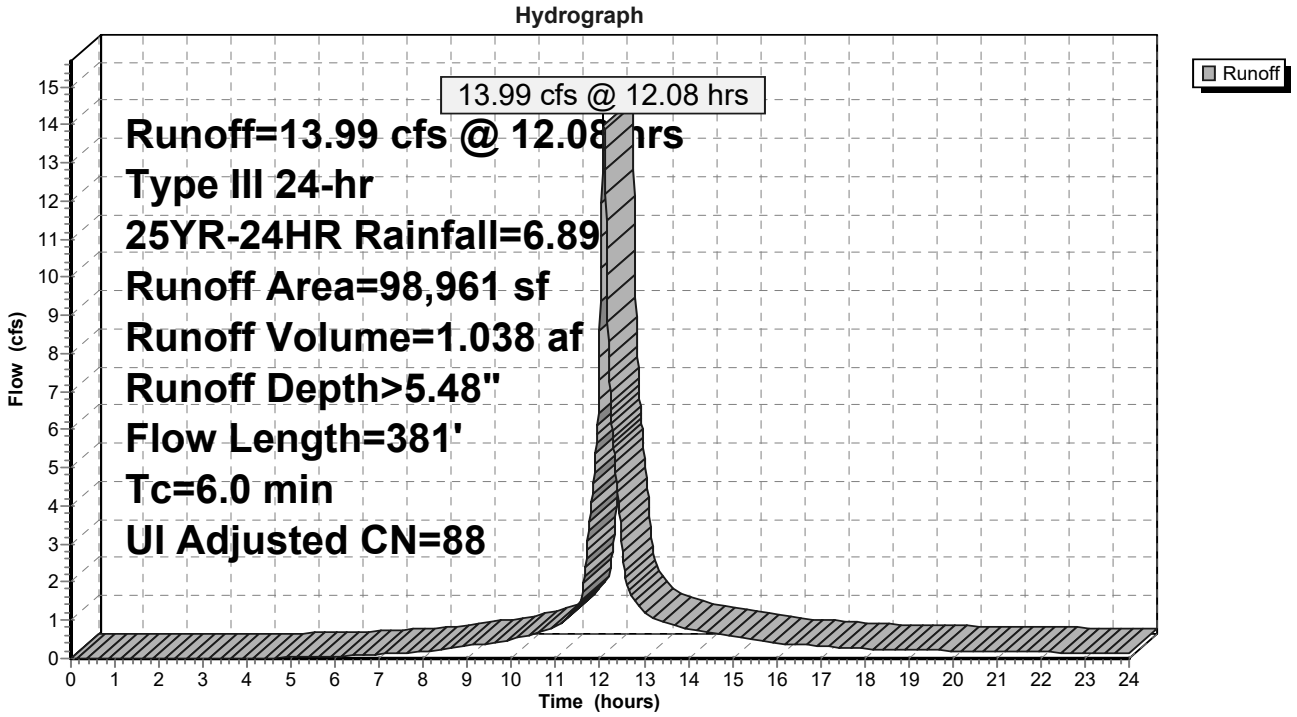
Runoff = 13.99 cfs @ 12.08 hrs, Volume= 1.038 af, Depth> 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-24HR Rainfall=6.89"

Area (sf)	CN	Adj	Description
4,139	39		>75% Grass cover, Good, HSG A
6,955	96		Gravel surface, HSG A
3,247	98		Unconnected pavement, HSG A
11,768	98		Unconnected roofs, HSG B
11,800	61		>75% Grass cover, Good, HSG B
8,387	98		Unconnected pavement, HSG B
48,639	96		Gravel surface, HSG B
1,083	96		Gravel surface, HSG C
2,943	80		>75% Grass cover, Good, HSG D
98,961	89	88	Weighted Average, UI Adjusted
75,559			76.35% Pervious Area
23,402			23.65% Impervious Area
23,402			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	100	0.0025	0.59		**Sheet Flow, Segment #1** Smooth surfaces n= 0.011 P2= 3.13"
0.8	115	0.0152	2.50		**Shallow Concentrated Flow, Segment #2** Paved Kv= 20.3 fps
1.8	166	0.0060	1.57		**Shallow Concentrated Flow, Segment #3** Paved Kv= 20.3 fps
5.4	381	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: Subcatchment #11



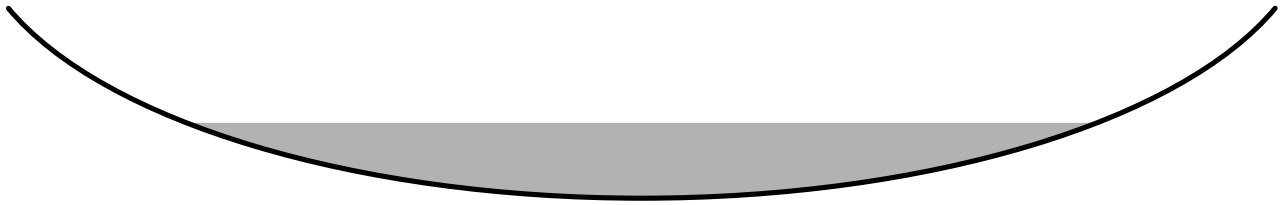
Summary for Reach 6R: Reach #6

Inflow = 1.04 cfs @ 12.19 hrs, Volume= 0.086 af
Outflow = 0.96 cfs @ 12.25 hrs, Volume= 0.086 af, Atten= 8%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.46 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 13.7 min

Peak Storage= 299 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 0.50' Flow Area= 8.3 sf, Capacity= 7.13 cfs

25.00' x 0.50' deep Parabolic Channel, n= 0.022 Earth, clean & straight
Length= 144.0' Slope= 0.0007 '/'
Inlet Invert= 92.10', Outlet Invert= 92.00'



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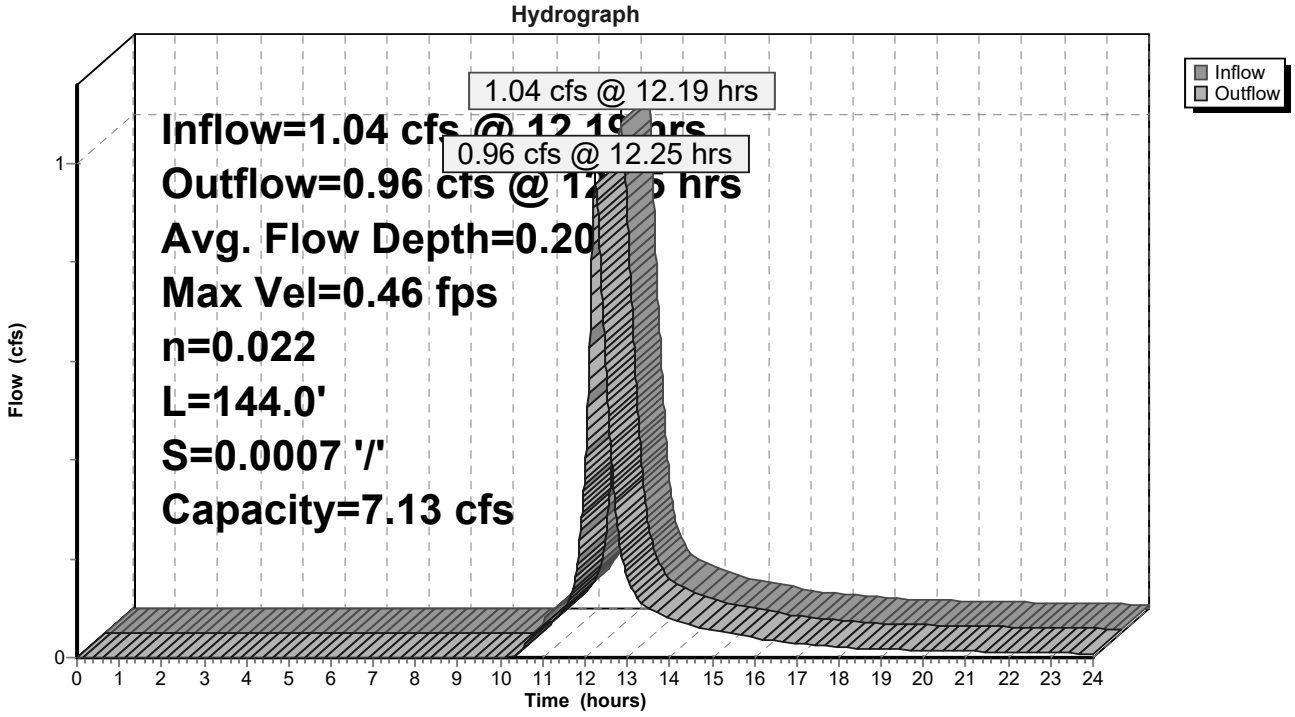
Reach 6R: Reach #6



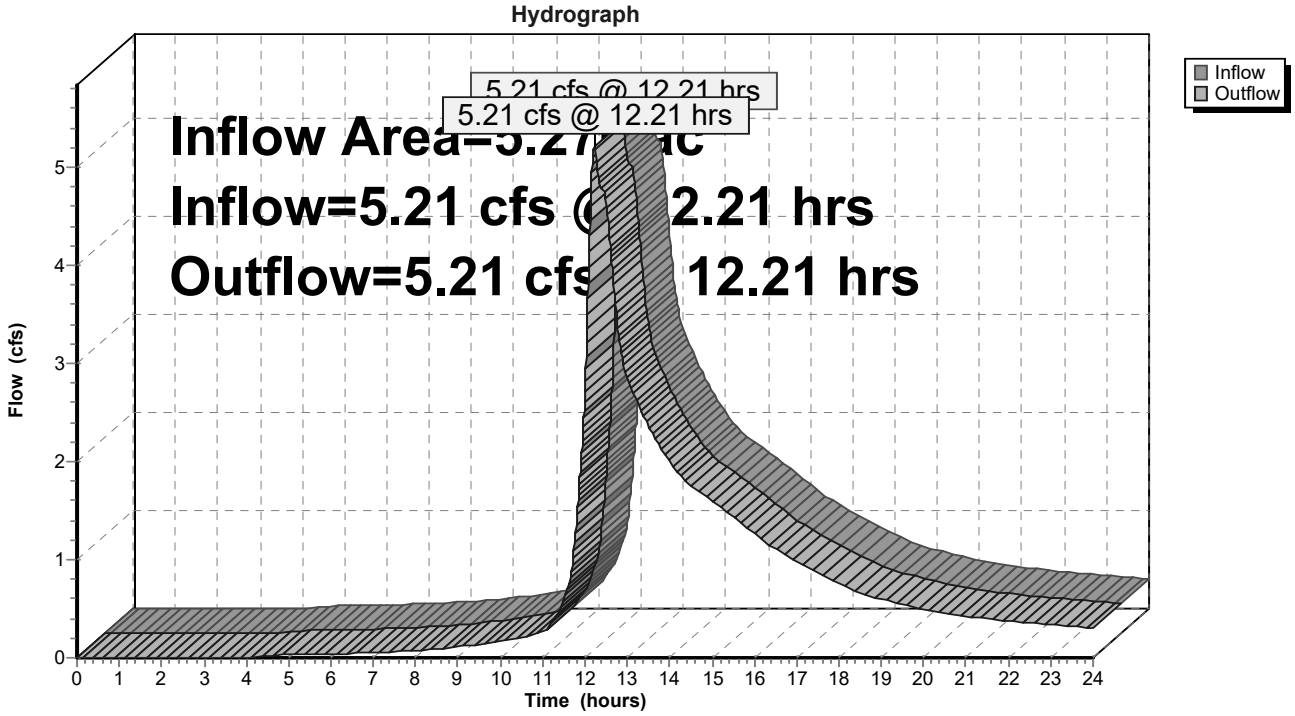
Summary for Reach 100R: Reach #100

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.270 ac, 25.83% Impervious, Inflow Depth > 2.98" for 25YR-24HR event
Inflow = 5.21 cfs @ 12.21 hrs, Volume= 1.309 af
Outflow = 5.21 cfs @ 12.21 hrs, Volume= 1.309 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 100R: Reach #100



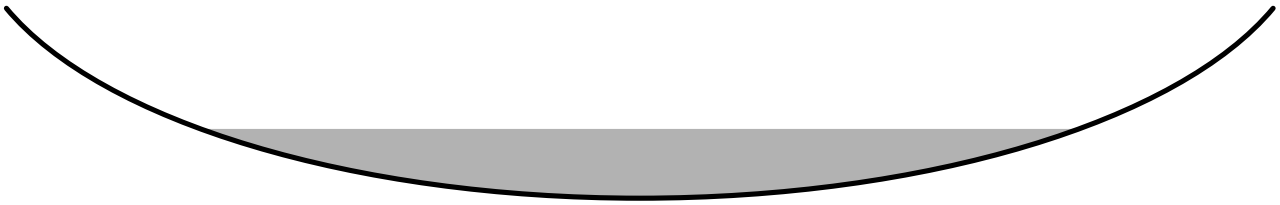
Summary for Reach 101bR: Reach #101b

Inflow = 2.66 cfs @ 12.53 hrs, Volume= 0.803 af
Outflow = 2.66 cfs @ 12.53 hrs, Volume= 0.803 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.82 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 0.7 min

Peak Storage= 72 cf @ 12.53 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 0.50' Flow Area= 6.7 sf, Capacity= 23.78 cfs

20.00' x 0.50' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 49.0' Slope= 0.0306 '/'
Inlet Invert= 88.25', Outlet Invert= 86.75'



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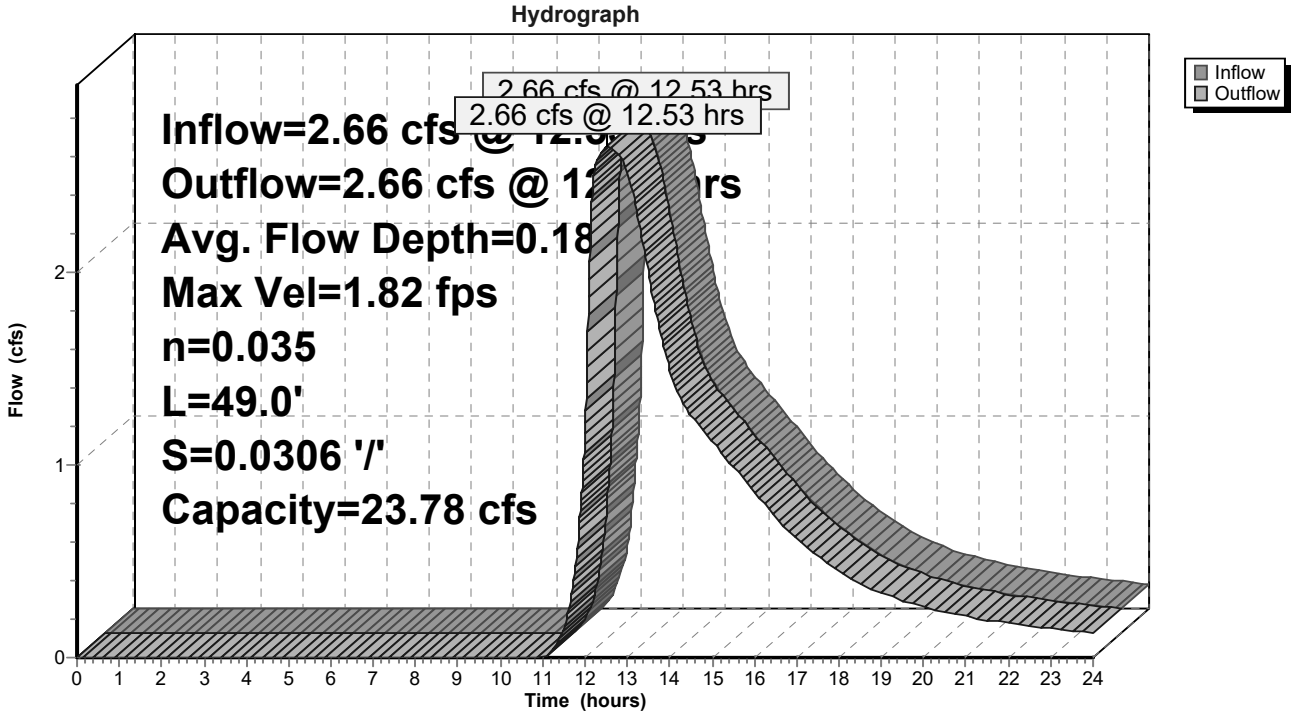
Reach 101bR: Reach #101b



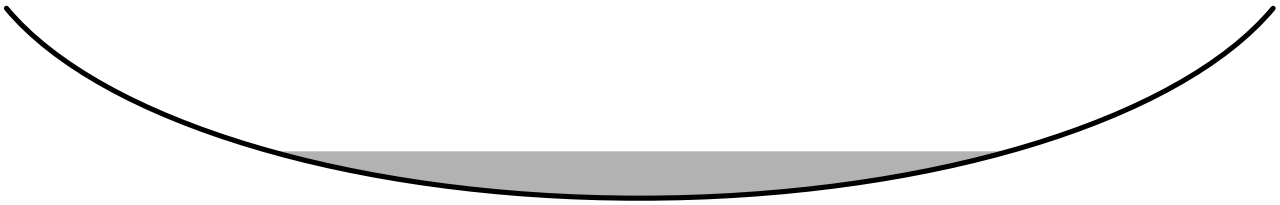
Summary for Reach 101cR: Reach #101c

Inflow = 1.23 cfs @ 12.53 hrs, Volume= 0.037 af
Outflow = 1.22 cfs @ 12.54 hrs, Volume= 0.037 af, Atten= 1%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.50 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 4.4 min

Peak Storage= 117 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.50' Flow Area= 6.7 sf, Capacity= 25.38 cfs

20.00' x 0.50' deep Parabolic Channel, n= 0.035
Length= 143.4' Slope= 0.0349 '/'
Inlet Invert= 89.00', Outlet Invert= 84.00'



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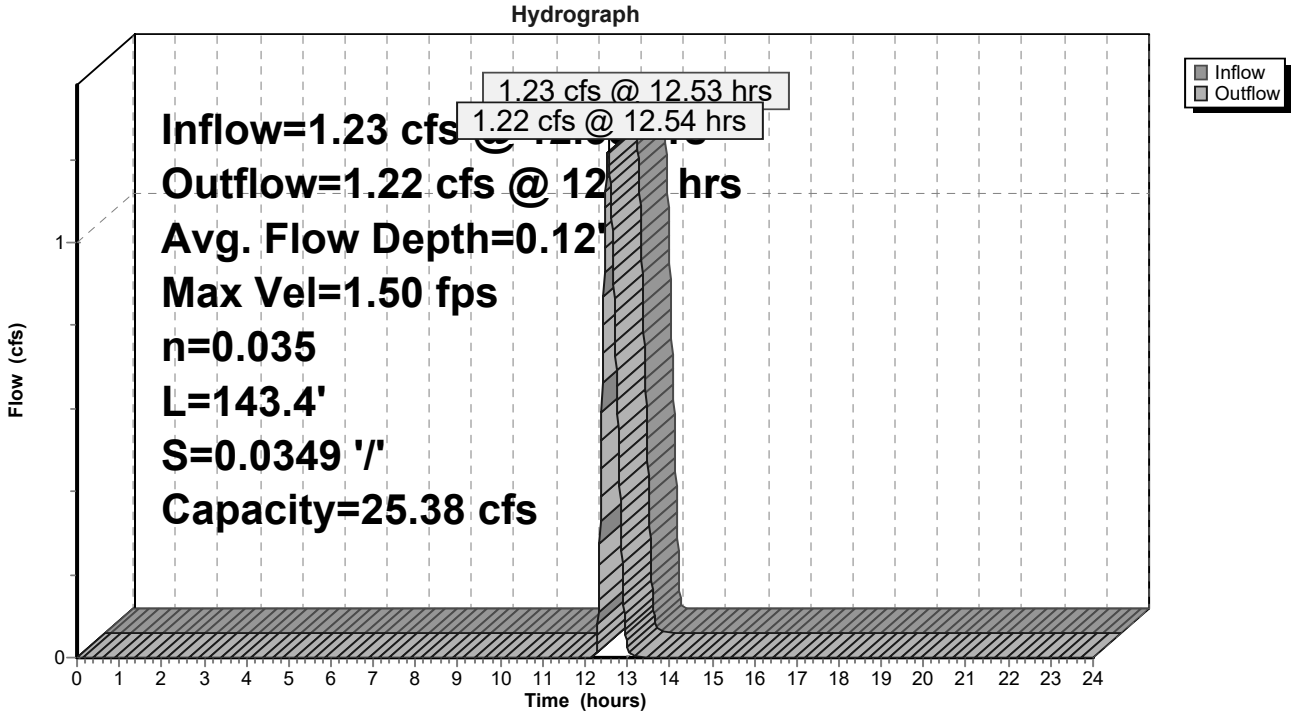
Reach 101cR: Reach #101c



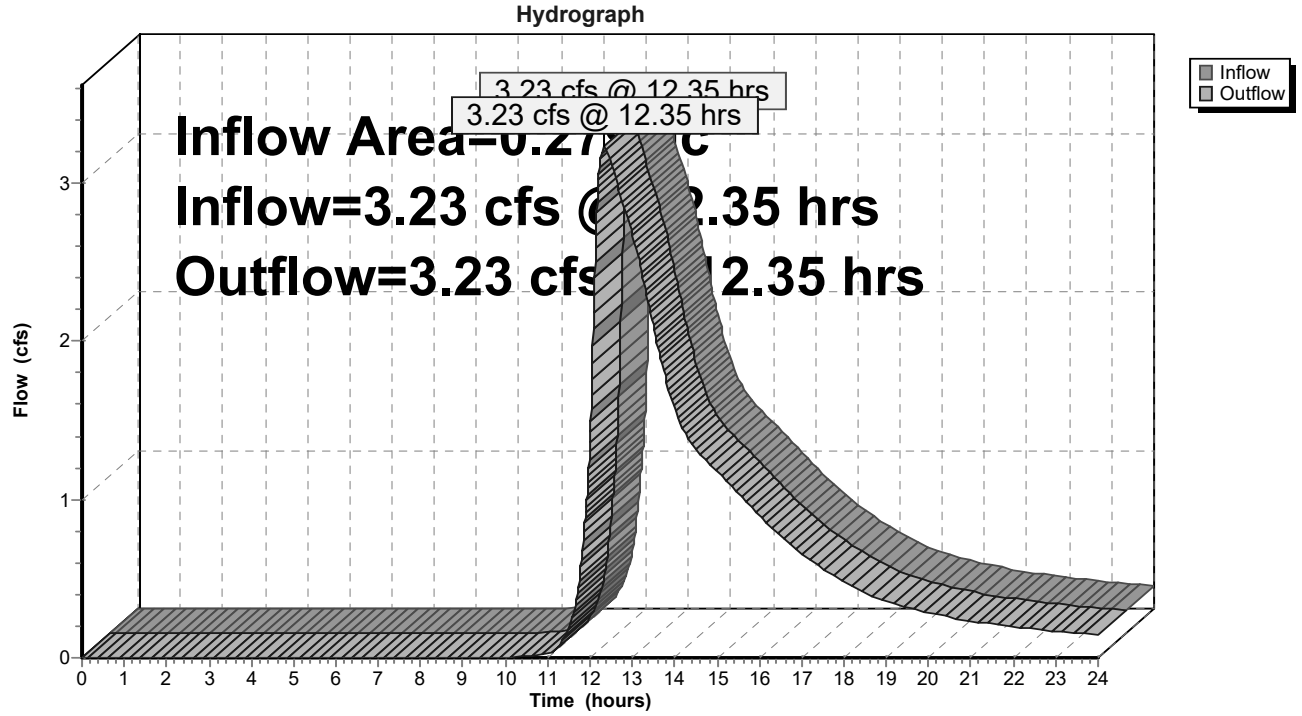
Summary for Reach 400R: Reach #400

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.279 ac, 0.00% Impervious, Inflow Depth > 37.57" for 25YR-24HR event
Inflow = 3.23 cfs @ 12.35 hrs, Volume= 0.873 af
Outflow = 3.23 cfs @ 12.35 hrs, Volume= 0.873 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 400R: Reach #400



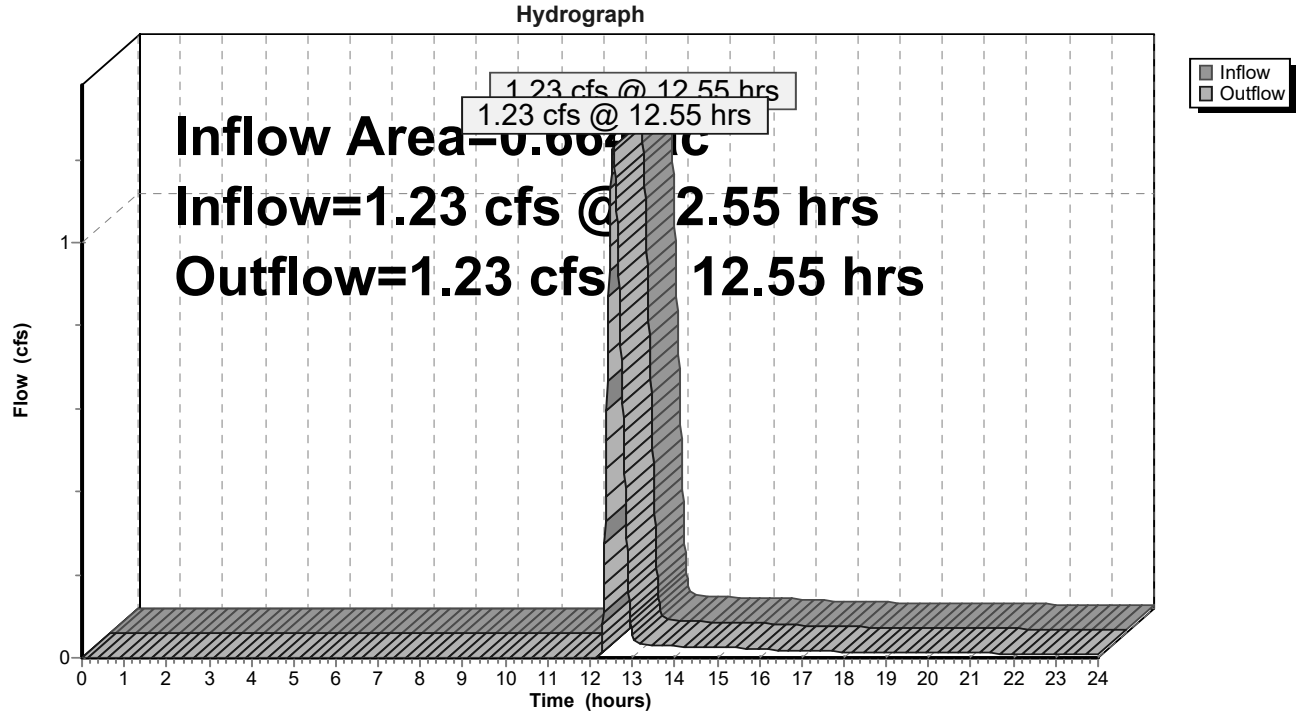
Summary for Reach 500R: Final Reach #500

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.664 ac, 0.00% Impervious, Inflow Depth > 0.96" for 25YR-24HR event
Inflow = 1.23 cfs @ 12.55 hrs, Volume= 0.053 af
Outflow = 1.23 cfs @ 12.55 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Reach 500R: Final Reach #500



Summary for Pond 3P: Wetland Ponding

Inflow Area = 2.302 ac, 31.41% Impervious, Inflow Depth > 5.92" for 25YR-24HR event
Inflow = 11.80 cfs @ 12.20 hrs, Volume= 1.135 af
Outflow = 4.57 cfs @ 12.58 hrs, Volume= 1.044 af, Atten= 61%, Lag= 22.7 min
Discarded = 0.00 cfs @ 7.93 hrs, Volume= 0.003 af
Primary = 1.82 cfs @ 14.38 hrs, Volume= 0.847 af
Secondary = 3.61 cfs @ 12.57 hrs, Volume= 0.193 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.68' @ 12.56 hrs Surf.Area= 1,720 sf Storage= 23,104 cf
Flood Elev= 90.00' Surf.Area= 1,720 sf Storage= 30,564 cf

Plug-Flow detention time= 157.8 min calculated for 1.043 af (92% of inflow)
Center-of-Mass det. time= 117.3 min (912.1 - 794.8)

Volume	Invert	Avail.Storage	Storage Description
#1	88.12'	30,193 cf	**Open Water (Irregular)**Listed below (Recalc) -Impervious
#2	87.66'	371 cf	**Exfil Area (Irregular)**Listed below (Recalc)
		30,564 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.12	4	10.9	0	0	4
88.25	8,542	528.0	378	378	22,179
89.00	15,213	723.8	8,789	9,167	41,690
89.50	23,054	802.7	9,499	18,666	51,282
90.00	23,054	802.7	11,527	30,193	51,683

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.66	15	20.0	0	0	15
88.00	645	142.0	86	86	1,588
88.25	1,720	208.0	285	371	3,427

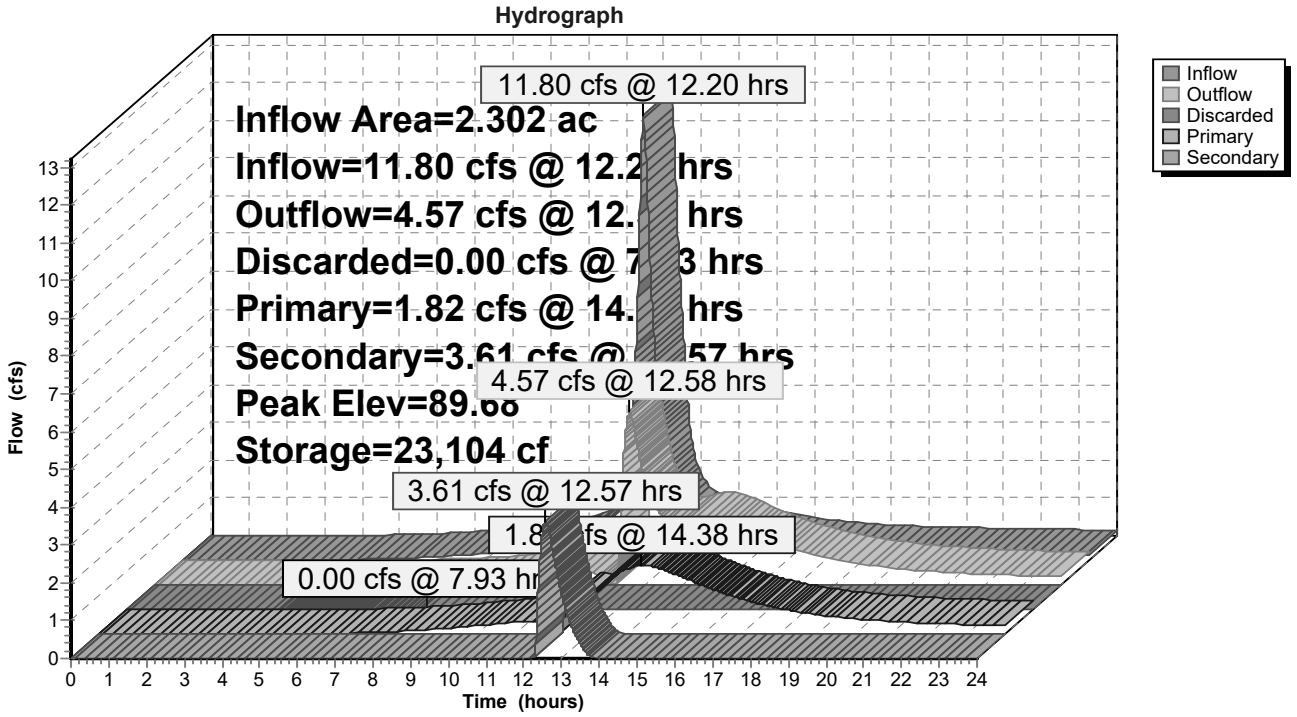
Device	Routing	Invert	Outlet Devices
#1	Primary	88.12'	**12.0" Round 12" HDPE N-12** L= 125.0' Ke= 0.500 Inlet / Outlet Invert= 88.12' / 87.25' S= 0.0070 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	89.50'	**20.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	87.66'	**0.050 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 7.93 hrs HW=88.25' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.82 cfs @ 14.38 hrs HW=89.42' TW=89.05' (Dynamic Tailwater)
↑└**1=12" HDPE N-12** (Outlet Controls 1.82 cfs @ 2.33 fps)

Secondary OutFlow Max=3.61 cfs @ 12.57 hrs HW=89.68' TW=89.56' (Dynamic Tailwater)
↑└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.61 cfs @ 1.02 fps)

Pond 3P: Wetland Ponding



Summary for Pond 6P: Existing Driveway Catch Basin (Self-Leaching)

Inflow Area = 0.221 ac, 71.22% Impervious, Inflow Depth > 5.48" for 25YR-24HR event
Inflow = 1.09 cfs @ 12.17 hrs, Volume= 0.101 af
Outflow = 1.04 cfs @ 12.19 hrs, Volume= 0.094 af, Atten= 5%, Lag= 0.8 min
Discarded = 0.01 cfs @ 6.53 hrs, Volume= 0.009 af
Secondary = 1.04 cfs @ 12.19 hrs, Volume= 0.086 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 92.31' @ 12.23 hrs Surf.Area= 79 sf Storage= 391 cf

Plug-Flow detention time= 53.8 min calculated for 0.094 af (93% of inflow)
Center-of-Mass det. time= 19.3 min (811.3 - 792.0)

Volume	Invert	Avail.Storage	Storage Description
#1	85.61'	79 cf	**4.00'D x 6.25'H Vertical Cylinder** Inside #2
#2	85.61'	165 cf	**10.00'D x 6.25'H Vertical Cylinder Stone** 491 cf Overall - 79 cf Embedded = 412 cf x 40.0% Voids
#3	91.86'	353 cf	**Flooding Ponding (Irregular)** Listed below (Recalc) -Impervious
		596 cf	Total Available Storage

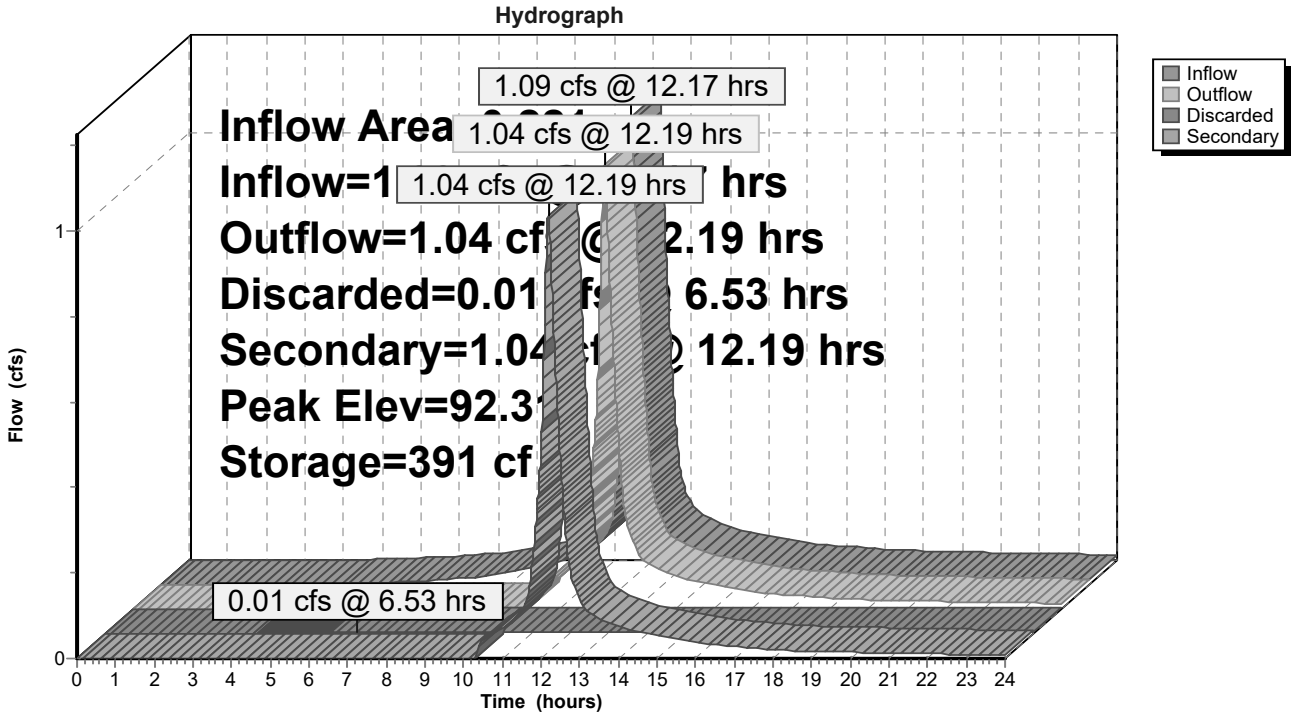
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.86	4	8.0	0	0	4
92.00	187	60.4	10	10	289
92.50	1,364	139.6	343	353	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.61'	**3.000 in/hr Exfiltration over Surface area**
#2	Secondary	92.10'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.01 cfs @ 6.53 hrs HW=85.68' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Secondary OutFlow Max=1.05 cfs @ 12.19 hrs HW=92.30' TW=92.29' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.05 cfs @ 0.44 fps)

Pond 6P: Existing Driveway Catch Basin (Self-Leaching)



Summary for Pond 101P: Gravel Wetland #101

[80] Warning: Exceeded Pond 3P by 0.17' @ 12.14 hrs (1.24 cfs 0.023 af)
[80] Warning: Exceeded Pond 3P by 0.08' @ 12.24 hrs (0.01 cfs 0.000 af)

Inflow Area = 4.573 ac, 27.55% Impervious, Inflow Depth > 5.45" for 25YR-24HR event
Inflow = 13.99 cfs @ 12.08 hrs, Volume= 2.079 af
Outflow = 7.13 cfs @ 12.53 hrs, Volume= 1.883 af, Atten= 49%, Lag= 26.4 min
Primary = 3.24 cfs @ 12.53 hrs, Volume= 1.043 af
Secondary = 2.66 cfs @ 12.53 hrs, Volume= 0.803 af
Tertiary = 1.23 cfs @ 12.53 hrs, Volume= 0.037 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.57' @ 12.53 hrs Surf.Area= 21,342 sf Storage= 20,072 cf
Flood Elev= 90.00' Surf.Area= 31,965 sf Storage= 28,334 cf

Plug-Flow detention time= 99.3 min calculated for 1.882 af (91% of inflow)
Center-of-Mass det. time= 54.7 min (904.0 - 849.3)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	1,871 cf	**Gravel Wetland Cell #1 (Irregular)**Listed below (Recalc)
#2	87.00'	1,863 cf	**Gravel Wetland Cell #2 (Irregular)**Listed below (Recalc)
#3	86.67'	31 cf	**4.00'D x 2.48'H Outlet Structure**
#4	87.00'	2,699 cf	**Sediment Forebay (Irregular)**Listed below (Recalc)
#5	88.25'	21,869 cf	**Open Water Storage (Irregular)**Listed below (Recalc)
		28,334 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	1,215	144.7	0	0	1,215
88.00	1,671	161.3	1,437	1,437	1,647
88.25	1,801	166.9	434	1,871	1,799

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	1,163	159.0	0	0	1,163
88.00	1,695	177.7	1,421	1,421	1,692
88.25	1,848	184.0	443	1,863	1,878

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	389	79.1	0	0	389
87.25	1,229	158.5	192	192	1,891
87.50	1,966	270.7	396	588	5,723
88.00	3,121	472.7	1,261	1,849	17,674
88.25	3,691	574.1	851	2,699	26,122

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.25	7,831	822.7	0	0	7,831
89.00	10,664	1,003.2	6,908	6,908	34,067
89.50	12,628	1,328.0	5,816	12,724	94,323
90.00	24,612	1,460.3	9,145	21,869	123,687

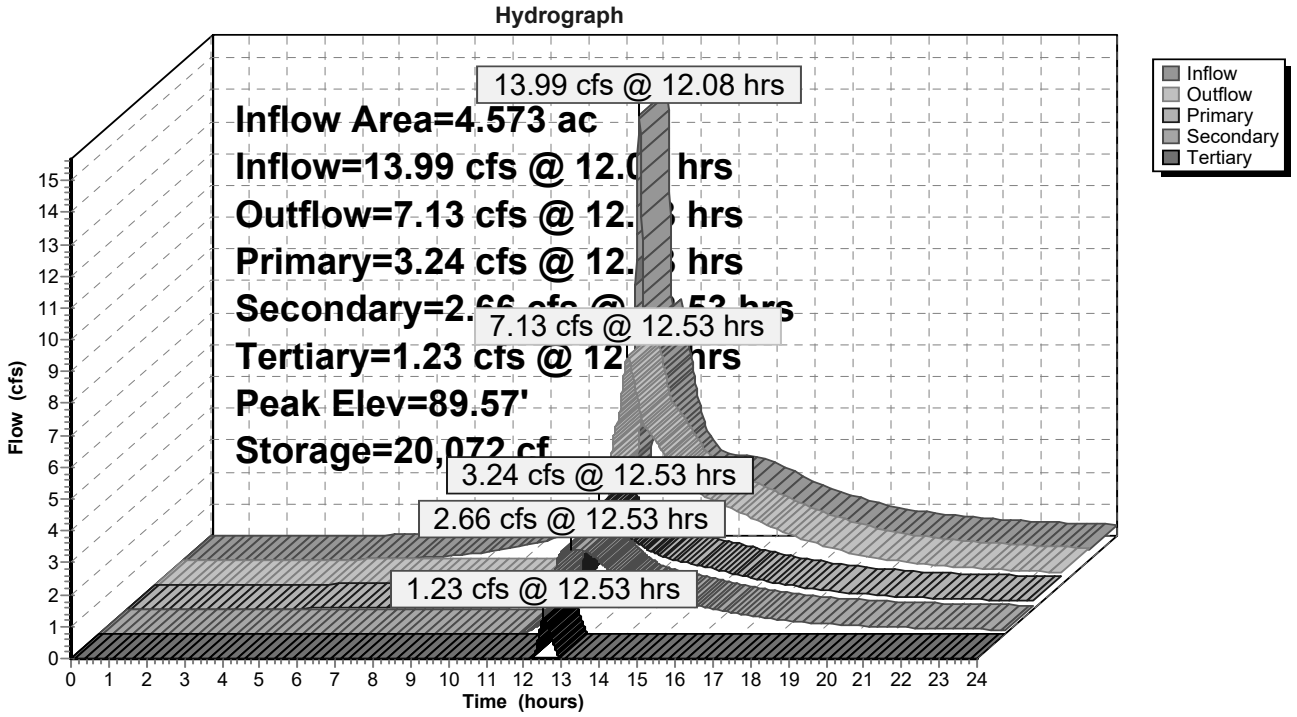
Device	Routing	Invert	Outlet Devices
#1	Primary	86.67'	**12.0" Round 12" HDPE N-12** L= 14.5' Ke= 0.500 Inlet / Outlet Invert= 86.67' / 86.50' S= 0.0117 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	88.25'	**12.0" Round 12" RCP** L= 14.0' Ke= 0.500 Inlet / Outlet Invert= 88.25' / 88.25' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 1	86.67'	**1.7" Vert. 1.75" Orifice** C= 0.600
#4	Device 1	88.25'	**6.0" Vert. 6" Orifice** C= 0.600
#5	Device 1	88.50'	**8.0" Vert. 8" Orifice** C= 0.600
#6	Device 1	89.50'	**48.0" Horiz. 48" Grate** C= 0.600 Limited to weir flow at low heads
#7	Tertiary	89.50'	**30.0' long x 7.0' breadth 30' Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=3.24 cfs @ 12.53 hrs HW=89.57' TW=0.00' (Dynamic Tailwater)
└─**1=12" HDPE N-12** (Passes 3.24 cfs of 5.85 cfs potential flow)
  ├─**3=1.75" Orifice** (Orifice Controls 0.13 cfs @ 8.09 fps)
  ├─**4=6" Orifice** (Orifice Controls 0.98 cfs @ 4.97 fps)
  ├─**5=8" Orifice** (Orifice Controls 1.44 cfs @ 4.12 fps)
  └─**6=48" Grate** (Weir Controls 0.70 cfs @ 0.84 fps)

Secondary OutFlow Max=2.66 cfs @ 12.53 hrs HW=89.57' TW=88.43' (Dynamic Tailwater)
└─**2=12" RCP** (Barrel Controls 2.66 cfs @ 3.39 fps)

Tertiary OutFlow Max=1.23 cfs @ 12.53 hrs HW=89.57' TW=89.12' (Dynamic Tailwater)
└─**7=30' Spillway** (Weir Controls 1.23 cfs @ 0.62 fps)

Pond 101P: Gravel Wetland #101



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>1.71"
Flow Length=90' Tc=15.5 min CN=80 Runoff=1.04 cfs 0.099 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>2.35"
Flow Length=178' Tc=14.6 min CN=88 Runoff=4.84 cfs 0.451 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>0.80"
Flow Length=113' Tc=21.8 min CN=65 Runoff=0.14 cfs 0.019 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>2.35"
Flow Length=182' Tc=13.0 min CN=88 Runoff=0.49 cfs 0.043 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>2.36"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=6.24 cfs 0.446 af

Reach 6R: Reach #6 Avg. Flow Depth=0.13' Max Vel=0.35 fps Inflow=0.44 cfs 0.030 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=0.37 cfs 0.030 af

Reach 100R: Reach #100 Inflow=1.48 cfs 0.535 af
Outflow=1.48 cfs 0.535 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.10' Max Vel=1.19 fps Inflow=0.67 cfs 0.246 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=0.67 cfs 0.246 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=0.00 cfs 0.000 af

Reach 400R: Reach #400 Inflow=0.74 cfs 0.265 af
Outflow=0.74 cfs 0.265 af

Reach 500R: Final Reach #500 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 3P: Wetland Ponding Peak Elev=89.01' Storage=9,616 cf Inflow=5.16 cfs 0.481 af
Discarded=0.00 cfs 0.003 af Primary=0.97 cfs 0.413 af Secondary=0.00 cfs 0.000 af Outflow=0.97 cfs 0.416 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.23' Storage=340 cf Inflow=0.49 cfs 0.043 af
Discarded=0.01 cfs 0.007 af Secondary=0.44 cfs 0.030 af Outflow=0.44 cfs 0.037 af

Pond 101P: Gravel Wetland #101 Peak Elev=88.81' Storage=11,380 cf Inflow=6.58 cfs 0.860 af
Primary=0.93 cfs 0.435 af Secondary=0.67 cfs 0.246 af Tertiary=0.00 cfs 0.000 af Outflow=1.59 cfs 0.682 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>3.27"
Flow Length=90' Tc=15.5 min CN=80 Runoff=2.01 cfs 0.190 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>4.08"
Flow Length=178' Tc=14.6 min CN=88 Runoff=8.24 cfs 0.782 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>1.94"
Flow Length=113' Tc=21.8 min CN=65 Runoff=0.40 cfs 0.045 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth>0.06"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.01 cfs 0.003 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>4.08"
Flow Length=182' Tc=13.0 min CN=88 Runoff=0.83 cfs 0.075 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>4.08"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=10.58 cfs 0.773 af

Reach 6R: Reach #6 Avg. Flow Depth=0.17' Max Vel=0.42 fps Inflow=0.78 cfs 0.061 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=0.71 cfs 0.060 af

Reach 100R: Reach #100 Inflow=3.87 cfs 0.977 af
Outflow=3.87 cfs 0.977 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.15' Max Vel=1.63 fps Inflow=1.86 cfs 0.555 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=1.86 cfs 0.555 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=0.00 cfs 0.000 af

Reach 400R: Reach #400 Inflow=2.22 cfs 0.600 af
Outflow=2.22 cfs 0.600 af

Reach 500R: Final Reach #500 Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Pond 3P: Wetland Ponding Peak Elev=89.48' Storage=18,524 cf Inflow=8.90 cfs 0.843 af
Discarded=0.00 cfs 0.003 af Primary=1.80 cfs 0.759 af Secondary=0.00 cfs 0.000 af Outflow=1.81 cfs 0.761 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.28' Storage=370 cf Inflow=0.83 cfs 0.075 af
Discarded=0.01 cfs 0.008 af Secondary=0.78 cfs 0.061 af Outflow=0.78 cfs 0.069 af

Pond 101P: Gravel Wetland #101 Peak Elev=89.24' Storage=16,024 cf Inflow=10.58 cfs 1.532 af
Primary=2.00 cfs 0.787 af Secondary=1.86 cfs 0.555 af Tertiary=0.00 cfs 0.000 af Outflow=3.86 cfs 1.343 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>4.58"
Flow Length=90' Tc=15.5 min CN=80 Runoff=2.79 cfs 0.266 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>5.47"
Flow Length=178' Tc=14.6 min CN=88 Runoff=10.90 cfs 1.050 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>3.00"
Flow Length=113' Tc=21.8 min CN=65 Runoff=0.63 cfs 0.070 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth>0.29"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.03 cfs 0.016 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>5.48"
Flow Length=182' Tc=13.0 min CN=88 Runoff=1.09 cfs 0.101 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>5.48"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=13.99 cfs 1.038 af

Reach 6R: Reach #6 Avg. Flow Depth=0.20' Max Vel=0.46 fps Inflow=1.04 cfs 0.086 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=0.96 cfs 0.086 af

Reach 100R: Reach #100 Inflow=5.21 cfs 1.309 af
Outflow=5.21 cfs 1.309 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.18' Max Vel=1.82 fps Inflow=2.66 cfs 0.803 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=2.66 cfs 0.803 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.12' Max Vel=1.50 fps Inflow=1.23 cfs 0.037 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=1.22 cfs 0.037 af

Reach 400R: Reach #400 Inflow=3.23 cfs 0.873 af
Outflow=3.23 cfs 0.873 af

Reach 500R: Final Reach #500 Inflow=1.23 cfs 0.053 af
Outflow=1.23 cfs 0.053 af

Pond 3P: Wetland Ponding Peak Elev=89.68' Storage=23,104 cf Inflow=11.80 cfs 1.135 af
Discarded=0.00 cfs 0.003 af Primary=1.82 cfs 0.847 af Secondary=3.61 cfs 0.193 af Outflow=4.57 cfs 1.044 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.31' Storage=391 cf Inflow=1.09 cfs 0.101 af
Discarded=0.01 cfs 0.009 af Secondary=1.04 cfs 0.086 af Outflow=1.04 cfs 0.094 af

Pond 101P: Gravel Wetland #101 Peak Elev=89.57' Storage=20,072 cf Inflow=13.99 cfs 2.079 af
Primary=3.24 cfs 1.043 af Secondary=2.66 cfs 0.803 af Tertiary=1.23 cfs 0.037 af Outflow=7.13 cfs 1.883 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>5.83"
Flow Length=90' Tc=15.5 min CN=80 Runoff=3.52 cfs 0.338 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>6.78"
Flow Length=178' Tc=14.6 min CN=88 Runoff=13.35 cfs 1.300 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>4.06"
Flow Length=113' Tc=21.8 min CN=65 Runoff=0.86 cfs 0.094 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth>0.62"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.13 cfs 0.034 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>6.78"
Flow Length=182' Tc=13.0 min CN=88 Runoff=1.34 cfs 0.125 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>6.79"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=17.12 cfs 1.285 af

Reach 6R: Reach #6 Avg. Flow Depth=0.22' Max Vel=0.49 fps Inflow=1.28 cfs 0.110 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=1.19 cfs 0.109 af

Reach 100R: Reach #100 Inflow=7.90 cfs 1.604 af
Outflow=7.90 cfs 1.604 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.19' Max Vel=1.87 fps Inflow=2.93 cfs 0.930 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=2.93 cfs 0.930 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.22' Max Vel=2.21 fps Inflow=4.35 cfs 0.194 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=4.34 cfs 0.194 af

Reach 400R: Reach #400 Inflow=3.73 cfs 1.025 af
Outflow=3.73 cfs 1.025 af

Reach 500R: Final Reach #500 Inflow=4.43 cfs 0.228 af
Outflow=4.43 cfs 0.228 af

Pond 3P: Wetland Ponding Peak Elev=89.78' Storage=25,595 cf Inflow=14.47 cfs 1.409 af
Discarded=0.00 cfs 0.003 af Primary=1.82 cfs 0.930 af Secondary=6.72 cfs 0.376 af Outflow=7.76 cfs 1.309 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.33' Storage=409 cf Inflow=1.34 cfs 0.125 af
Discarded=0.01 cfs 0.009 af Secondary=1.28 cfs 0.110 af Outflow=1.28 cfs 0.118 af

Pond 101P: Gravel Wetland #101 Peak Elev=89.65' Storage=21,381 cf Inflow=17.12 cfs 2.591 af
Primary=5.15 cfs 1.266 af Secondary=2.93 cfs 0.930 af Tertiary=4.35 cfs 0.194 af Outflow=12.43 cfs 2.390 af

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment #1 Runoff Area=30,363 sf 14.51% Impervious Runoff Depth>7.37"
Flow Length=90' Tc=15.5 min CN=80 Runoff=4.42 cfs 0.428 af

Subcatchment 3S: Subcatchment #3 Runoff Area=100,258 sf 31.41% Impervious Runoff Depth>8.37"
Flow Length=178' Tc=14.6 min CN=88 Runoff=16.30 cfs 1.606 af

Subcatchment 4S: Subcatchment #4 Runoff Area=12,145 sf 0.00% Impervious Runoff Depth>5.42"
Flow Length=113' Tc=21.8 min CN=65 Runoff=1.16 cfs 0.126 af

Subcatchment 5S: Subcatchment #5 Runoff Area=28,932 sf 0.00% Impervious Runoff Depth>1.16"
Flow Length=152' Tc=26.8 min CN=32 Runoff=0.33 cfs 0.064 af

Subcatchment 6S: Subcatchment #6 Runoff Area=9,644 sf 71.22% Impervious Runoff Depth>8.38"
Flow Length=182' Tc=13.0 min CN=88 Runoff=1.64 cfs 0.155 af

Subcatchment 11S: Subcatchment #11 Runoff Area=98,961 sf 23.65% Impervious Runoff Depth>8.39"
Flow Length=381' Tc=6.0 min UI Adjusted CN=88 Runoff=20.89 cfs 1.588 af

Reach 6R: Reach #6 Avg. Flow Depth=0.24' Max Vel=0.53 fps Inflow=1.56 cfs 0.139 af
n=0.022 L=144.0' S=0.0007 '/' Capacity=7.13 cfs Outflow=1.46 cfs 0.138 af

Reach 100R: Reach #100 Inflow=10.44 cfs 1.936 af
Outflow=10.44 cfs 1.936 af

Reach 101bR: Reach #101b Avg. Flow Depth=0.20' Max Vel=1.94 fps Inflow=3.25 cfs 1.082 af
n=0.035 L=49.0' S=0.0306 '/' Capacity=23.78 cfs Outflow=3.25 cfs 1.082 af

Reach 101cR: Reach #101c Avg. Flow Depth=0.31' Max Vel=2.78 fps Inflow=9.10 cfs 0.422 af
n=0.035 L=143.4' S=0.0349 '/' Capacity=25.38 cfs Outflow=9.09 cfs 0.422 af

Reach 400R: Reach #400 Inflow=4.39 cfs 1.208 af
Outflow=4.39 cfs 1.208 af

Reach 500R: Final Reach #500 Inflow=9.36 cfs 0.487 af
Outflow=9.36 cfs 0.487 af

Pond 3P: Wetland Ponding Peak Elev=89.90' Storage=28,268 cf Inflow=17.70 cfs 1.745 af
Discarded=0.00 cfs 0.003 af Primary=1.81 cfs 1.031 af Secondary=10.53 cfs 0.601 af Outflow=11.65 cfs 1.635 af

Pond 6P: Existing Driveway Catch Basin Peak Elev=92.35' Storage=431 cf Inflow=1.64 cfs 0.155 af
Discarded=0.01 cfs 0.009 af Secondary=1.56 cfs 0.139 af Outflow=1.57 cfs 0.148 af

Pond 101P: Gravel Wetland #101 Peak Elev=89.75' Storage=23,010 cf Inflow=20.89 cfs 3.219 af
Primary=6.07 cfs 1.508 af Secondary=3.25 cfs 1.082 af Tertiary=9.10 cfs 0.422 af Outflow=18.43 cfs 3.013 af

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.915 degrees West
Latitude	43.174 degrees North
Elevation	0 feet
Date/Time	Thu, 24 Sep 2020 09:24:56 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.03	**1yr**	0.70	0.98	1.20	1.54	2.00	2.60	2.85	**1yr**	2.30	2.74	3.14	3.86	4.44	**1yr**
2yr	0.32	0.49	0.61	0.81	1.01	1.28	**2yr**	0.87	1.17	1.50	1.91	2.44	3.13	3.48	**2yr**	2.77	3.35	3.84	4.57	5.21	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.58	**5yr**	1.06	1.44	1.85	2.38	3.07	3.96	4.46	**5yr**	3.51	4.29	4.90	5.78	6.54	**5yr**
10yr	0.40	0.63	0.80	1.09	1.41	1.84	**10yr**	1.22	1.69	2.17	2.82	3.65	4.73	5.38	**10yr**	4.19	5.17	5.90	6.90	7.77	**10yr**
25yr	0.46	0.73	0.94	1.29	1.72	2.26	**25yr**	1.48	2.09	2.69	3.52	4.59	5.99	6.90	**25yr**	5.30	6.64	7.54	8.73	9.77	**25yr**
50yr	0.51	0.82	1.06	1.48	1.99	2.66	**50yr**	1.72	2.45	3.17	4.17	5.48	7.16	8.34	**50yr**	6.34	8.02	9.07	10.44	11.63	**50yr**
100yr	0.58	0.93	1.20	1.70	2.31	3.11	**100yr**	1.99	2.88	3.73	4.94	6.52	8.57	10.07	**100yr**	7.59	9.69	10.93	12.48	13.84	**100yr**
200yr	0.64	1.04	1.35	1.94	2.68	3.65	**200yr**	2.32	3.39	4.41	5.87	7.78	10.26	12.18	**200yr**	9.08	11.71	13.17	14.93	16.48	**200yr**
500yr	0.75	1.23	1.61	2.34	3.28	4.51	**500yr**	2.83	4.20	5.47	7.35	9.80	13.01	15.65	**500yr**	11.52	15.05	16.85	18.94	20.77	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.90	**1yr**	0.64	0.88	0.91	1.25	1.55	2.04	2.48	**1yr**	1.81	2.39	2.92	3.33	4.04	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.18	**2yr**	0.86	1.16	1.36	1.83	2.36	3.04	3.38	**2yr**	2.69	3.25	3.73	4.45	5.05	**2yr**
5yr	0.35	0.54	0.67	0.91	1.16	1.40	**5yr**	1.00	1.37	1.62	2.15	2.78	3.70	4.12	**5yr**	3.28	3.96	4.58	5.40	6.11	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.82	2.45	3.14	4.27	4.78	**10yr**	3.78	4.60	5.31	6.25	7.02	**10yr**
25yr	0.44	0.67	0.83	1.18	1.55	1.91	**25yr**	1.34	1.87	2.11	2.85	3.67	5.03	5.80	**25yr**	4.45	5.58	6.48	7.58	8.45	**25yr**
50yr	0.48	0.73	0.91	1.31	1.77	2.19	**50yr**	1.52	2.14	2.36	3.21	4.12	5.77	6.71	**50yr**	5.10	6.45	7.54	8.76	9.70	**50yr**
100yr	0.54	0.81	1.02	1.47	2.02	2.51	**100yr**	1.74	2.46	2.64	3.59	4.61	6.60	7.75	**100yr**	5.84	7.45	8.78	10.13	11.12	**100yr**
200yr	0.60	0.90	1.14	1.65	2.30	2.87	**200yr**	1.99	2.81	2.94	4.03	5.16	7.55	8.95	**200yr**	6.68	8.61	10.21	11.72	12.78	**200yr**
500yr	0.70	1.04	1.34	1.94	2.76	3.46	**500yr**	2.38	3.38	3.41	4.67	6.01	8.99	10.82	**500yr**	7.95	10.41	12.48	14.22	15.28	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.08	**1yr**	0.75	1.05	1.24	1.74	2.21	2.83	3.05	**1yr**	2.51	2.93	3.37	4.18	4.76	**1yr**
2yr	0.33	0.51	0.62	0.84	1.04	1.24	**2yr**	0.90	1.22	1.48	1.95	2.50	3.25	3.59	**2yr**	2.88	3.45	3.96	4.71	5.39	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.58	**5yr**	1.13	1.54	1.85	2.49	3.19	4.22	4.79	**5yr**	3.73	4.61	5.23	6.17	6.94	**5yr**
10yr	0.46	0.70	0.87	1.21	1.57	1.92	**10yr**	1.35	1.87	2.23	3.04	3.84	5.19	5.97	**10yr**	4.60	5.74	6.54	7.57	8.45	**10yr**
25yr	0.55	0.84	1.05	1.49	1.96	2.47	**25yr**	1.70	2.41	2.87	3.95	4.93	6.96	8.01	**25yr**	6.16	7.70	8.71	9.96	11.02	**25yr**
50yr	0.64	0.97	1.21	1.74	2.34	2.98	**50yr**	2.02	2.91	3.48	4.81	5.98	8.59	10.01	**50yr**	7.60	9.63	10.84	12.24	13.47	**50yr**
100yr	0.74	1.12	1.40	2.03	2.78	3.60	**100yr**	2.40	3.52	4.22	5.89	7.25	10.61	12.53	**100yr**	9.39	12.04	13.47	15.07	16.47	**100yr**
200yr	0.86	1.29	1.63	2.37	3.30	4.36	**200yr**	2.85	4.26	5.13	7.20	8.79	13.14	15.69	**200yr**	11.63	15.08	16.75	18.53	20.18	**200yr**
500yr	1.05	1.56	2.00	2.91	4.14	5.59	**500yr**	3.57	5.47	6.62	9.41	11.36	17.47	21.12	**500yr**	15.46	20.31	22.37	24.40	26.42	**500yr**

Powered by ACIS Northeast Regional Climate Center

GRAVEL WETLAND DESIGN CRITERIA
(Env-Wq 1508.05)

Type/Node Name: **Gravel Wetland #101**

Enter the node name in the drainage analysis if applicable.

4.57	ac	A = Area draining to the practice	
1.00	ac	A_I = Impervious area draining to the practice	
0.22	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.25	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
1.13	ac-in	WQV= 1" x Rv x A	
4,097	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
410	cf	10% x WQV (check calc for sediment forebay)	
1,844	cf	45% x WQV (check calc for gravel wetland treatment bay volume)	
2,699	cf	V_{SED} = Sediment forebay volume	**≥ 10%WQV**
1,871	cf	V_{TB1} = Volume of treatment bay 1 [1]	**≥ 45%WQV**
1,863	cf	V_{TB2} = Volume of treatment bay 2 [1]	**≥ 45%WQV**
0.09	cfs	$2Q_{avg}$ = 2* WQV / 24 hrs * (1hr / 3600 sec) [2]	
87.91	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.08	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	**< $2Q_{avg}$**
28.45	hours	T_{ED} = Drawdown time of extended detention = 2WQV/Q_{WQV}	**≥ 24-hrs**
3.00	:1	Pond side slopes	**≥ 3:1**
87.00	ft	Elevation of SHWT	
85.00	ft	SHWT - 2 feet	
86.67	ft	Epp = Elevation of the permanent pool (elevation of lowest orifice) [3]	**≤ E_{SHWT} - 2 ft**
32.00	ft	Length of the flow path between the inlet and outlet in each cell	**≥ 15 ft**
Angle	Grate	What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of ≤6")?	
89.65	ft	Peak elevation of the 50-year storm event (E_{50})	
90.00	ft	Berm elevation of the pond	
YES		E_{50} ≤ the berm elevation?	**← yes**

Qualified professional that developed the planting plan
Name, Profession:

1. Volume stored above the wetland soil and below the high flow by-pass.

2. To ensure orifice is sized so that WQV is released at a relatively stable rate.

3. 4" to 8" below the wetland soil. If lowest orifice is higher than (SHWT - 2 feet), and saturated hydraulic conductivity (Ksat) is greater than 0.015 in/hr, the system must be lined.

Designer's Notes:

Since 2011:

18,335 Gravel Imp Additional, 25,779 SF Pavement/Roof Additional - 695 overlap area = 43,419 = 1.00 AC WQV

Saturated Zone Storage: 26% OF THE WQV = 1,065 CF

Cell #1: 1,215 SF Saturated Area Footprint, 8" Wetland Soil (20% voids), 27" Stone (40% voids)

1,215 SF*(4"/12")*20% + 1,215 SF*(27"/12")*40% = 81 CF + 1,094 CF = 1,175 CF > 1,065 CF

Cell #2: 1,094 SF Saturated Area Footprint, 8" Wetland Soil (20% voids), 27" Stone (40% voids)

1,163 SF*(4"/12")*20% + 1,163 SF*(27"/12")*40% = 78 CF + 1,047 CF = 1,125 CF > 1,065 CF

Summary for Pond 101P: Gravel Wetland #101

[80] Warning: Exceeded Pond 3P by 0.19' @ 12.12 hrs (1.25 cfs 0.019 af)
[80] Warning: Exceeded Pond 3P by 0.19' @ 12.12 hrs (0.86 cfs 0.017 af)

Inflow Area = 4.573 ac, 27.55% Impervious, Inflow Depth > 6.80" for 50YR-24HR event
Inflow = 17.12 cfs @ 12.08 hrs, Volume= 2.591 af
Outflow = 12.43 cfs @ 12.43 hrs, Volume= 2.390 af, Atten= 27%, Lag= 20.8 min
Primary = 5.15 cfs @ 12.43 hrs, Volume= 1.266 af
Secondary = 2.93 cfs @ 12.43 hrs, Volume= 0.930 af
Tertiary = 4.35 cfs @ 12.43 hrs, Volume= 0.194 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.65' @ 12.43 hrs Surf.Area= 23,249 sf Storage= 21,381 cf
Flood Elev= 90.00' Surf.Area= 31,965 sf Storage= 28,334 cf

Plug-Flow detention time= 86.8 min calculated for 2.389 af (92% of inflow)
Center-of-Mass det. time= 48.4 min (886.2 - 837.9)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	1,871 cf	**Gravel Wetland Cell #1 (Irregular)**Listed below (Recalc)
#2	87.00'	1,863 cf	**Gravel Wetland Cell #2 (Irregular)**Listed below (Recalc)
#3	86.67'	31 cf	**4.00'D x 2.48'H Outlet Structure**
#4	87.00'	2,699 cf	**Sediment Forebay (Irregular)**Listed below (Recalc)
#5	88.25'	21,869 cf	**Open Water Storage (Irregular)**Listed below (Recalc)
		28,334 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	1,215	144.7	0	0	1,215
88.00	1,671	161.3	1,437	1,437	1,647
88.25	1,801	166.9	434	1,871	1,799

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	1,163	159.0	0	0	1,163
88.00	1,695	177.7	1,421	1,421	1,692
88.25	1,848	184.0	443	1,863	1,878

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
87.00	389	79.1	0	0	389
87.25	1,229	158.5	192	192	1,891
87.50	1,966	270.7	396	588	5,723
88.00	3,121	472.7	1,261	1,849	17,674
88.25	3,691	574.1	851	2,699	26,122

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
88.25	7,831	822.7	0	0	7,831
89.00	10,664	1,003.2	6,908	6,908	34,067
89.50	12,628	1,328.0	5,816	12,724	94,323
90.00	24,612	1,460.3	9,145	21,869	123,687

Device	Routing	Invert	Outlet Devices
#1	Primary	86.67'	**12.0" Round 12" HDPE N-12** L= 14.5' Ke= 0.500 Inlet / Outlet Invert= 86.67' / 86.50' S= 0.0117 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	88.25'	**12.0" Round 12" RCP** L= 14.0' Ke= 0.500 Inlet / Outlet Invert= 88.25' / 88.25' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 1	86.67'	**1.7" Vert. 1.75" Orifice** C= 0.600
#4	Device 1	88.25'	**6.0" Vert. 6" Orifice** C= 0.600
#5	Device 1	88.50'	**8.0" Vert. 8" Orifice** C= 0.600
#6	Device 1	89.50'	**48.0" Horiz. 48" Grate** C= 0.600 Limited to weir flow at low heads
#7	Tertiary	89.50'	**30.0' long x 7.0' breadth 30' Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=5.15 cfs @ 12.43 hrs HW=89.65' TW=0.00' (Dynamic Tailwater)
- **1=12" HDPE N-12** (Passes 5.15 cfs of 5.96 cfs potential flow)
  - **3=1.75" Orifice** (Orifice Controls 0.13 cfs @ 8.22 fps)
  - **4=6" Orifice** (Orifice Controls 1.02 cfs @ 5.17 fps)
  - **5=8" Orifice** (Orifice Controls 1.52 cfs @ 4.36 fps)
  - **6=48" Grate** (Weir Controls 2.48 cfs @ 1.28 fps)

Secondary OutFlow Max=2.93 cfs @ 12.43 hrs HW=89.65' TW=88.44' (Dynamic Tailwater)
- **2=12" RCP** (Barrel Controls 2.93 cfs @ 3.73 fps)

Tertiary OutFlow Max=4.35 cfs @ 12.43 hrs HW=89.65' TW=89.22' (Dynamic Tailwater)
- **7=30' Spillway** (Weir Controls 4.35 cfs @ 0.94 fps)

Stage-Discharge for Pond 101P: Gravel Wetland #101

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Tertiary (cfs)
86.67	0.00	0.00	0.00	0.00
86.77	0.01	0.01	0.00	0.00
86.87	0.03	0.03	0.00	0.00
86.97	0.04	0.04	0.00	0.00
87.07	0.04	0.04	0.00	0.00
87.17	0.05	0.05	0.00	0.00
87.27	0.06	0.06	0.00	0.00
87.37	0.06	0.06	0.00	0.00
87.47	0.06	0.06	0.00	0.00
87.57	0.07	0.07	0.00	0.00
87.67	0.07	0.07	0.00	0.00
87.77	0.08	0.08	0.00	0.00
87.87	0.08	0.08	0.00	0.00
87.97	0.08	0.08	0.00	0.00
88.07	0.09	0.09	0.00	0.00
88.17	0.09	0.09	0.00	0.00
88.27	0.10	0.10	0.00	0.00
88.37	0.16	0.14	0.02	0.00
88.47	0.33	0.23	0.10	0.00
88.57	0.59	0.38	0.22	0.00
88.67	0.97	0.59	0.38	0.00
88.77	1.42	0.83	0.58	0.00
88.87	1.92	1.10	0.82	0.00
88.97	2.46	1.38	1.08	0.00
89.07	3.01	1.65	1.36	0.00
89.17	3.53	1.87	1.66	0.00
89.27	4.01	2.06	1.95	0.00
89.37	4.47	2.24	2.24	0.00
89.47	4.89	2.40	2.49	0.00
89.57	7.30	3.31	2.66	1.33
89.67	13.60	5.57	2.98	5.05
89.77	19.70	6.10	3.32	10.28
89.87	26.73	6.21	3.62	16.89
89.97	**35.20**	**6.33**	**3.91**	**24.97**

87.91 = 0.08

Stage-Area-Storage for Pond 101P: Gravel Wetland #101

Elevation (feet)	Storage (cubic-feet)
86.67	0
86.72	1
86.77	1
86.82	2
86.87	3
86.92	3
86.97	4
87.02	60
87.07	207
87.12	364
87.17	531
87.22	710
87.27	901
87.32	1,101
87.37	1,311
87.42	1,531
87.47	1,761
87.52	2,001
87.57	2,250
87.62	2,506
87.67	2,770
87.72	3,042
87.77	3,322
87.82	3,611
87.87	3,909
87.92	4,215
87.97	4,530
88.02	4,854
88.07	5,186
88.12	5,527
88.17	5,877
88.22	6,235
88.27	6,611
88.32	7,011
88.37	7,420
88.42	7,838
88.47	8,265
88.52	8,701
88.57	9,146
88.62	9,601
88.67	10,065
88.72	10,539
88.77	11,022
88.82	11,515
88.87	12,017
88.92	12,530
88.97	13,053
89.02	13,586
89.07	14,128
89.12	14,680
89.17	15,241
89.22	15,811
89.27	16,392
89.32	16,982
89.37	17,582
89.42	18,192
89.47	18,812
89.52	19,446
89.57	20,123
89.62	20,853
89.67	21,638
89.72	22,480
89.77	23,380
89.82	24,341
89.87	25,365
89.92	26,453
89.97	**27,608**

87.90 = 4,091
87.91 = 4,153

RIP RAP CALCULATIONS

20-083 LandCare Associates

Madbury, NH

Berry Surveying & Engineering

335 Second Crown Point Road

Barrington, NH

26-Apr-22

Rip Rap equations were obtained from the *Stormwater Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire.* Rip Rap was sized for the 25 year storm event. (Some d50 sizes and T values have been modified)

TAILWATER < HALF THE Do

La = (1.8 x Q) / Do 3/2 + (7 x Do) Q = Peak Flow & Do is Pipe Diameter

W = La + 3*Do or defined channel width

d50 = (0.02 x Q4/3) / (Tw x Do) Tw = Tailwater Depth

T = Largest Stone Size x 1.5

Culvert or Catch Basin	Tailwater (Feet) Tw	Discharge (C.F.S.) Q	Diameter of Pipe Do	Length of Rip Rap La (feet)	Width of Rip Rap W (feet)	d50-Stone Rip Rap d50(ft.)	Actual Size	Thickness
12" HDPE (Pond #3P)	0.20	1.82	1.00	10.3	13.3	0.22	0.50	1.20
12" HDPE (Pond #101P)	0.20	3.24	1.00	12.8	15.8	0.48	0.50	1.20
12" RCP (Pond #101P)	0.20	2.66	1.00	11.8	14.8	0.37	0.50	1.20

Please note that the designer chose to use the 25 Year Event for the dimensional calculations.

Table 7-24 -- Recommended Rip Rap Gradation Ranges				
d50 Size =	0.5	Feet	6	Inches
% of Weight Smaller	Size of Stone (Inches)			
Than the Given d50 Size	From		To	
100%	9		12	
85%	8		11	
50%	6		9	
15%	2		3	

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 Strafford County, New Hampshire

September 24, 2020

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.

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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: 1:3,450 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:20,000.

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: Strafford County, New Hampshire
Survey Area Data: Version 20, May 29, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 9, 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
DeA	Deerfield loamy fine sand, 0 to 3 percent slopes	0.6	1.1%
EaA	Elmwood fine sandy loam, 0 to 3 percent slopes	0.1	0.1%
EaB	Elmwood fine sandy loam, 3 to 8 percent slopes	2.2	4.1%
Ml	Mixed alluvial land, wet	34.6	64.7%
On	Ondawa fine sandy loam	1.7	3.1%
Po	Podunk fine sandy loam	2.8	5.2%
ScA	Scantic silt loam, 0 to 3 percent slopes	0.9	1.6%
ScB	Scantic silt loam, 3 to 8 percent slopes	1.5	2.9%
WdA	Windsor loamy sand, 0 to 3 percent slopes	9.2	17.2%
Totals for Area of Interest		**53.5**	**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.

Strafford County, New Hampshire

DeA—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

Deerfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, kame terraces, outwash plains, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Concave, linear, convex
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash plains, outwash deltas, kame terraces, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave, convex
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Kame terraces, outwash plains, outwash terraces, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Outwash terraces, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

EaA—Elmwood fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9d70
Elevation: 0 to 1,000 feet
Mean annual precipitation: 28 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 120 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Elmwood and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elmwood

Setting

Parent material: Glaciomarine

Typical profile

H1 - 0 to 16 inches: fine sandy loam
H2 - 16 to 20 inches: fine sandy loam
H3 - 20 to 43 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY018NY - Moist Lake Plain
Hydric soil rating: No

Minor Components

Deerfield

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

Swanton

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Not named

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

EaB—Elmwood fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d71
Elevation: 0 to 1,000 feet
Mean annual precipitation: 28 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 120 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Elmwood and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elmwood

Setting
Parent material: Glaciomarine

Typical profile
H1 - 0 to 16 inches: fine sandy loam
H2 - 16 to 20 inches: fine sandy loam
H3 - 20 to 43 inches: silty clay

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F144AY018NY - Moist Lake Plain
Hydric soil rating: No

Minor Components

Not named
Percent of map unit: 10 percent
Hydric soil rating: No

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

Ml—Mixed alluvial land, wet

Map Unit Setting
National map unit symbol: 9d86
Elevation: 300 to 1,800 feet

Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Mixed alluvial land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mixed Alluvial Land

Setting
Landform: Flood plains

Typical profile
H1 - 0 to 5 inches: loam
H2 - 5 to 72 inches: very gravelly silt loam

Properties and qualities
Slope: 0 to 2 percent
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydric soil rating: Yes

On—Ondawa fine sandy loam

Map Unit Setting
National map unit symbol: 9d88
Elevation: 0 to 430 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ondawa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ondawa

Setting

Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Typical profile

H1 - 0 to 30 inches: fine sandy loam
H2 - 30 to 42 inches: stratified loamy fine sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Podunk

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

Suncook

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

Not named

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

Po—Podunk fine sandy loam

Map Unit Setting

National map unit symbol: 9d8j
Elevation: 0 to 440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days

Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Podunk and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Podunk

Setting

Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Typical profile

H1 - 0 to 30 inches: fine sandy loam
H2 - 30 to 42 inches: stratified loamy fine sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Suncook

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

Rumney

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Not named

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

ScA—Scantic silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9d8s
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

Scantic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scantic

Setting

Landform: Marine terraces

Typical profile

H1 - 0 to 13 inches: silt loam
H2 - 13 to 23 inches: silty clay loam
H3 - 23 to 40 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Not named wet

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Biddeford
Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Swanton
Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

ScB—Scantic silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9d8t
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition
Scantic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scantic

Setting
Landform: Marine terraces

Typical profile
H1 - 0 to 13 inches: silt loam
H2 - 13 to 23 inches: silty clay loam
H3 - 23 to 40 inches: silty clay

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D

Hydric soil rating: Yes

Minor Components

Swanton
Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Not named wet
Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

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

WdA—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 2svkg
Elevation: 0 to 990 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition
Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile
O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities
Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

References

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11/16/20

Christopher Berry
Berry Surveying and Engineering
335 Second Crown Point Road
Barrington NH 03825

Job # 20-027

Site Specific Soil Survey 11/10/20
Map 9 Lots 3&4
284 Knox Marsh Road Madbury, NH

Dear Chris,

This letter report presents the findings of a Site Specific Soil Survey conducted on the referenced property by John P. Hayes III, 0n November 11, 2020. The soil survey was conducted in accordance with the New Hampshire Supplement of the Site-Specific Soil Mapping Standard For New Hampshire and Vermont, Version 5.0, December 2017, Special Publication # 3, published by the Society of Soil Scientist of Northern New England.

The portion of the property that is subject of the soil survey is located on the southeast side of Knox Marsh road, and north of the Bellamy river, in Madbury NH. The parcel is approximately 8.2 acres in size. The plans used for these soil maps are a 40 scale plan, where 1 inch equals 40 feet, with one foot contours.

The purpose of the soil survey is to provide the client with soils information for urban and suburban or rural land planning. Soil characteristics on the property were evaluated through observation of numerous test holes and hand auger probes conducted throughout the property. Slope phases were determined with the use of the topography provided on the plan. The Site-specific Soil Map Units identified are taken from the New Hampshire State-Wide Numerical Soils Legend, Issue #10 January 2011, and are briefly described below. Official Series Descriptions (OSD) for each of these soil series are enclosed with this report. The soil map units comply with the Range In Characteristics described in the OSD. Dissimilar inclusions are noted above. Limits of the Site Specific mapping units are highlighted on the plan.

Portions of the soil map with the map unit denominator P and VP are poorly, and very poorly drained soils respectively.The areas of the soil map with the map unit Mi, contains soils with various mixed soil textures and alluvial material with a silt loam subsoil, that is somewhat poorly drained. The portions of the soil map with the map units 300 and 350 are disturbed soils that have been filled, or excavated and/or regraded, and are sandy in texture. Portions of the soil map with the map unit 500, are disturbed soils that have been filled, or excavated and/or regraded, and are loamy in texture. A Disturbed Soil Mapping Unit Supplement for New Hampshire DES AoT Site Specific Soil Maps, is also included. This supplement explains the additional information given about each of the disturbed soil map units that are present on the site.

MAP UNIT #	SOIL TAXANOMIC NAME	DESCRIPTION
BeA VP (State No. 234)	**Biddeford**	The Biddeford series consists of very deep, very poorly drained soils formed in glaciolacustrine or glaciomarine deposits on coastal lowlands and in river valleys. Saturated hydraulic conductivity is high or moderately high in the organic surface layer, moderately low or moderately high in the A or Eg horizon, and moderately low or low in the subsoil and substratum. The hydrologic soil group is D. Slopes range from 0% to 3%.
MiA	**Mixed Alluvial Land**	The Mixed Alluvial Land series consists of very deep, somewhat poorly drained soils that formed in silty alluvium derived from mixed sources. Land soils are on smooth flood plains, stream teraces and alluvial flats.The hydrologic soil group is D. Slopes range from 0% to 3%.
MiB	**Mixed Alluvial Land**	The Mixed Alluvial Land series consists of very deep, somewhat poorly drained soils that formed in silty alluvium derived from mixed sources. Land soils are on smooth flood plains, stream teraces and alluvial flats.The hydrologic soil group is D. Slopes range from 3% to 8%.
MiC	**Mixed Alluvial Land**	The Mixed Alluvial Land series consists of very deep, somewhat poorly drained soils that formed in silty alluvium derived from mixed sources. Land soils are on smooth flood plains, stream teraces and alluvial flats.The hydrologic soil group is D. Slopes range from 8% to 15%.
ScA P (State No. 233)	**Scantic**	The Scantic series consists of very deep, poorly drained soils formed in glaciomarine or glaciolacustrine deposits on coastal lowlands and river valleys. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum. The hydrologic soil group is D. Slopes range from 0% to 3%.
ScB P (State No. 233)	**Scantic**	The Scantic series consists of very deep, poorly drained soils formed in glaciomarine or glaciolacustrine deposits on coastal lowlands and river valleys. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum. The hydrologic soil group is D. Slopes range from 3% to 8%.
WdB (State No. 26)	**Windsor**	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slopes range from 3% to 8%.

MAP UNIT #	SOIL TAXANOMIC NAME	DESCRIPTION
WdC (State No. 26)	**Windsor**	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slopes range from 8% to 15%
WdD (State No. 26)	**Windsor**	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slopes range from 15% to 25%
300A (abada)	**Udipsamments**	This map unit is characterized by soil textures of loamy fine sand to sand and gravel throughout the entire particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (Ksat) is high or very high. Drainage class ranges from moderately well drained to somewhat poorly drained. The hydrologic soil group is A. Slopes range from 0% to 3%.
350A (dbadb)	**Udipsamments (wet substratum)**	This map unit is characterized by soil textures of loamy fine sand to sand and gravel throughout the entire particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (Ksat) is high or very high. Drainage class ranges from moderately well drained to somewhat poorly drained. The hydrologic soil group is B. Slopes range from 0% to 3%.
350B (dbadb)	**Udipsamments (wet substratum)**	This map unit is characterized by soil textures of loamy fine sand to sand and gravel throughout the entire particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (Ksat) is high or very high. Drainage class ranges from moderately well drained to somewhat poorly drained. The hydrologic soil group is B. Slopes range from 3% to 8%.
500A (decdc)	**Udorthents (Loamy)**	This map unit is characterized typically by soil textures that are sandy loam, loam, or silt loam within the particle size control section (25 – 100cm or 10 – 40"). Saturated hydraulic conductivity (Ksat) is low through high. Drainage class ranges from well drained to somewhat poorly drained. These areas typically represent excavated glacial till or perhaps areas where sand and gravel was excavated down to the loamy underlying material. The hydrologic soil group is C. Slopes range from 0% to 3%.

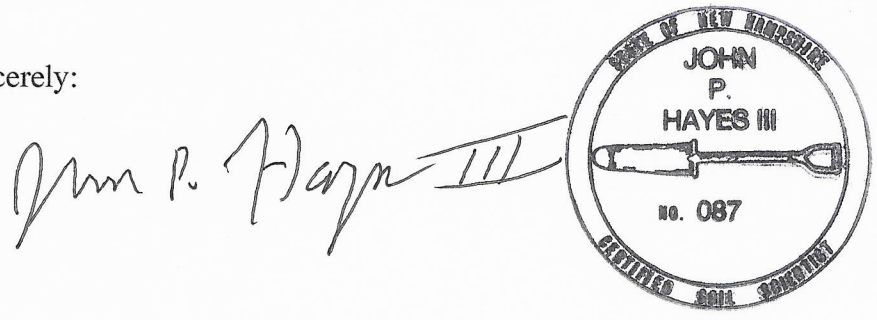
MAP UNIT #	SOIL TAXANOMIC NAME	DESCRIPTION
500C (decdc)	**Udorthents (Loamy)**	This map unit is characterized typically by soil textures that are sandy loam, loam, or silt loam within the particle size control section (25 – 100cm or 10 – 40"). Saturated hydraulic conductivity (Ksat) is low through high. Drainage class ranges from well drained to somewhat poorly drained. These areas typically represent excavated glacial till or perhaps areas where sand and gravel was excavated down to the loamy underlying material. The hydrologic soil group is C. Slopes range from 8% to 15%.

Slope Phases

Alpha Slope Symbol	Range
A	**0 – 3%**
B	**3 – 8%**
C	**8 – 15%**
D	**15 – 25%**
E	**25 – 50%**
F	**> 50%**

I trust that this Soil Survey and report meet your current planning needs. Please do not hesitate to contact me if you have any questions.

Sincerely:



John P. Hayes III CSS, CWS

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Stormwater System Management:

Inspection and Maintenance Manual

Knox Marsh Road, Madbury
Tax Map 9, Lots 3 & 4

Prepared for:

LandCare Associates, LLC
282 Knox Marsh Road
Madbury, NH 03823

Land of

Charles Street Holding, LLC
282 Knox Marsh Road
Madbury, NH 03823

&

284 Knox Marsh, LLC
284 Knox Marsh Road
Madbury, NH 03823

Prepared By

Berry Surveying & Engineering
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File Number
DB2020-097

April 26, 2022

Inspection and Maintenance Manual

Stormwater System Management

Table of Contents

Introduction

The Best Management Practices (BMP) described in this manual are specified in more detail within the plan set giving design details and specifications. The New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design (December 2008, NHDES & US EPA) is included by reference to this manual. Additional details, construction specifications, and example drawings are provided within this reference. (http://des.nh.gov/organization/divisions/water/stormwater/)

The BMP's are covered below in the general order in which the storm water flows. Each BMP has a description and maintenance consideration listed. A Check List table is proved after the narrative to summarize the maintenance responsibilities and schedule. A Log Form is also provided for the owners use.

For details regarding the design of the Storm Water System see also Drainage Analysis & Sediment and Erosion, **April 26, 2022**, as revised. See also plan set completed for **LandCare Associates, LLC**, originally dated **April 26, 2022**, as revised.

Daniel Gordon, Managing Member of LandCare Associates, LLC is responsible for the Operation, Inspection, and Maintenance of the Stormwater Management System. A significant step in this responsibility is the Inspection and Maintenance of each component of the system. Ongoing, semi-annual, and annual inspection and maintenance requirements are documented below and must be followed diligently. Failure of any component of the system can result in surface water run-off ponding and/or freezing in the roadway and parking lots, leaving the developed site untreated, and/or causing violations to issued permits. The responsible party must maintain, and have available, plans of the Stormwater System in order properly inspect and maintain the system. (Reduced copies attached.) The responsible party will conduct the inspections, complete the required maintenance, and will maintain the Inspection & Maintenance Check Lists and Logs, and will provide copies with the Annual Report to the Town of Madbury, Land Use Department by December 15th of each year.

The owners of Tax Map 9, Lot 3 and 4, Charles Street Holding, LLC & 284 Knox Marsh LLC (LandCare Associates, LLC), are proposing to implement a stormwater best management practice (BMP) to become compliant with Madbury, NH Site Review Regulations and more nearly conforming with Shoreland Regulations. LandCare Associates is proposing a reduction in gravel impervious surface to achieve this.

The following practices and drainage features will all require periodic inspections and maintenance based on this manual and drainage layout:

Proposed Construction

Culvert Inlet Sump

Catch Basins & Drainage Pipes

Sediment Forebays for Treatment Practice

Subsurface Gravel Wetland #101 with Outlet Structure and Spillway

Rip Rap Outlet Protection & Level Spreaders

Culvert Inlet Sumps

Description: On the southern side of one of the existing wetlands (Pond #3), there is one Inlet Sump. This culvert pipe, flared end section, and constructed sump will collect the runoff that is directed to that location during and after the development. The culvert will allow the runoff to enter the drainage network where the runoff will be pre-treated and treated at a treatment practice. The location of the Inlet Sump will be marked and identified with painted and distinctive fence post.

Maintenance Considerations: Vegetation and debris will need to be removed from the culvert inlet several times a year, especially late fall after the majority of the leaves have fallen and in the spring. In addition to the sump and culverts themselves, the drainage channel will need to be inspected to ensure that the runoff intended to get to the inlets is making it to the sump. The identification fence post will be inspected for structural condition and painted condition.

Catch Basin, and Drain Manholes

Description: Catch Basins are used throughout the site to capture and, along with culvert pipes, route surface water runoff to stormwater treatment and detention infrastructure. During construction the catch basins will be protected by inlet protection per the approved construction plans. The practice of street sweeping on a bi-annual basis will help reduce maintenance of these catch basins and culvert pipes.

Note: Deep sump catch basins are not allowed to be used on this proposed development due to wildlife concerns and any manufacturer sump resulting in a catch

basin must be filled with washed crushed stone. Sediment should be trapped in the sediment forebays but is also a concern in earlier structures.

Maintenance Considerations: Sediment must be removed from Catch Basins and Manholes on a regular basis, at least twice a year and more often if post-winter maintenance and street sweeping is not conducted. Inspections should be conducted periodically. At a minimum they should be cleaned after snow-melt and after leaf-drop. Disposal of all material, sediment, and debris must be done in accordance with state and federal regulations. Culvert pipes will be inspected to ensure that surface water runoff is capable of leaving the structures.

Treatment & Conveyance Swales

Description: "Swales are stabilized channels designed to convey runoff at non-erosive velocities." (NHDES SWM) They will be trapezoidal or parabolic in section view. A conveyance swale is intended to move surface water runoff from one point to another where as a treatment swale will slow the velocity to a point where sediment will settle out of the stormwater flow. A treatment swale will be constructed to a width of between four and eight feet and have a minimum length of 100 feet. The flow characteristics will also meet design criteria. See SWM Volume 2, 4.3 Treatment Practices, 5. Treatment Swales, page 123.

Project Intent: The swales are individually designed in the drainage analysis and specified on the design plans. The designed swales must have greater than 85% vegetated growth prior to receiving runoff. The bottom of a treatment swale must be above the seasonal high water table.

Maintenance Considerations: Grassed swales will be inspected twice annually, removing accumulated sediment and gross solids. Grass will be mowed periodically but to a depth of not less than 4 inches. Any damage to the vegetation will be repaired and woody vegetation and invasive vegetation will be removed.

Culvert Pipes, Flared End Sections / Headwalls

Description: Culvert pipes are placed to route surface water runoff from catch basins to a discharge point conveying the runoff in such a manner that erosion does not take place. Culvert pipes are often terminated with flared end sections or headwalls.

Maintenance Considerations: The entrance and exit of the culvert pipe should be cleaned of any trash and sediment build-up. The culvert should be clear to let runoff pass through the culvert unobstructed. Flared end sections and headwalls should be inspected for erosion and destabilization, with repairs made as required.

Sediment Forebay

Description: A sediment forebay is designed to reduce the velocity of incoming surface water runoff allowing sediment to fall out of suspension initially pre-treating the runoff before it is sent to a treatment structure. This earthen basin will have vegetated side-slopes and a check dam to further reduce and pretreat the runoff. At the point of incoming runoff, the basin will be protected by rip rap outlet protection construction and the outgoing edge will be protected with rip rap. The check dam will be constructed from one side of the basin to the other and cause runoff to either go through or over. The volume of the forebay is generally 10% the volume of the Water Quality Volume (WQV) for gravel wetlands, and 25% for rain gardens. A dewatering drain is designed into the two-foot berm of the forebay. Construction specifications are included in the plan set and New Hampshire Stormwater Manual, Volume 2, 4-4 Pretreatment Practices 1, Sediment Forebays.

If it determined that too much sediment is by-passing the sediment forebay into the stormwater practice, semi-permanent sediment barriers may be warranted in the form of check dams by using a filtering media such as Filtrexx Silt Soxx.

Maintenance Considerations: The basin and slopes will be periodically mowed, at least twice per year ensuring that woody material does not get an opportunity to grow. Sediment accumulated in the basin will be removed and properly disposed of when it reaches half the height of the check dam. Erosion or other damage to the basin will be repaired and revegetated. (See Outlet Protection) Inspect and clean the dewatering drain to ensure runoff is not trapped for more than 72 hours in the forebay.

Subsurface Gravel Wetland

Description: A Gravel Wetland (NHDES SWM 4-3 Treatment Practice 2D) or Subsurface Gravel Wetland consists of a forebay and multiple flow-through treatment cells. During smaller rain events, the surface water runoff is intended to pass from the forebay, into the gravel media through perforated pipes and structures where it passes through an anaerobic environment where the Water Quality Volume will have 24-72 hours of contact time. The forebay is required to contain 10% of the WQV and each of the two cell must contain 45% of the WQV. During larger storm events, the system works as a detention pond. The design of a Subsurface Gravel Wetland will be constructed in accordance with the most current version of the Design Specifications provided by the

UNH Stormwater Center and SWM Volume 2, Section 4-3 Treatment Practices, 2d Gravel Wetlands.

Maintenance Considerations: The outlet configuration of the anaerobic subsurface gravel consists of a small discharge orifice that is located in a threaded cap. This goose-neck feature is designed to be disassembled to allow cleaning. This outlet orifice is located within a concrete outlet structure that may contains a control stack or manifold used to control and detain runoff in the system. Although this is designed to be "clean water" after the filtering process, the outlet structure in general is going to require periodic maintenance to ensure that it is discharging runoff properly. If the Subsurface Gravel Wetland retains runoff on the surface for more than 72 hours the performance is not correct and maintenance is required.
Debris will need to be removed from the inlet and outlet structures as well as any buildup of sediment. The surface of the ponded area is intended to have wetland plants which may require periodic replanting, depending on the sediment loading. Sediment buildup in the forebay must be removed to maintain the minimum required volume. See also 9 and 10 of the attached UNHSC Subsurface Gravel Wetland Design Specifications 2009, and / or UNHSC Subsurface Gravel Wetland Design Specifications 2016 with Maintenance Guidelines and Checklist. See also Design and Maintenance of Subsurface Gravel Wetlands, February 4, 2015, UNHSC / NHDOT with included Checklist for Inspection of Gravel Wetland and Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device which is attached.

Rip Rap Outlet Protection, Level Spreaders, & Emergency Spillways

Description: Outlet Protection consists of a riprap apron or preformed scour hole that is designed to provide velocity reduction of the surface water run-off that is leaving a culvert. The design is dependent on the culvert size, soil conditions, velocity, and quantity of the run-off. There are to be no bend or curves at the intersection of the conduit and apron. Level spreaders are intended to provide a level lip where surface water runoff is allowed to continue downhill closer to sheet flow. The level lip is to be constructed as level as possible for the entire length. Emergency Spillways are rip rap reinforced outlets near the top of the berm that allow runoff to leave a practice during periods of very high flow. Ref.: NHDES SWM Volume 2, Section 4-6 Conveyance Practices, 6. Outlet Protection and 1. Detention Ponds, Note 3, Page 158.

Maintenance Considerations: The riprap outlet protection will be inspected annually for damage, which must be corrected immediately. Any sediment buildup will be removed and disposed of correctly. Sediment and subsequent vegetation will build up in the Level Spreader. This material will be cleaned out along with any gross solids and disposed of properly. (See invasive species below) Any rip rap that has been displaced from the original construction will be repaired, especially recreating the level lip.

Stabilization for Long Term Cover

Vegetated Stabilization – Original Planting

All areas that are disturbed during construction will be stabilized with vegetated material within 30 days of breaking ground. Construction will be managed in such a manner that erosion is prevented and that no abutter's property will be subjected to any siltation, unless otherwise permitted. All areas to be planted with grass for long-term cover will follow the specification and on Sheet E-102 using seeding mixture C, as follows:

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	24	0.55
Creeping Red Fescue	24	0.55
Total	48	1.10

Conservation Mix

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	15	0.35
Creeping Red Fescue	15	0.35
Annual Ryegrass	5	0.12
Perennial Ryegrass	5	0.12
Kentucky Bluegrass	15	0.35
White Clover	7	0.16
Total	**62**	**1.45**

Conservation Mix will used to stabilize all 2:1 slopes and all land area disturbed within the wetland buffer. As the site is to be stabilized with erosion control mix as a mulch, the vegetation should be established with a high percentage of white clover for growth to be established.

Subsurface Gravel Wetland Mix:

The grass that is planted within a Subsurface Gravel Wetland will be a diverse mix of species to provide food and cover as well as erosion control in the seasonally flooded conditions such as Ernst Seeds Seasonally Flooded Wildlife Mix ERNMX-128.

Maintenance Considerations:

Permanent seeded areas for long-term cover will be inspected on a periodic basis looking for signs of growth loss or erosion. Any areas found to be damaged will be repaired and replanted to reestablish the growth. The grass should be mowed at least twice per year and any dead material removed. Any woody growth that becomes established will need to be cut and removed.

Long-term maintenance of the land cover is critical and must be maintained at least 85% grass / vegetation coverage, must be inspected for concentrated flow, rills, and channels; and must be repaired as necessary to prevent erosion.

CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

Annual Report

Description: The owner is responsible to keep an **I & M Activity Log** that documents inspection, maintenance and repairs to the storm water management system, and a **Deicing Log** to track the amount and type of deicing material applied to the site. The original owner is responsible to ensure that any subsequent owner (s) have copies of

the Inspection & Maintenance Manual, Stormwater System Management, copies of past logs and check lists. This includes any owner association that might become involved with the property. The Annual Report will be prepared and submitted to the Town of Madbury Department of Public Works with copies of both logs and check lists no later than December 15th of each year. Upon an ownership change, the Annual Report will include the Transfer of Ownership Responsibility Forms duplicated from the form found below.

The plans that accompany this manual includes two sheets, "Drainage Operation, Inspection, & Maintenance Plan". The owners and municipality will also maintain a complete set of the approved original design plans.

Respectfully
BERRY SURVEYING & ENGINEERING

Kevin R. Poulin, EIT
Project Engineer / Manager

Kenneth A. Berry, PE, LLS
CPSWQ, CPESC, CESSWI
Principal, VP – Technical Operations

STORMWATER SYSTEM: INSPECTION AND MAINTENANCE MANUAL

Inspection & Maintenance Manual Checklist

LandCare Associates, LLC

282 Knox Marsh Road
Madbury, NH 03823

☑	Date	BMP / System	Minimum Inspection Frequency	Minimum Inspection Requirements	Maintenance / Cleanout Threshold
		Pavement Sweeping	Three Times Per Year	N/A	N/A
		Litter/Trash Removal	Routinely	Inspect dumpsters, outdoor waste receptacles area, and yard areas.	Parcel will be free of litter/trash.
		Deicing Agents	N/A	N/A	Use salt as the primary agent for roadway safety during winter.
		Invasive Species	Two times per year.	Inspect for Invasive Species	Remove and dispose invasive species.
		Closed Drainage System:			
		Drainage Pipes & Inlet Sumps	2 years per year	Check for sediment accumulation & clogging.	Less than 2" sediment depth
		Catch Basins & Catch Basins	2 times per year	Check for sediment accumulation & clogging.	Sediment accumulated to a depth of 2 feet.

☑	Date	BMP / System	Minimum Inspection Frequency	Minimum Inspection Requirements	Maintenance / Cleanout Threshold
		Subsurface Gravel Wetlands	2 times per year	Check for sediment and debris accumulation buildup.	Remove sediment & debris when required. Remove Invasive Species
		Subsurface Gravel Wetland and system clean-outs.	Annually	72-Hour drawdown time evaluation and vegetation evaluation. Underdrain flushing.	Remove dead & diseased vegetation along with all debris, take corrective measures of filtration media if required. Flush underdrain clean-outs with a hose.
		Riprap Outlet Protection	Annually	Check for sediment buildup and structure damage.	Remove excess sediment and repair damage.
		Winter Maintenance	Ongoing	Remove snow as directed.	Ongoing
		Post Winter Maintenance	Annually	Remove excess sand, gross solids, and repair vegetation and plantings	Parcel will be free of excess sand, litter/trash. Vegetation per approved plans.
		Annual Report	1 time per year	Submit Annual Report to Madbury Planning Board.	Report to be submitted on or before December 15th each year. Copies submitted to NHDES by that date.

Inspection Check List:

The following practices and drainage features will all require periodic inspections and maintenance based on this manual and drainage layout:

Catch Basins & Drainage Pipes

Sediment Forebays for Treatment Practice

Subsurface Gravel Wetland #101 with Outlet Structure and Spillway

Rip Rap Outlet Protection & Level Spreaders

Inlet Sump #3P

STORMWATER SYSTEM INSPECTION AND MAINTENANCE PLAN

Inspection & Maintenance Manual Log Form

LandCare Associates, LLC
282 Knox Marsh Road
Madbury, NH 03823

BMP / System	Date Inspected	Inspector	Cleaning/Repair (List Items & Comments)	Repair Date	Performed By:

STORMWATER SYSTEM INSPECTION AND MAINTENANCE PLAN

Deicing Log Form

LandCare Associates, LLC
282 Knox Marsh Road
Madbury, NH 03823

Date	Amount Applied	Performed By:	Date	Amount Applied	Performed By:

STORMWATER SYSTEM OPERATION & MAINTENANCE PLAN CERTIFICATION

Owner	Responsibility
Name: Daniel Gordon, Managing Member LandCare Associates, LLC Address: 282 Knox Marsh Road Madbury, NH 03823 Telephone: (603) 743-3559	The owner is responsible for the conduct of all construction activities, and ultimate compliance with all the provisions of the Stormwater System Operation & Maintenance Plan and the implementation of the Inspection and Maintenance Manual.

OWNER CERTIFICATION

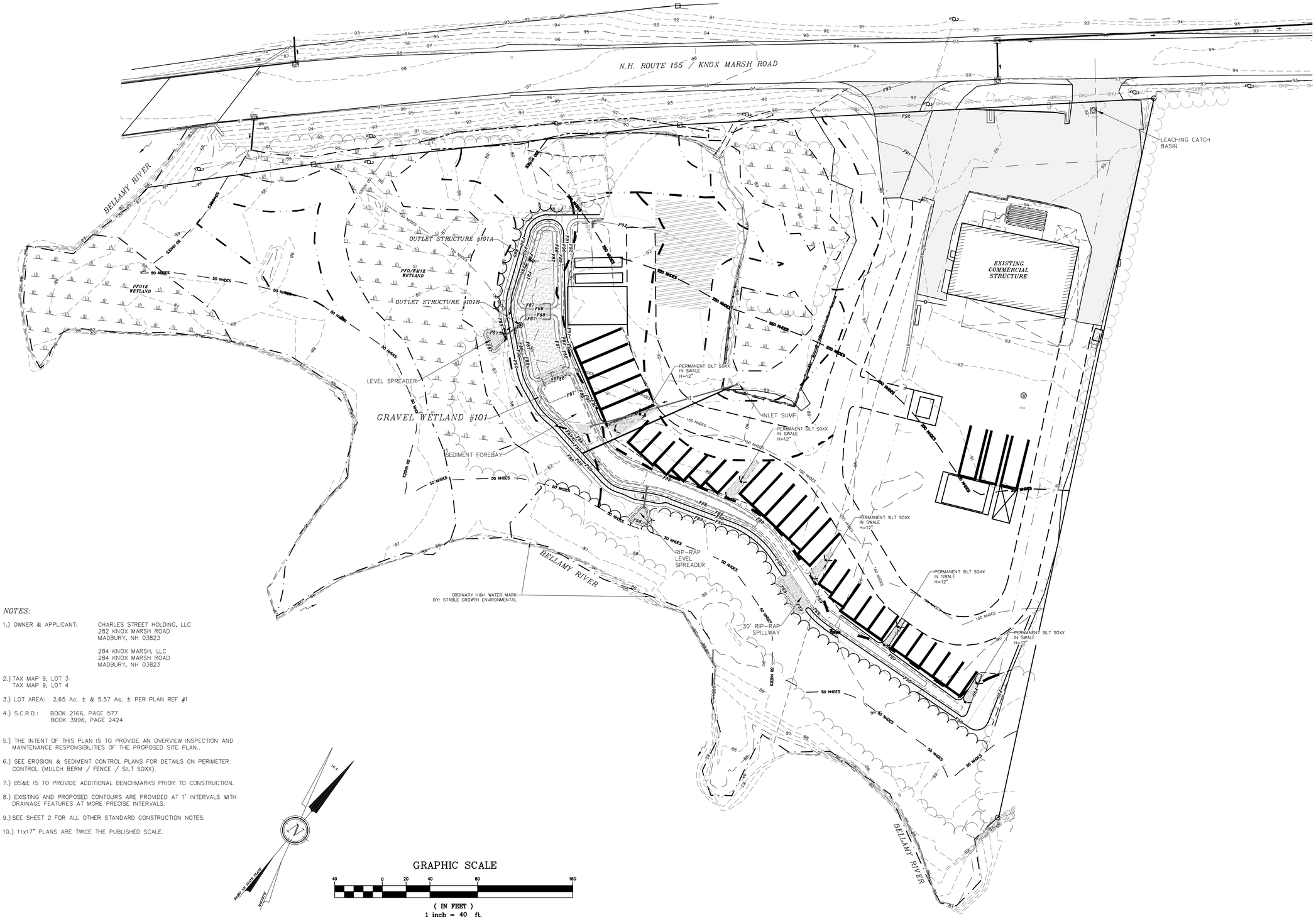
I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____ Date: _____

Printed Name:

Representing:

LandCare Associates, LLC
282 Knox Marsh Road
Madbury, NH 03823



NOTES:

1.) OWNER & APPLICANT: CHARLES STREET HOLDING, LLC
282 KNOX MARSH ROAD
MADBURY, NH 03823

284 KNOX MARSH, LLC
284 KNOX MARSH ROAD
MADBURY, NH 03823

2.) TAX MAP 9, LOT 3
TAX MAP 9, LOT 4

3.) LOT AREA: 2.65 Ac. ± & 5.57 Ac. ± PER PLAN REF #1

4.) S.C.R.D.: BOOK 2166, PAGE 577
BOOK 3996, PAGE 2424

5.) THE INTENT OF THIS PLAN IS TO PROVIDE AN OVERVIEW INSPECTION AND MAINTENANCE RESPONSIBILITIES OF THE PROPOSED SITE PLAN..

6.) SEE EROSION & SEDIMENT CONTROL PLANS FOR DETAILS ON PERIMETER CONTROL (MULCH BERM / FENCE / SILT SOXX).

7.) BS&E IS TO PROVIDE ADDITIONAL BENCHMARKS PRIOR TO CONSTRUCTION.

8.) EXISTING AND PROPOSED CONTOURS ARE PROVIDED AT 1' INTERVALS WITH DRAINAGE FEATURES AT MORE PRECISE INTERVALS.

9.) SEE SHEET 2 FOR ALL OTHER STANDARD CONSTRUCTION NOTES.

10.) 11x17" PLANS ARE TWICE THE PUBLISHED SCALE.

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

REVISION	DATE	DESCRIPTION
#2	4-26-22	SITE LAYOUT REVISION
#1	1-19-22	COLOR RENDERINGS REVISED FOR TOWN MEETING

OPERATION & MAINTENANCE PLAN
LAND OF
CHARLES STREET HOLDING LLC & 284 KNOX MARSH LLC
N.H. ROUTE 155 / 282 & 284 KNOX MARSH ROAD
MADBURY, N.H.
TAX MAP 9, LOTS 3 & 4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

SCALE : 1 IN. EQUALS 40 FT.
DATE : OCTOBER 18, 2021
FILE NO. : DB 2020 - 083

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
No. 13243
LICENSED PROFESSIONAL ENGINEER

Welcome to New Hampshire's Watershed Report Cards built from the 2018, 305(b)/303(d)

Each Watershed Report Card covers a single 12 digit Hydrologic Unit Code (HUC12), on average a 34 square mile area. Each Watershed Report Card has three components;

1. REPORT CARD - A one page card that summarizes the overall use support for Aquatic Life Integrity, Primary Contact (i.e. Swimming), and Secondary Contact (i.e. Boating) Designated Uses on every Assessment Unit ID (AUID) within the HUC12.
2. HUC 12 MAP - A map of the watershed with abbreviated labels for each AUID within the HUC12.
3. ASSESSMENT DETAILS - Anywhere from one to forty pages with the detailed assessment information for each and every AUID in the Report Card and Map.

How are the Surface Water Quality Assessment determinations made?

All readily available data with reliable Quality Assurance/Quality Control is used in the biennial surface water quality assessments. For a full understanding of how the Surface Water Quality Standards (Env-Wq 1700) are translated into surface water quality assessments we urge the reader to review the 2018 Consolidated Assessment and Listing Methodology (CALM) at https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/documents/r-wd-19-04.pdf.

Where can I find more advanced mapping resources?

GIS files are available by assessment cycle at ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/GIS

I'd like to see the more raw water quality data?

The web mapping tool allows you to download the data used in the assessment of the primary contact and aquatic life designated uses by clicking on the "Data Access Waterbody Data (Aquatic Life and Swimming Uses)" link for any assessment unit. (https://www.des.nh.gov/organization/divisions/water/wmb/swqa/assessment-viewers.htm)

How are assessments coded in the report card?

Assessment outcomes are displayed on a color scale as well as an alpha numeric scale that provides additional distinctions for the designated use and parameter level assessments as outlined in the table below.

		Severe Not Supporting, Severe	**Poor** Not Supporting, Marginal	**Likely Bad** Insufficient Information – Potentially Not Supporting	**No Data** No Data	**Likely Good** Insufficient Information – Potentially Full Supporting	**Marginal** Full Support, Marginal	**Good** Full Support, Good
CATEGORY	**Description**							
Category 2	Meets standards						2-M or 2-OBS	2-G
Category 3	Insufficient Information			3-PNS	3-ND	3-PAS		
Category 4	Does not Meet Standards;							
4A	TMDL* Completed	4A-P	4A-M or 4A-T					
4B	Other enforceable measure will correct the issue.	4B-P	4B-M or 4B-T					
4C	Non-pollutant (i.e. exotic weeds)	4C-P	4C-M					
Category 5	TMDL^ Needed	5-P	5-M or 5-T					

* TMDL stands for Total Maximum Daily Load studies (http://des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm)

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010600030903

HUC 12 NAME BELLAMY RIVER

(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good		Full Support Good
Marginal		Full Support Marginal
Likely Good		Insufficient Information – Potentially Full Support
No Data		No Data
Likely Bad		Insufficient Information – Potentially Not Support
Poor		Not Support Marginal
Severe		Not Support Severe

ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHEST600030903-01-01	E*01-01	BELLAMY RIVER NORTH	5-P	2-G	2-G	5-M
NHEST600030903-01-03	E*01-03	BELLAMY RIVER SOUTH CLEMENT POINT	5-P	2-G	2-G	5-M
NHEST600030903-01-04	E*01-04	BELLAMY RIVER SOUTH	5-P	2-G	2-G	5-M
NHIMP600030903-01	I*01	BELLAMY RIVER	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-02	I*02	BELLAMY RIVER - SAWYERS MILL DAM POND	5-M	5-M	3-ND	4A-M
NHIMP600030903-03	I*03	CANNEY BROOK - WILDLIFE POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-04	I*04	BELLAMY RIVER IV DAM	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-05	I*05	KNOX MARSH BROOK	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-06	I*06	UNNAMED BROOK - THORNWOOD COMMONS POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-07	I*07	UNNAMED BROOK - BELLAMY RIVER WILDLIFE POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-08	I*08	UNNAMED BROOK - FARM POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-09	I*09	UNNAMED BROOK - WEBSTER BROOK DAM	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-10	I*10	UNNAMED BROOK - FARM POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-01	L*01	BARBADOES POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-02	L*02	BELLAMY RESERVOIR	5-M	3-ND	3-ND	4A-M
NHLAK600030903-03	L*03	SWAINS LAKE	5-P	3-PNS	3-ND	4A-M
NHLAK600030903-04	L*04	WINKLEY POND	5-P	3-ND	3-ND	4A-M
NHLAK600030903-05	L*05	BRANCH MALLEGO BROOK POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-06	L*06	FARM POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-07	L*07	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-01	R*01	MADLA BROOK	5-P	3-ND	3-ND	4A-M
NHRIV600030903-02	R*02	MALLEGO BROOK	5-P	3-ND	3-ND	4A-M
NHRIV600030903-03	R*03	CALEF BROOK	3-ND	3-PAS	3-PAS	4A-M
NHRIV600030903-05	R*05	UNNAMED BROOK - TO SWAINS LAKE	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-06	R*06	BELLAMY RIVER - UNNAMED BROOK	5-M	3-ND	3-ND	4A-M
NHRIV600030903-07	R*07	BELLAMY RIVER	5-P	4A-P	4A-P	4A-M
NHRIV600030903-08	R*08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	5-P	4A-P	3-PNS	4A-M
NHRIV600030903-09	R*09	BELLAMY RIVER - UNNAMED BROOK	5-M	4A-P	3-ND	4A-M

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010600030903

HUC 12 NAME BELLAMY RIVER

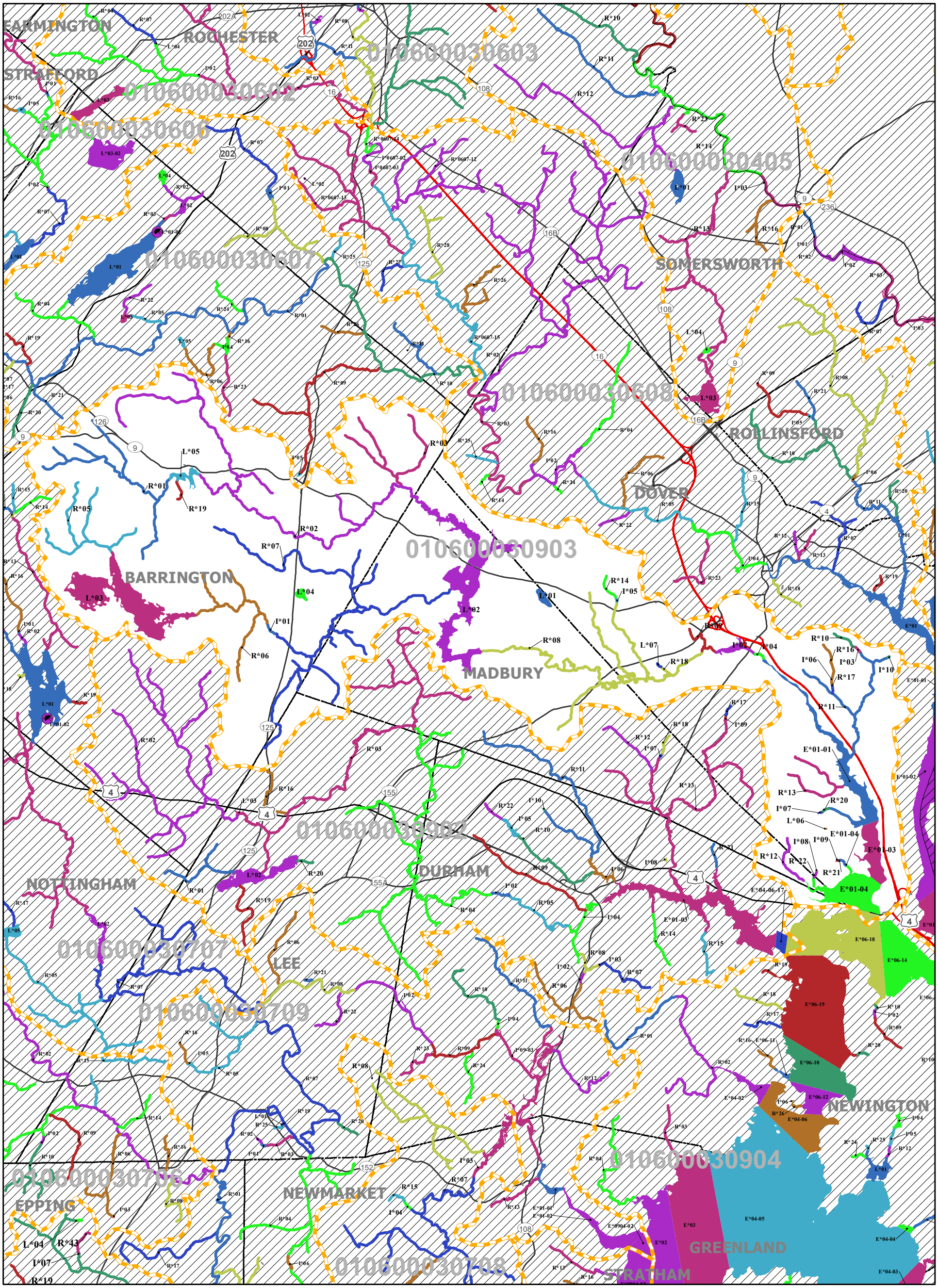
(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good		Full Support Good
Marginal		Full Support Marginal
Likely Good		Insufficient Information – Potentially Full Support
No Data		No Data
Likely Bad		Insufficient Information – Potentially Not Support
Poor		Not Support Marginal
Severe		Not Support Severe

ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHRIV600030903-10	R*10	CANNEY BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-11	R*11	VARNEY BROOK - CANNEY BROOK	3-ND	4A-P	4A-M	4A-M
NHRIV600030903-12	R*12	UNNAMED BROOK - TO BELLAMY RIVER ROYALLS COVE	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-13	R*13	GARRISON BROOK	3-ND	4A-P	3-ND	4A-M
NHRIV600030903-14	R*14	KNOX MARSH BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-16	R*16	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-17	R*17	VARNEY BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-18	R*18	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-19	R*19	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-20	R*20	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-21	R*21	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-22	R*22	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-M

AUIDs For HUC12: 010600030903 - Bellamy River



HUC12 Boundaries
Town Boundaries
Major Roads
Interstate Highway
US Highway
State Highway

Assessment Unit Coloring
AUs Ending with:
0 =
1 =
2 =
3 =
4 =
5 =
6 =
7 =
8 =
9 =

N
W E
S

Abbrv. Label	HUC 12
L* 03	010 700060201

AUID = NH L AK 700060201 - 03

Assessment Unit IDs are derived from the HUC12 they reside within. The labels have been shortened on this map for presentation purposes.
Example: the Label "L*03" in HUC12 = 010700060201 represents AUID = "NHLAK700060201-03"
In rare cases where an AUID extends beyond the boundary of a single HUC12, additional portions of the end of the HUC 12 number have also been replaced.

0 0.8 1.6 2.4 3.2 Miles

Scale:1:78,820

S:\WD-Watershed\WQ_Planning\305b_303d\2018\AUIDs\HUC12Maps

Assessment Unit ID NHRIV600030903-08 Size 9.4540 MILES

Assessment Unit Name BELLAMY RIVER - KELLY BROOK - KNOX MARSH Beach N

Primary Town MADBURY Assessment Unit Category*~ 5-P

2018, 305(b)/303(d) - All Reviewed Parameters by Assessment Unit

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Aquatic Life Integrity	5-P	ALKALINITY, CARBONATE AS CACO3	N	1990	1990	3-ND	
		AMMONIA (TOTAL)	N	1997	N/A	3-ND	
		ARSENIC	N	1990	N/A	3-ND	
		Aluminum	N	2017	2017	5-M	LOW
		Benthic-Macroinvertebrate Bioassessments (Streams)	N	2000	2000	5-P	LOW
		CADMIUM	N	1990	N/A	3-ND	
		CHLORIDE	N	2018	N/A	3-PAS	
		COPPER	N	2016	2016	3-PNS	
		DISSOLVED OXYGEN SATURATION	N	2018	2007	3-PAS	
		Fishes Bioassessments (Streams)	N			3-PAS	
		Habitat Assessment (Streams)	N	2000	2000	4C-P	
		IRON	N	1997	N/A	3-ND	
		LEAD	N	2000	2000	3-ND	
		NICKEL	N	1990	N/A	3-ND	
		OXYGEN, DISSOLVED	N	2018	2016	2-M	
		PHOSPHORUS (TOTAL)	N	2017	NLV	3-PAS	
		SELENIUM	N	1990	N/A	3-ND	
		TURBIDITY	N	2017	2008	3-PAS	
		ZINC	N	2016	1998	3-PAS	
		pH	N	2018	2017	5-M	LOW
Fish Consumption	4A-M	ARSENIC	N	1990	1990	3-ND	
		COPPER	N	2016	N/A	3-PNS	
		MANGANESE	N	1990	N/A	3-ND	
		Mercury	N			4A-M	
		NICKEL	N	1990	N/A	3-ND	
		SELENIUM	N	1990	N/A	3-ND	
		ZINC	N	2016	N/A	3-PNS	
Potential Drinking Water Supply	2-G	ARSENIC	N	1990	1990	3-ND	
		COPPER	N	2016	N/A	3-PAS	

Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Full Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good

*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm)

Assessment Unit ID NHRIV600030903-08 Size 9.4540 MILES

Assessment Unit Name BELLAMY RIVER - KELLY BROOK - KNOX MARSH Beach N

Primary Town MADBURY Assessment Unit Category*~ 5-P

2018, 305(b)/303(d) - All Reviewed Parameters by Assessment Unit

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Potential Drinking Water Supply	2-G	ESCHERICHIA COLI	N	2017	2017	3-PNS	
		FECAL COLIFORM	N	1990	1990	3-ND	
		FLUORIDE	N	1997	N/A	3-ND	
		IRON	N	1997	1997	3-ND	
		MANGANESE	N	1990	N/A	3-ND	
		NICKEL	N	1990	N/A	3-ND	
		SELENIUM	N	1990	N/A	3-ND	
		SULFATES	N	2016	N/A	3-PAS	
		ZINC	N	2016	N/A	3-PAS	
Primary Contact Recreation	4A-P	CHLOROPHYLL-A	N	1990	N/A	3-ND	
		Escherichia coli	N	2017	2017	4A-P	
Secondary Contact Recreation	3-PNS	ESCHERICHIA COLI	N	2017	2016	3-PNS	
Wildlife	3-ND						

Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Full Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good

*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm)

Cycle	Assessment Unit ID (AUID)	Assessment Unit Name	Town(s) Primary Town is Listed First	Water Size	Size Unit	Designated Use Description	Parameter Name	NHDES Category	Threatened	TMDL Priority
2018	NHRIV600030903-07	BELLAMY RIVER	BARRINGTON, LEE, MADBURY	11.507	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600030903-07	BELLAMY RIVER	BARRINGTON, LEE, MADBURY	11.507	MILES	Aquatic Life Integrity	pH	5-P	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	DOVER	0.756	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Copper	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Iron	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030904-09	KNIGHT BRANCH	NEWINGTON	0.565	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600030904-11	MCINTYRE BROOK - PEASE AIR FORCE	NEWINGTON	0.621	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Arsenic	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Cadmium	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Zinc	5-M	N	LOW
2018	NHRIV600031001-01	PICKERING BROOK -FLAGSTONE BROOK	NEWINGTON	2.720	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600031001-01	PICKERING BROOK -FLAGSTONE BROOK	NEWINGTON	2.720	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-03	SAGAMORE CREEK	PORTSMOUTH	0.975	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-03	SAGAMORE CREEK	PORTSMOUTH	0.975	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P		LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Chloride	5-P	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Arsenic	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Chromium (total)	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Copper	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Lead	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Zinc	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Chloride	5-P	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	DDD	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-08	RAILWAY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.638	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-10	NEWFILEDS DITCH	PORTSMOUTH	1.315	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-10	NEWFILEDS DITCH	PORTSMOUTH	1.315	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031002-01	BERRYS BROOK	PORTSMOUTH, GREENLAND, RYE	9.372	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031002-01	BERRYS BROOK	PORTSMOUTH, GREENLAND, RYE	9.372	MILES	Aquatic Life Integrity	pH	5-M	N	LOW

List of ORW and Impaired (4A and 5) Waters for CGP NOIs 5/10/12							
(Outstanding Resource Waters and Impairments on the 2010 305(b)/303(d) that need, or have a completed, TMDL. File last update May 10, 2012.)							
Assessment Unit ID	**Assessment Unit Name**	**Impairment Name**	**Pollutant allocated in TMDL (if different than "Impairment Name")**	**CGP eNOI Equivalent (to Impairment Name)**	**TMDl Approval Date**	**TMDL Name**	**Outstanding Resource Water (ORW) (AUIDs not shown are non ORWs) {See http://www2.des.state.nh.us/gis/onestop/ if your AUID says "Review OneStop GIS ORW Layer"}**
NHRIV600030902-16	WENDYS BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-01	MADLA BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-02	MALLEGO BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-06	BELLAMY RIVER - UNNAMED BROOK	Oxygen, Dissolved		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-06	BELLAMY RIVER - UNNAMED BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Dissolved oxygen saturation		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Oxygen, Dissolved		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Aluminum		METALS (OTHER THAN MERCURY)			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Benthic-Macroinvertebrate Bioassessments (Streams)		CAUSE UNKNOWN - IMPAIRED BIOTA			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-11	VARNEY BROOK - CANNEY BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW

NOTES:

1.) OWNER & APPLICANT: CHARLES STREET HOLDING, LLC
282 KNOX MARSH ROAD
MADBURY, NH 03823

284 KNOX MARSH, LLC
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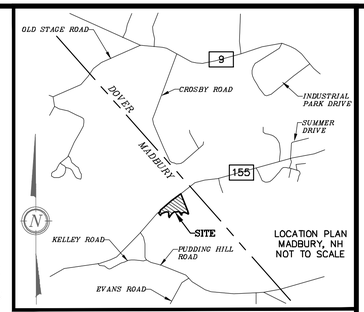

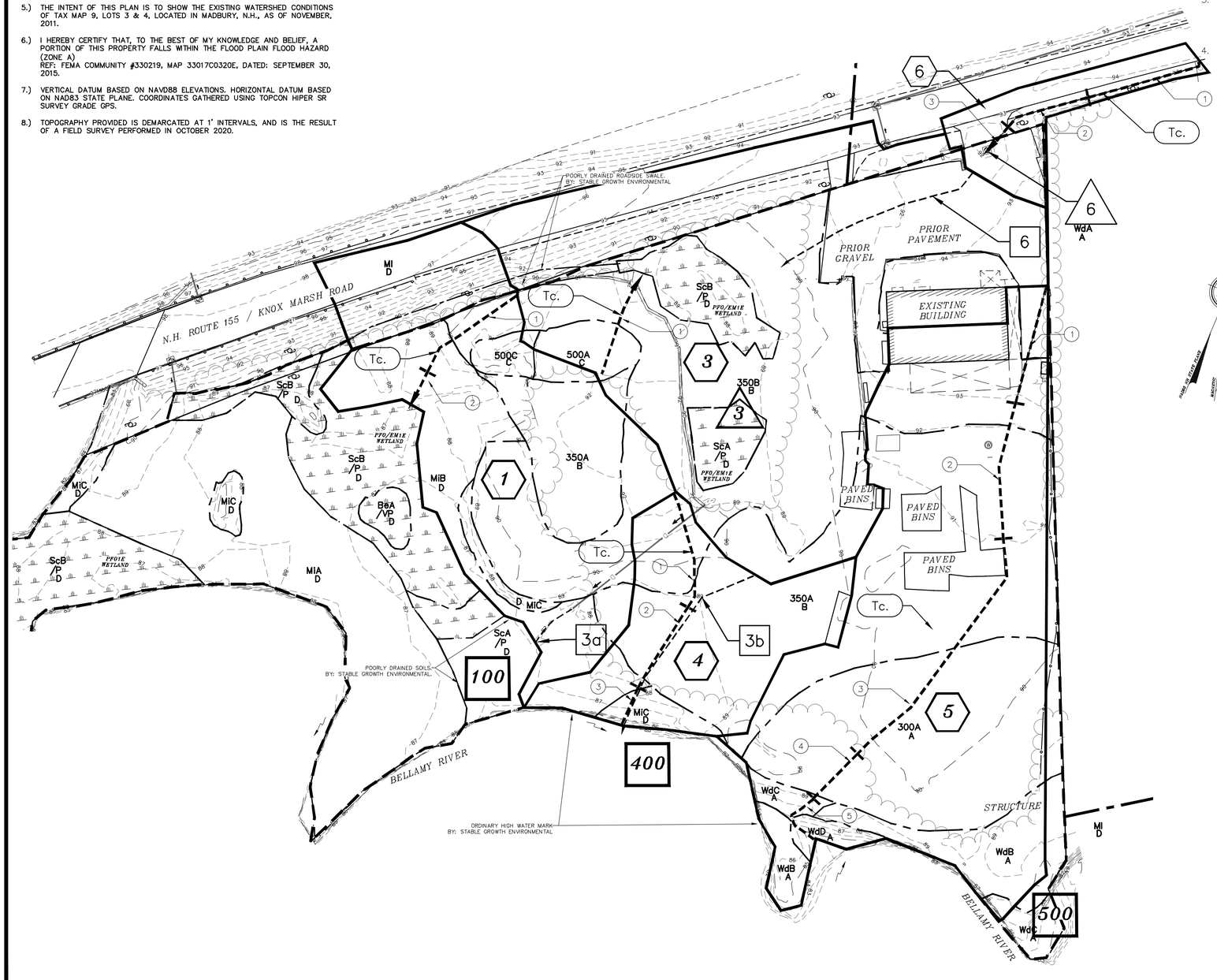

MICHAEL PARSONT CWS #28

JOHN P. HAYES CWS #18

JOHN P. HAYES CSS #87

SOILS LEGEND

SYMBOL	SOIL TAXONOMIC NAME	HYDROLOGIC SOIL GROUP
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MiB	MIXED ALLUVIAL LAND	D
MiC	MIXED ALLUVIAL LAND	D
ScA/P	SCANTIC, POORLY DRAINED	D
ScB/P	SCANTIC, POORLY DRAINED	D
WdB	WINDSOR	A
WdC	WINDSOR	A
WdD	WINDSOR	A
300A	UDIPSAMMENTS	A
350A	UDIPSAMMENTS (WET SUBSTRATUM)	B
350B	UDIPSAMMENTS (WET SUBSTRATUM)	B
500A	UDORTHENTS (LOAMY)	C

SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+

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SUBCATCHMENT AREA SYMBOL

FLOW REACH SYMBOL

POND DEVICE SYMBOL

TIME OF CONCENTRATION SEGMENT

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

REVISION	DATE	DESCRIPTION
#2	4-26-22	SITE LAYOUT REVISION
#1	1-19-22	COLOR RENDERINGS REVISED FOR TOWN MEETING

W-1 EXISTING WATERSHED 2011
LAND OF
CHARLES STREET HOLDING LLC & 284 KNOX MARSH LLC
N.H. ROUTE 155 / 282 & 284 KNOX MARSH ROAD
MADBURY, N.H.
TAX MAP 9, LOTS 3 & 4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

SCALE : 1 IN. EQUALS 50 FT.
DATE : OCTOBER 18, 2021
FILE NO. : DB 2020 - 083

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
No. 14040
LICENSED PROFESSIONAL ENGINEER

NOTES:

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MADBURY, NH 03823

284 KNOX MARSH, LLC
284 KNOX MARSH ROAD
MADBURY, NH 03823

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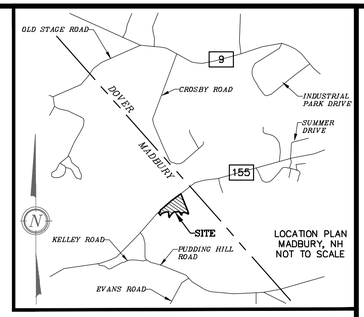

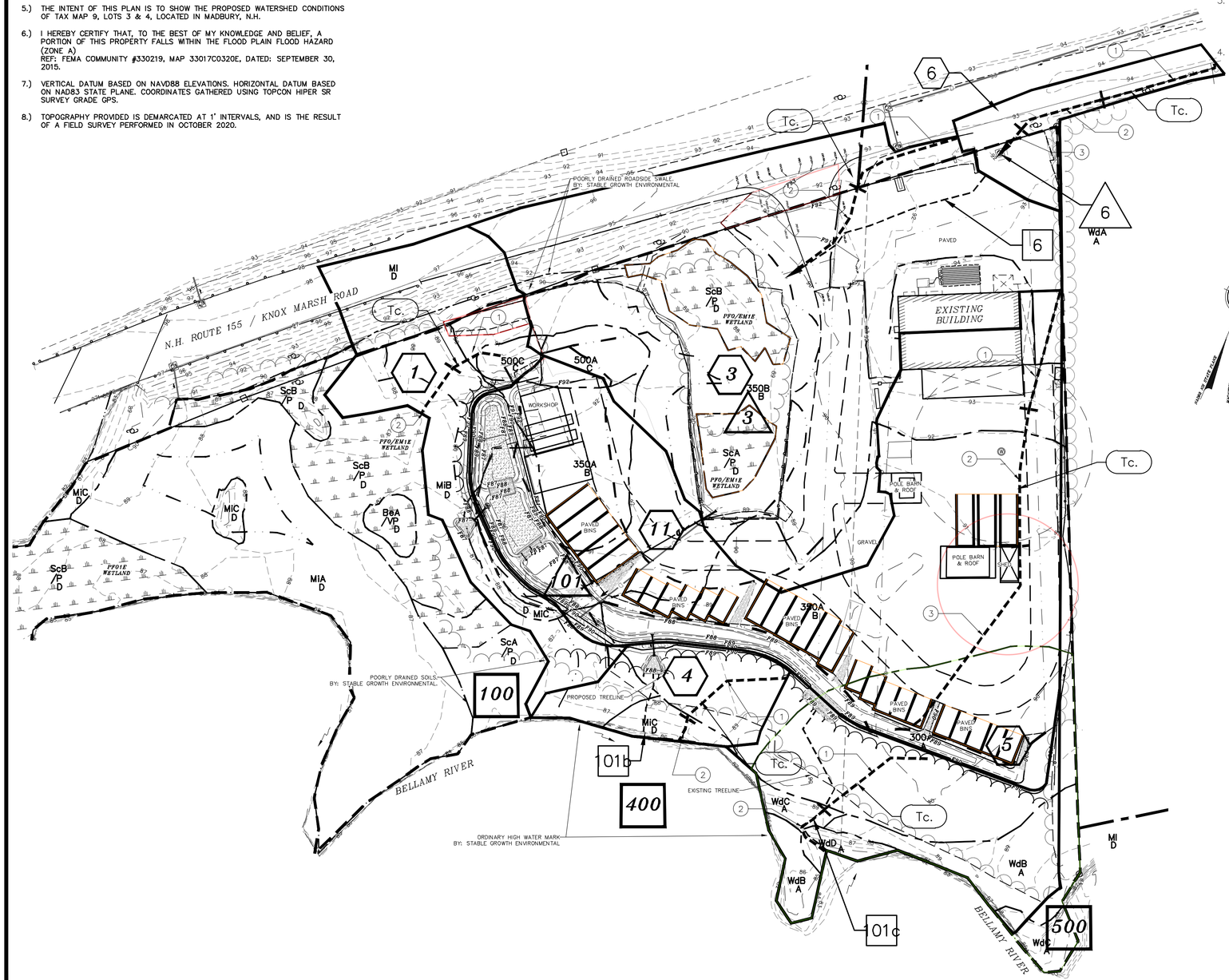

MICHAEL PARSONT CWS #28

JOHN P. HAYES CWS #18

JOHN P. HAYES CSS #87

SOILS LEGEND

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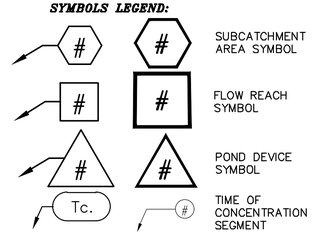

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W-2 PROPOSED WATERSHED
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CHARLES STREET HOLDING LLC & 284 KNOX MARSH LLC
N.H. ROUTE 155 / 282 & 284 KNOX MARSH ROAD
MADBURY, N.H.
TAX MAP 9, LOTS 3 & 4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

SCALE : 1 IN. EQUALS 50 FT.
DATE : OCTOBER 18, 2021
FILE NO. : DB 2020 - 083

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
No. 15447
LICENSED PROFESSIONAL ENGINEER

NOTES:

1.) OWNER & APPLICANT: CHARLES STREET HOLDING, LLC
282 KNOX MARSH ROAD
MADBURY, NH 03823

284 KNOX MARSH, LLC
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MADBURY, NH 03823

2.) TAX MAP 9, LOT 3
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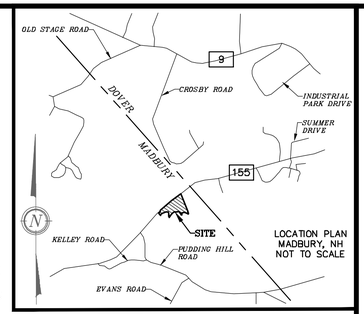

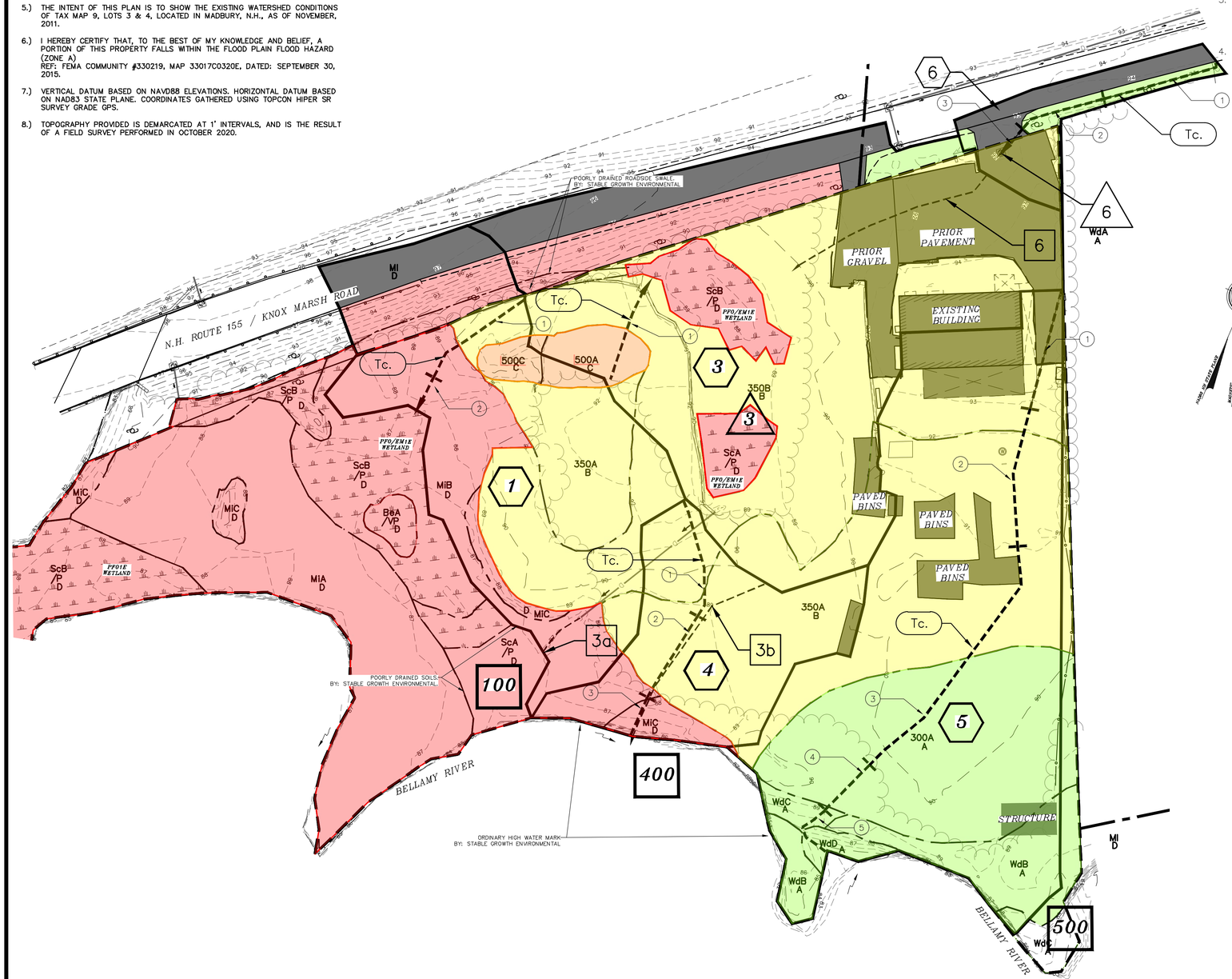

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MICHAEL PARSONT CWS #28

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SCALE : 1 IN. EQUALS 50 FT.
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STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
NO. 13475
LICENSED PROFESSIONAL ENGINEER

NOTES:

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282 KNOX MARSH ROAD
MADBURY, NH 03823

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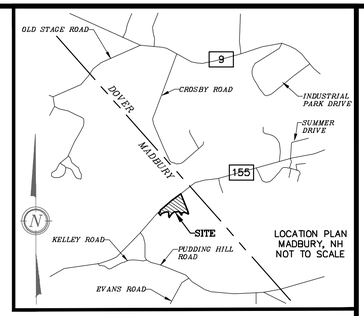

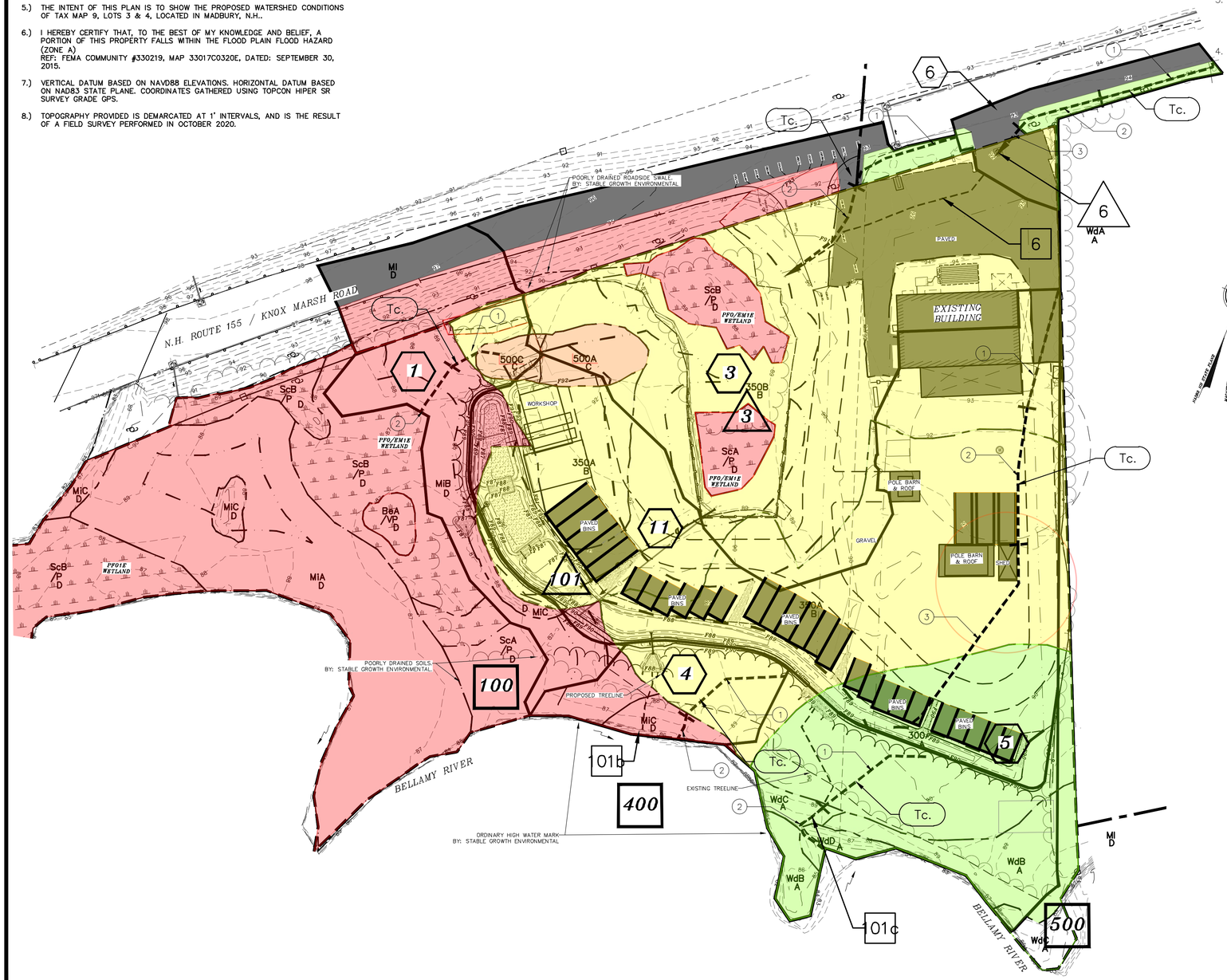

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NO. 15447
LICENSED
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