STORMWATER MANAGEMENT
&
SEDIMENT AND EROSION
CONTROL PLAN

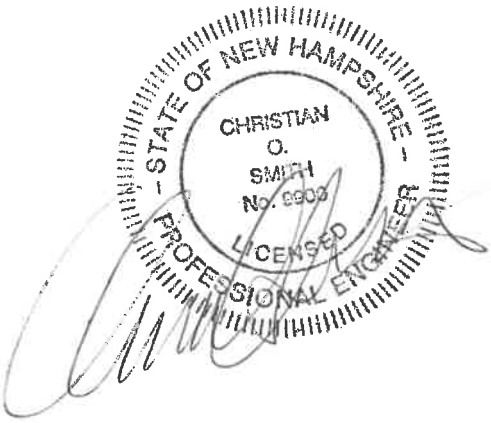
Prepared for:

STONEARCH DVELOPMENT CORP.
42J DOVER POINT ROAD
DOVER, NH 03820
COMMERCIAL SITE PLAN LOT 26-57

Prepared by:

BEALS ASSOCIATES, *PLLC*
70 PORTSMOUTH AVENUE
STRATHAM, NH 03885

Project Number:
NH-1144.1
NH Route 125
Barrington, New Hampshire
February 8, 2022



DESIGN METHOD OBJECTIVES

Stonearch Development Corp. proposes a Commercial Site Plan on the recently approved lot shown as Tax Map 223 as Lot 26-57 on approximately 5-acres of land located off NH Route 125/Signature Drive (not yet constructed) in Barrington, NH. A drainage analysis of the proposed development was conducted for the purpose of estimating the peak rate of stormwater run-off and to subsequently design adequate drainage structures. Two models were compiled, one for the area in its existing (pre-construction) condition, and a second for its proposed (post-construction) condition. The analysis was conducted using data for the 2, 10, and 50Yr – 24 Hr storm events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment. The purpose of this analysis is to estimate the peak rates of run-off from the site for swale adequacy purposes, and to compare the peak rate of run-off between the existing and proposed conditions. Rainfall data utilized is as provided in the Extreme Precipitation tables by Cornell University. Infiltration rates, for the ponds that are design to recharge stormwater, have been taken from field amoozemeter infiltration testing provided by TES Environmental, LLC. The published values were then divided by 2 as a factor of safety as required by the NH Stormwater Manual.

ANALYSIS COMPONENT PEAK RATE of DISCHARGE (CFS)

	1 YR	2 YR		10 YR		50 YR	
	Existing	Existing	Proposed	Existing	Proposed	Existing	Proposed
Reach #100	2.55	4.32	1.40	10.83	8.73	22.30	21.74

STORMWATER VOLUME COMPARISON (2-YR STORM IN AF)

	Existing	Proposed
Reach #100	0.540	1.103 (Channel protection is met as 2 YR Peak Flow Prop.< 1 YR existing)

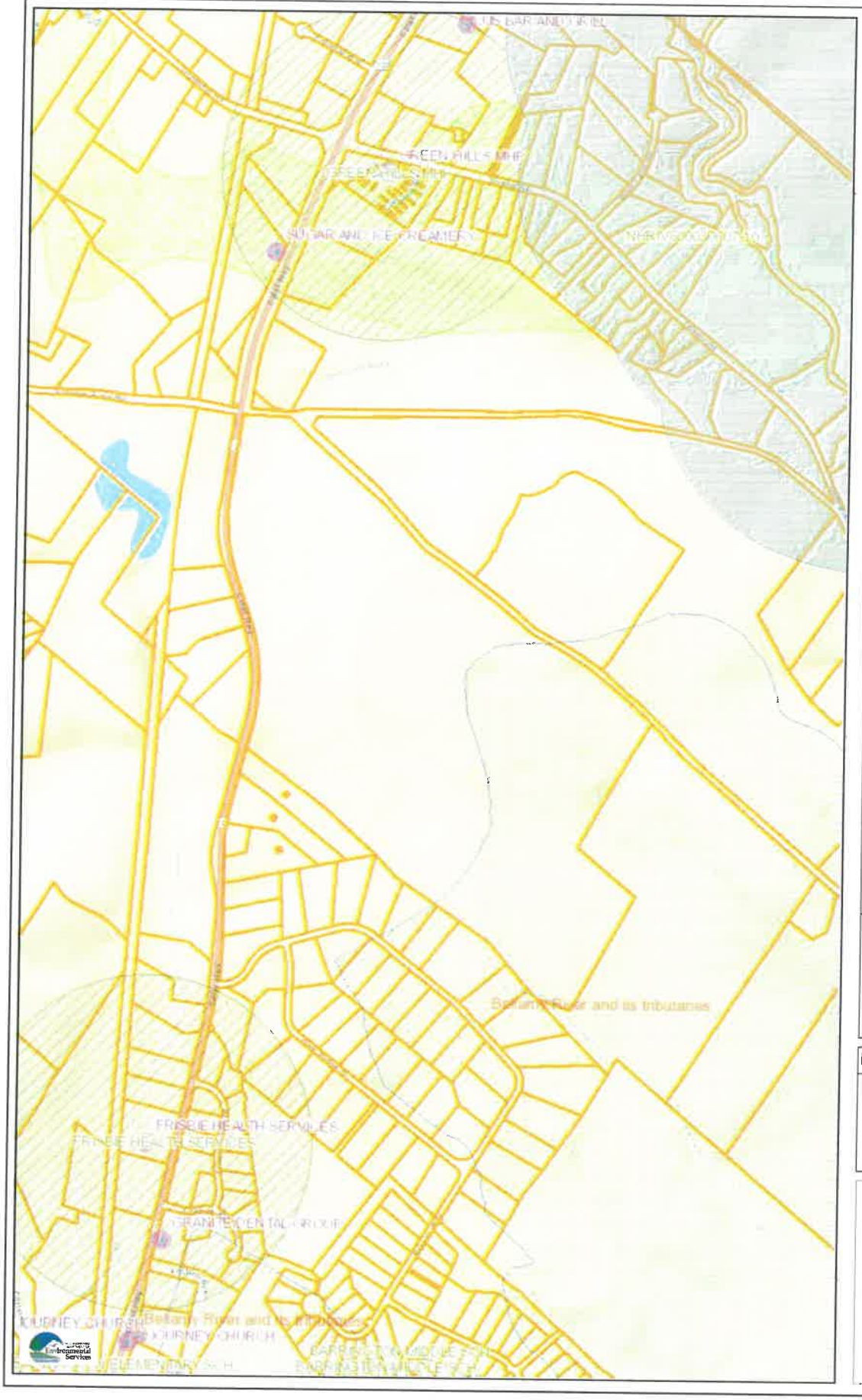
The existing property is located on a parcel consisting of forest, and a wetland area draining to an NHDOT culvert under Route 125. The existing topography is such that the site analysis is divided into one subcatchment. The reach flows offsite through an existing culvert under Rt 125), Classified by Site Specific Soil Mapping, the land within the drainage analysis is composed of slopes ranging from 3% to 15%, and soils categorized into the Hydrologic Soil Group (HSG) C. No flood hazard zone exists on the parcel.

The addition of the impervious area from the 22' wide paved drive, and the proposed commercial buildings cause an increase in the curve number (Cn) and a decrease in the time of concentration (Tc), the net result being a potential increase in peak rates of run-off from the site. The proposed development divides the site into seven different post-construction subcatchments. Impervious area take-offs were calculated digitally from the proposed pavement and roof areas. Seasonal high-water tables for the treatment ponds and infiltration areas were modeled based on actual test pits logged within the proposed BMP areas. The run-off is treated and infiltrated or outletted toward wetlands areas modeled as HydroCAD "reaches" and "ponds". These consist of constructed swales, existing flow paths through larger subcatchments, roadway culverts, deep sump catch basins, wet detention pond, constructed gravel wetlands, infiltration basins and level spreaders. Required groundwater recharge will be exceeded by a single 1" storm (4,776 c.f. required and 8,842 c.f. provided by a 2-year storm.

The use of Best Management Practices per the New Hampshire Stormwater Manual has been applied to the design of these structures and will be observed during all stages of construction. All land disturbed during construction will be permanently stabilized within 60 days of

groundbreaking, and existing wetlands and abutters will suffer no adversity resulting from this development.

Map By



Legend

- Coastal and Great Bay Regi Communities
- Designated Rivers Quarterm Buffer
- Public Water Supply Wells
- Groundwater Classification / GA1
- Groundwater Classification / GA2
- Water Supply Intake Protect Areas
- Wellhead Protection Areas
- Lakes with a Quarter Mile Bu
- All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairn 2016 with Quarter Mile Buffe
- Watersheds with Chloride Impairments 2016
- Parcels - polygons

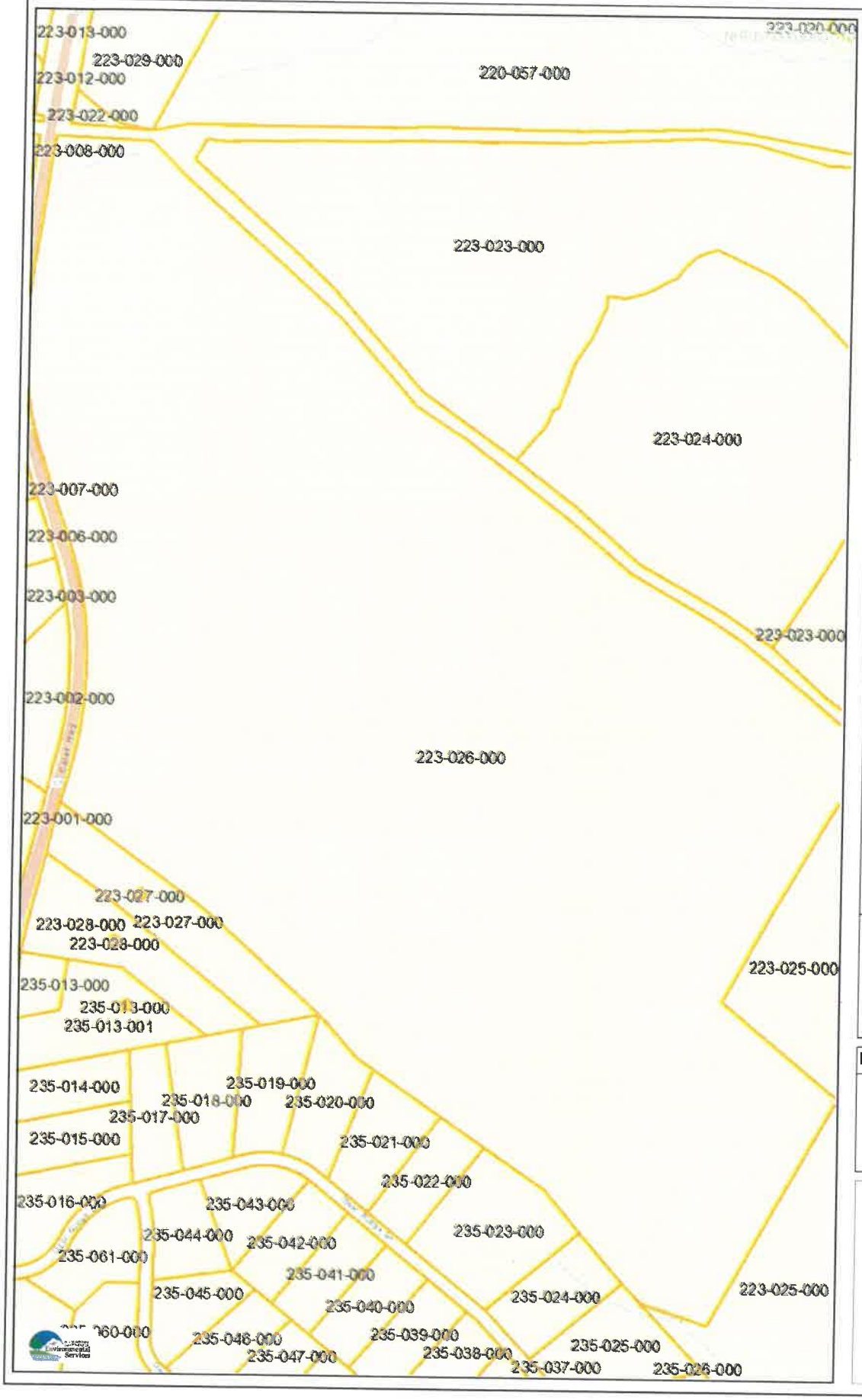
Map Scale

1: 12,988

Map Generated: 1/30/2019

Notes

Map By



Legend

- All Lakes, with a Quarter Mil Buffer
- Surface Waters with Impairm 2016 with Quarter Mile Buffe
- Parcels - polygons

Map Scale
1: 6,494

Map Generated: 1/30/2019

Notes

Table of Contents

1.0 RAINFALL CHARACTERISTICS

This stormwater management plan includes an existing conditions analysis of the area involved in the proposed development, as well as proposed conditions, or post-construction analysis of the same location. These analyses were accomplished using the USDA SCS TR-20 Method within the HydroCAD Stormwater Modeling System. The curve numbers were developed using the SCS TR-55 Runoff Curve numbers for Urban Areas. A Type III SCS 24-hour rainfall distribution was utilized in analyzing the data for the 2, 10 and 50Yr – 24 Hr storm events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment.

ANALYSIS COMPONENT PEAK RATE of DISCHARGE (CFS)

	1 YR	2 YR		10 YR		50 YR	
	Existing	Existing	Proposed	Existing	Proposed	Existing	Proposed
Reach #100	2.55	4.32	1.40	10.83	8.73	22.30	21.74

STORMWATER VOLUME COMPARISON (2-YR STORM IN AF)

	Existing	Proposed
Reach #100	0.540	1.103 (Channel protection is met as 2 YR Peak Flow Prop.< 1 YR existing)

2.0 EXISTING CONDITIONS

Reference: Sheet W-1, Existing Conditions Watershed Plan (Enclosed)
Existing Conditions Plans

The existing property is located on a parcel consisting of forest, and a wetland area draining to an NHDOT culvert under Route 125. The existing topography is such that the site analysis is divided into one subcatchment. The reach flows offsite through an existing culvert under Rt 125),
Classified by Site Specific Soil Mapping, the land within the drainage analysis is composed of slopes ranging from 3% to 15%, and soils categorized into the Hydrologic Soil Group (HSG) C. No flood hazard zone exists on the parcel.

3.0 PROPOSED CONDITIONS

Reference: W-Sheets Proposed Conditions Watershed Plan (Enclosed)
C Sheets Proposed Conditions Plans

The addition of the impervious area from the 22' wide paved drive, and the proposed commercial buildings cause an increase in the curve number (Cn) and a decrease in the time of concentration (Tc), the net result being a potential increase in peak rates of run-off from the site. The proposed development divides the site into seven different post-construction subcatchments. Impervious area take-offs were calculated digitally from the proposed pavement and roof areas. Seasonal high-water tables for the treatment ponds and infiltration areas were modeled based on actual test pits logged within the proposed BMP areas. The run-off is treated and infiltrated or outletted toward wetlands areas modeled as HydroCAD "reaches" and "ponds". These consist of constructed swales, existing flow paths through larger subcatchments, roadway culverts, deep sump catch basins, wet detention pond, constructed gravel wetlands, infiltration basins and level spreaders. Required groundwater

recharge will be exceeded by a single 1" storm (4,776 c.f. required and 8,842 c.f. provided by a 2-year storm.

In an effort to prevent the sedimentation of adjacent wetlands or abutting property, the westerly drive aisle is equipped with a roadside swale that terminates directly into sediment forebays for the mentioned BMP treatment ponds. Ksat values were utilized based on field testing with an amoozemeter. Post development stormwater flows reduced from existing for the 2YR through the 50YR storm events, and all ponds safely pass the 50YR storm event as required by NHDES AoT. It should also be noted that the stormwater volume to the analysis point is equal or reduced compared to the existing conditions under the 2-YR frequency storm event. All BMP's have been designed per the New Hampshire Stormwater Manual and design worksheets appear in the appendices. During construction, appropriate temporary and/or permanent BMP's will be applied so as to negate the potential for sediment-laden run-off to discharge into wetlands prior to the final stabilization of the proposed grading. The structures outlined in this proposal provide for compliant treatment of stormwater run-off and for sediment control.

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

Reference: C Sheets Proposed Conditions Plan
E Sheet Erosion & Sediment Control Details

The proposed site development is protected from erosion and the roadways and abutting properties are protected from sediment by the use of Best Management Practices as outlined in the New Hampshire Stormwater Manual. Any area disturbed by construction will be permanently re-stabilized within 60 days and abutting properties and wetlands 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.

4.1 Silt Fence / Erosion Control Berm and Construction Fence

The plan set demonstrates the location of silt fence or Erosion Control Berm for sediment control. In areas where the limits of construction need to be emphasized to operators, construction fence for added visibility will be installed. Sheet E-1, Erosion and Sediment Control Details, has the specifications for installation and maintenance of the silt fence. Orange construction fence will be VISI Perimeter Fence by Conwed Plastic Fencing, or equal. The four-foot fencing to be installed using six-foot posts at least two feet in the ground with spacing of six to eight feet.

4.2 Drainage Swales / Stormwater Conveyance Channels

Drainage swales will be stabilized with vegetation for long term cover as outlined below, and on Sheet E-1 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.

4.3 Vegetated Stabilization

All areas that are disturbed during construction will be stabilized with vegetated material within 60 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-1 using seeding mixture C, as follows:

Mixture	**Pounds** per Acre	**Pounds per** 1,000 Sq. Ft.
Tall Fescue	20	0.45
Creeping Red Fescue	28	0.65
Total	48	1.10

4.4 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 between 1 and 2-inch coarse aggregate, and the pad itself constructed to a minimum length of 50' 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 E1 - Sediment and Erosion Control Detail Plan.

4.5 Level Spreaders

As mentioned above, the proposed site plan includes stone level spreaders above a vegetated buffer. Level spreaders must be more than six feet in width per the "New Hampshire Stormwater Maual." Stone Level spreaders enable any run-off directed towards them to be spread evenly into sheet flow prior to discharge into wetlands or treatment by a vegetated buffer, thus allowing for better buffer efficiency and a lesser potential for erosion.

4.6 Vegetated Buffers

Vegetated buffers are areas of land with natural or planted vegetation designed to receive sheet run-off from upgradient development. These natural areas, preferably wooded, are effective in removing sediment and sediment-laden pollutants from such run-off, although their effectiveness is severely diminished when forced to deal with concentrated flow and must therefore be equipped with a level-spreading device. Vegetated buffers should not have a slope exceeding fifteen percent and have a minimum length of seventy-five feet.

4.7 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.

4.8 Construction Sequence

1. Construct and/or install temporary and permanent sediment erosion and detention control facilities (silt fence/erosion control berm, vegetated swales, level spreaders, and constructed Vegetated buffers), 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.

2. Clear, cut, grub, and dispose of debris in approved facilities.

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

4. Construct the roadway and its associated drainage structures.

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

6. 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.

7. Inspect and maintain all erosion and sediment control measures during construction every two weeks and after every storm event with 0.5" or more rain.

9. Complete permanent seeding and landscaping.

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

10. All swales and all drainage ponds and structures will be constructed and fully stabilized prior to having run-off being directed to them.

11. Finish graveling all roadways/parking.

4.9 Temporary Erosion Control Measures

1. The smallest practical area of open soil 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 revegetated.

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.

4.10 Inspection and Maintenance Schedule

Fencing/Erosion Control Berm will be inspected during and after storm events to ensure that the fence still has integrity and is not allowing sediment to pass. Sediment build-up in swales and level spreaders will be removed if it is deeper than six inches.

5.0 CONCLUSION

This proposed development off of NH Route 125/Signature Drive in Barrington, NH will have no adverse effect on abutting property owners by way of storm water run-off or siltation. The post-construction peak rate of run-off for the site has been decreased from that of the existing conditions for the analyzed design storms and roadway run-off will treatment by either constructed or natural methods. Appropriate steps will be taken to eliminate erosion and sedimentation; these will be accomplished through the construction of a drainage system consisting of swales, driveway culverts, detention areas, and filtration basins. The Best Management Practices developed by the State of New Hampshire have been utilized in the design of this system and these applications will be enforced throughout the construction process.

A Terrain Alteration Permit (RSA 485: A-17) is required for this project due to the area of disturbance being more than 100,000 square feet.

Respectfully Submitted,

BEALS ASSOCIATES, *PLLC.*

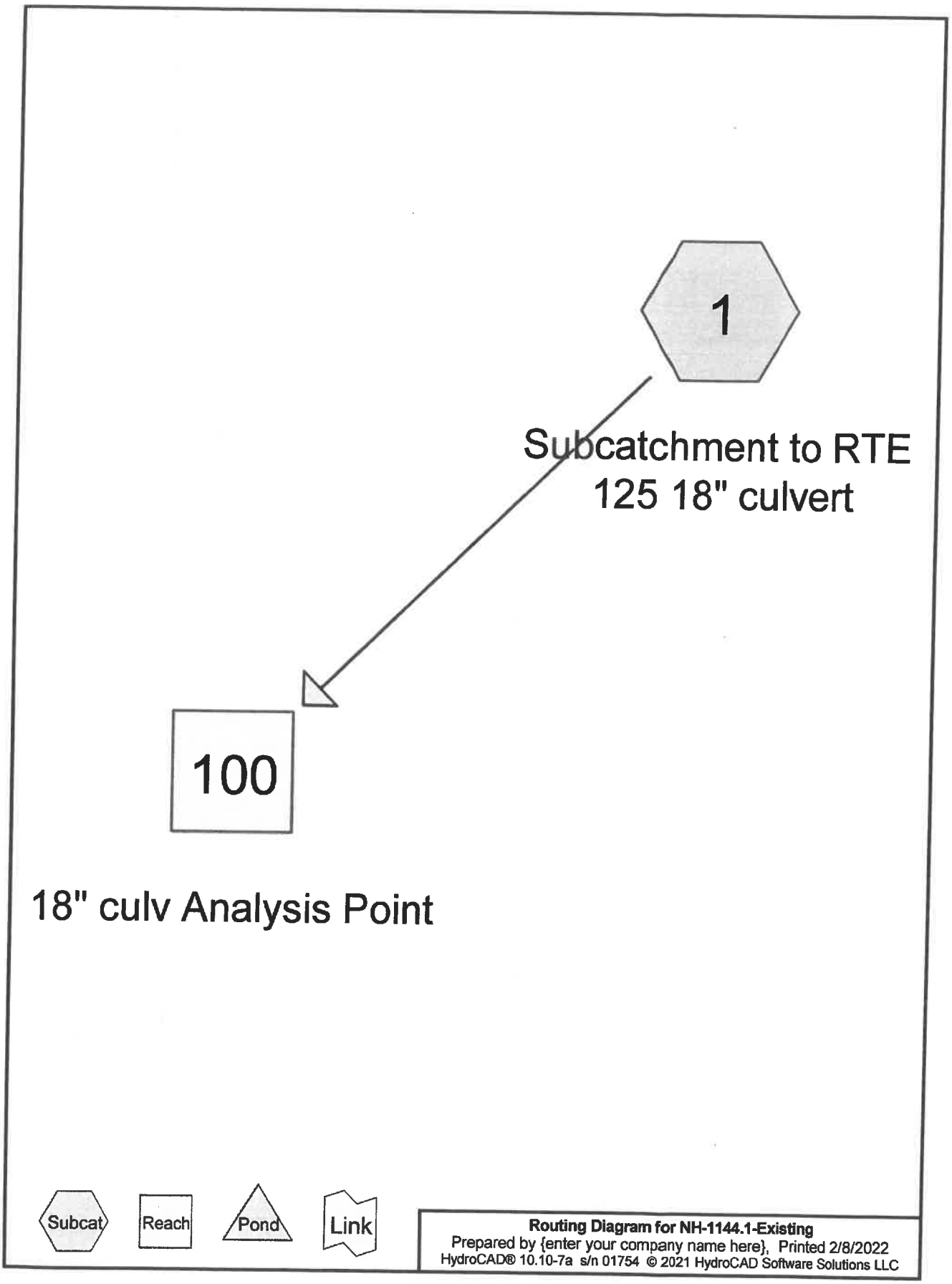
Christian O. Smith

Christian O. Smith, PE
Principal

APPENDIX I

Existing Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.08"
Complete 10 YR - 24 HR rainfall = 4.64"
Summary 50 YR - 24 HR rainfall = 7.00"
Sheet W-1 Existing Conditions Watershed Plan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Subcatchment to RTE
125 18" culvert
100
18" culv Analysis Point
Subcat
Reach
Pond
Link
Routing Diagram for NH-1144.1-Existing
Prepared by {enter your company name here}, Printed 2/8/2022
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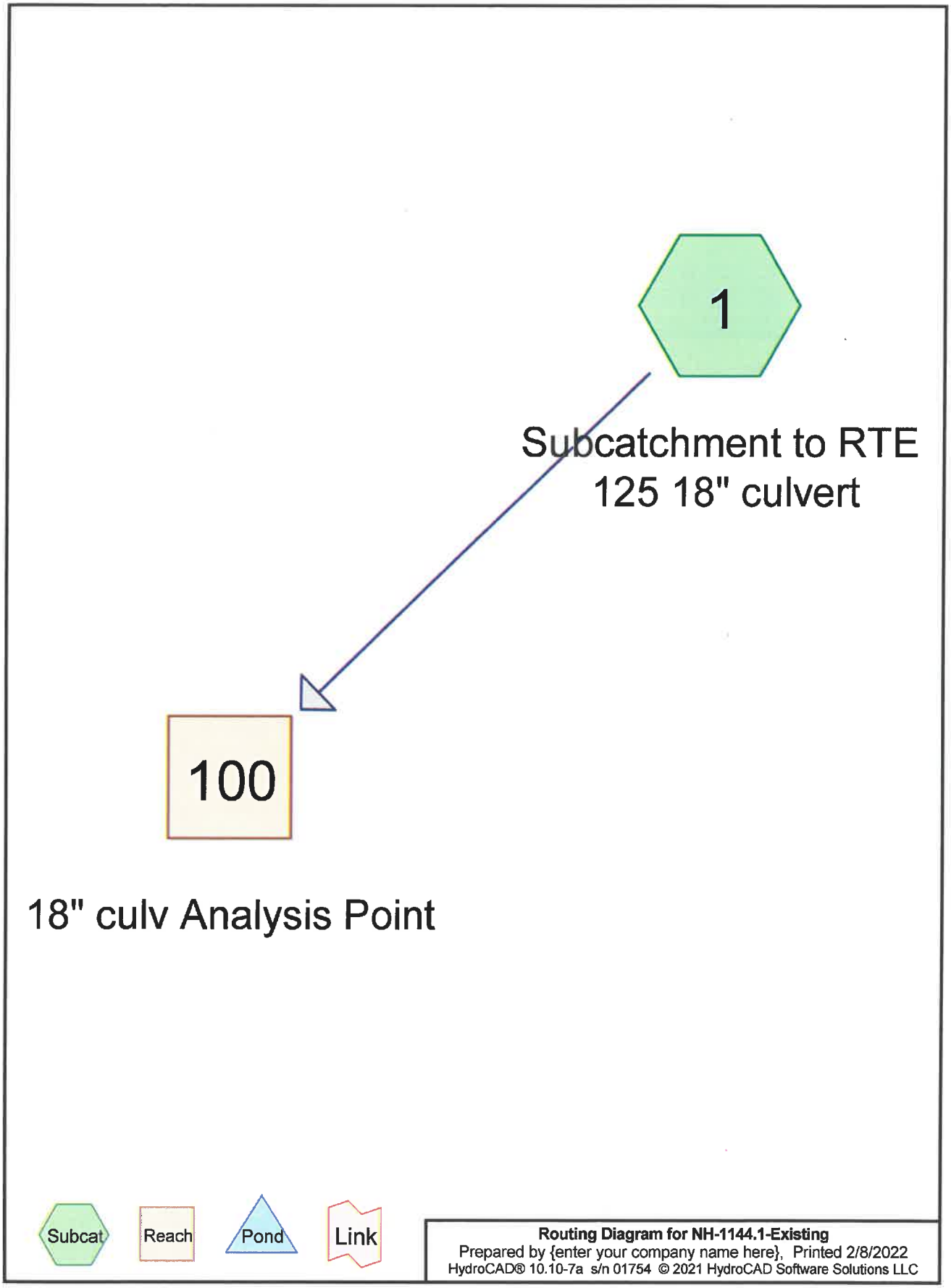
Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE Runoff Area=349,560 sf 2.91% Impervious Runoff Depth=0.52"
Flow Length=987' Tc=22.8 min CN=71 Runoff=2.55 cfs 0.349 af

Reach 100: 18" culv Analysis Point Inflow=2.55 cfs 0.349 af
Outflow=2.55 cfs 0.349 af

Total Runoff Area = 8.025 ac Runoff Volume = 0.349 af Average Runoff Depth = 0.52"
97.09% Pervious = 7.791 ac 2.91% Impervious = 0.234 ac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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.267	74	>75% Grass cover, Good, HSG C (1)
0.467	92	Paved roads w/open ditches, 50% imp, HSG C (1)
7.290	70	Woods, Good, HSG C (1)
8.025	**71**	**TOTAL AREA**

Soil Listing (all nodes)

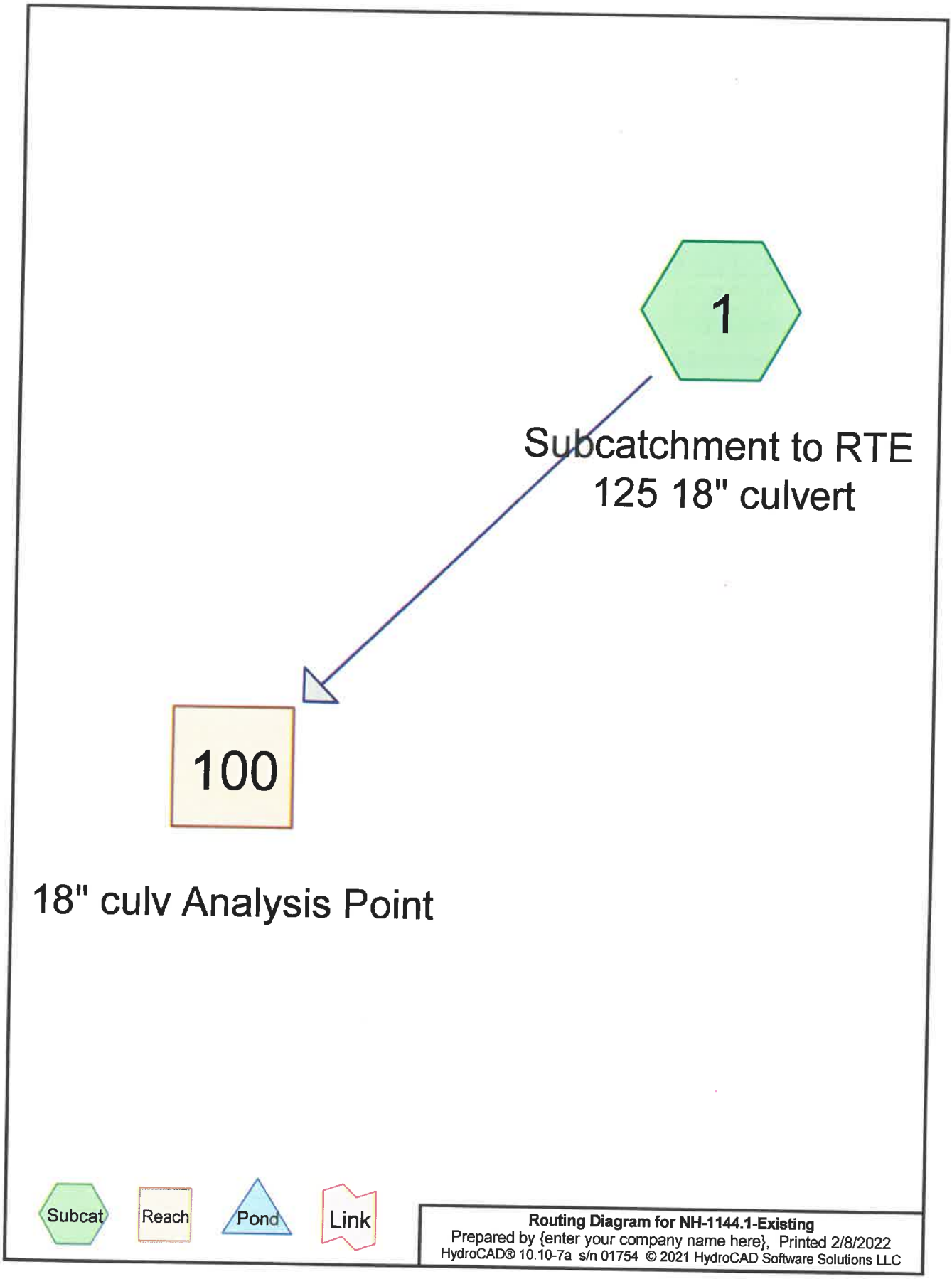
Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
8.025	HSG C	1
0.000	HSG D	
0.000	Other	
8.025		**TOTAL AREA**

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE Runoff Area=349,560 sf 2.91% Impervious Runoff Depth=0.81"
Flow Length=987' Tc=22.8 min CN=71 Runoff=4.32 cfs 0.540 af

Reach 100: 18" culv Analysis Point Inflow=4.32 cfs 0.540 af
Outflow=4.32 cfs 0.540 af

Total Runoff Area = 8.025 ac Runoff Volume = 0.540 af Average Runoff Depth = 0.81"
97.09% Pervious = 7.791 ac 2.91% Impervious = 0.234 ac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18" culv Analysis Point
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Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE Runoff Area=349,560 sf 2.91% Impervious Runoff Depth=1.85"
Flow Length=987' Tc=22.8 min CN=71 Runoff=10.83 cfs 1.236 af

Reach 100: 18" culv Analysis Point Inflow=10.83 cfs 1.236 af
Outflow=10.83 cfs 1.236 af

Total Runoff Area = 8.025 ac Runoff Volume = 1.236 af Average Runoff Depth = 1.85"
97.09% Pervious = 7.791 ac 2.91% Impervious = 0.234 ac

Summary for Subcatchment 1: Subcatchment to RTE 125 18" culvert

Runoff = 10.83 cfs @ 12.34 hrs, Volume= 1.236 af, Depth= 1.85"
Routed to Reach 100 : 18" culv Analysis Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

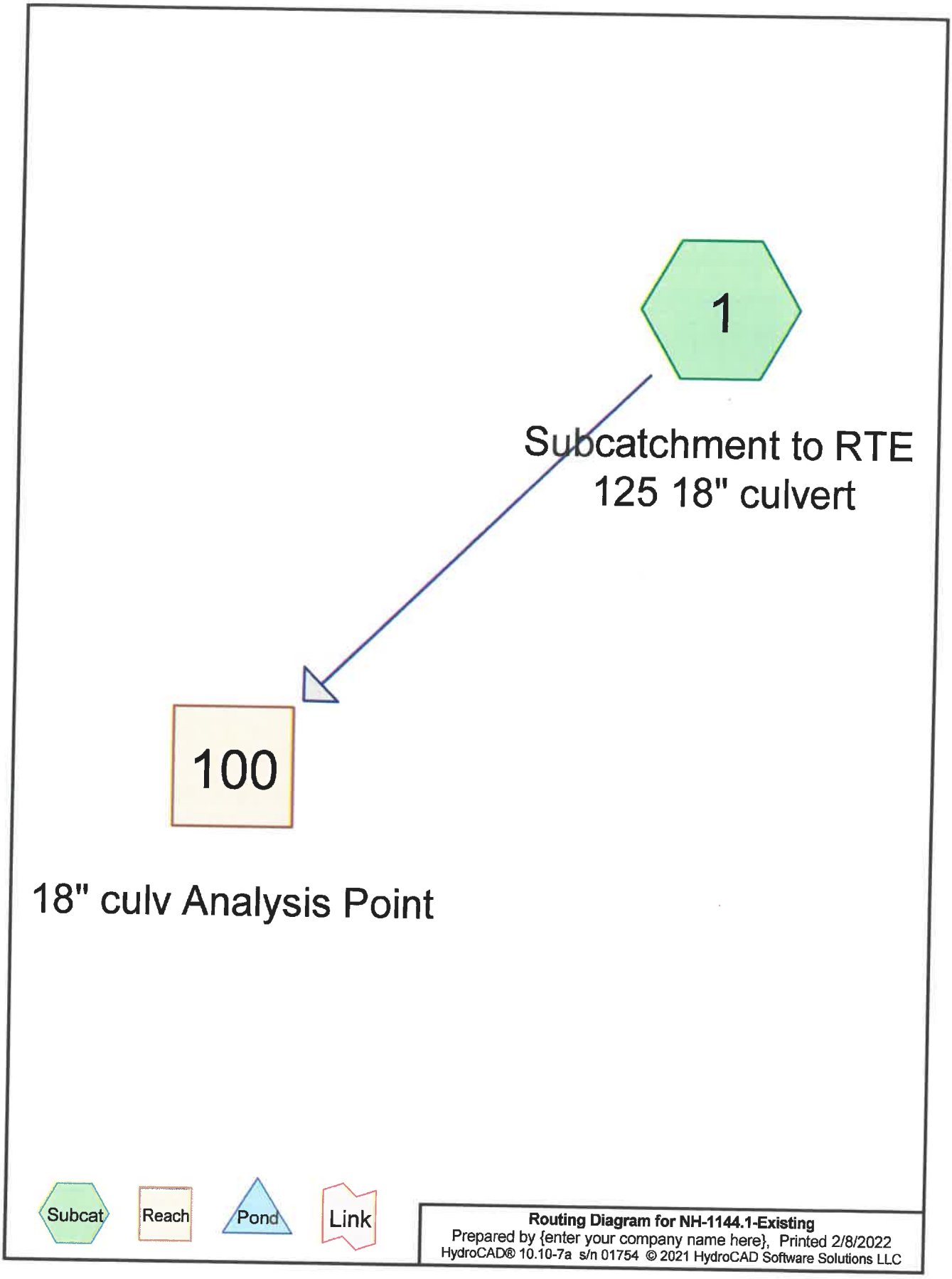
Area (sf)	CN	Description
317,568	70	Woods, Good, HSG C
11,646	74	>75% Grass cover, Good, HSG C
20,346	92	Paved roads w/open ditches, 50% imp, HSG C
349,560	71	Weighted Average
339,387		97.09% Pervious Area
10,173		2.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.00"
8.4	644	0.0652	1.28		**Shallow Concentrated Flow, SC to wetland** Woodland Kv= 5.0 fps
4.7	293	0.0440	1.05		**Shallow Concentrated Flow, SC to Culv** Woodland Kv= 5.0 fps
22.8	987	Total			

Summary for Reach 100: 18" culv Analysis Point

Inflow Area = 8.025 ac, 2.91% Impervious, Inflow Depth = 1.85" for 10 YR event
Inflow = 10.83 cfs @ 12.34 hrs, Volume= 1.236 af
Outflow = 10.83 cfs @ 12.34 hrs, Volume= 1.236 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs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Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE Runoff Area=349,560 sf 2.91% Impervious Runoff Depth=3.72"
Flow Length=987' Tc=22.8 min CN=71 Runoff=22.30 cfs 2.490 af

Reach 100: 18" culv Analysis Point
Inflow=22.30 cfs 2.490 af
Outflow=22.30 cfs 2.490 af

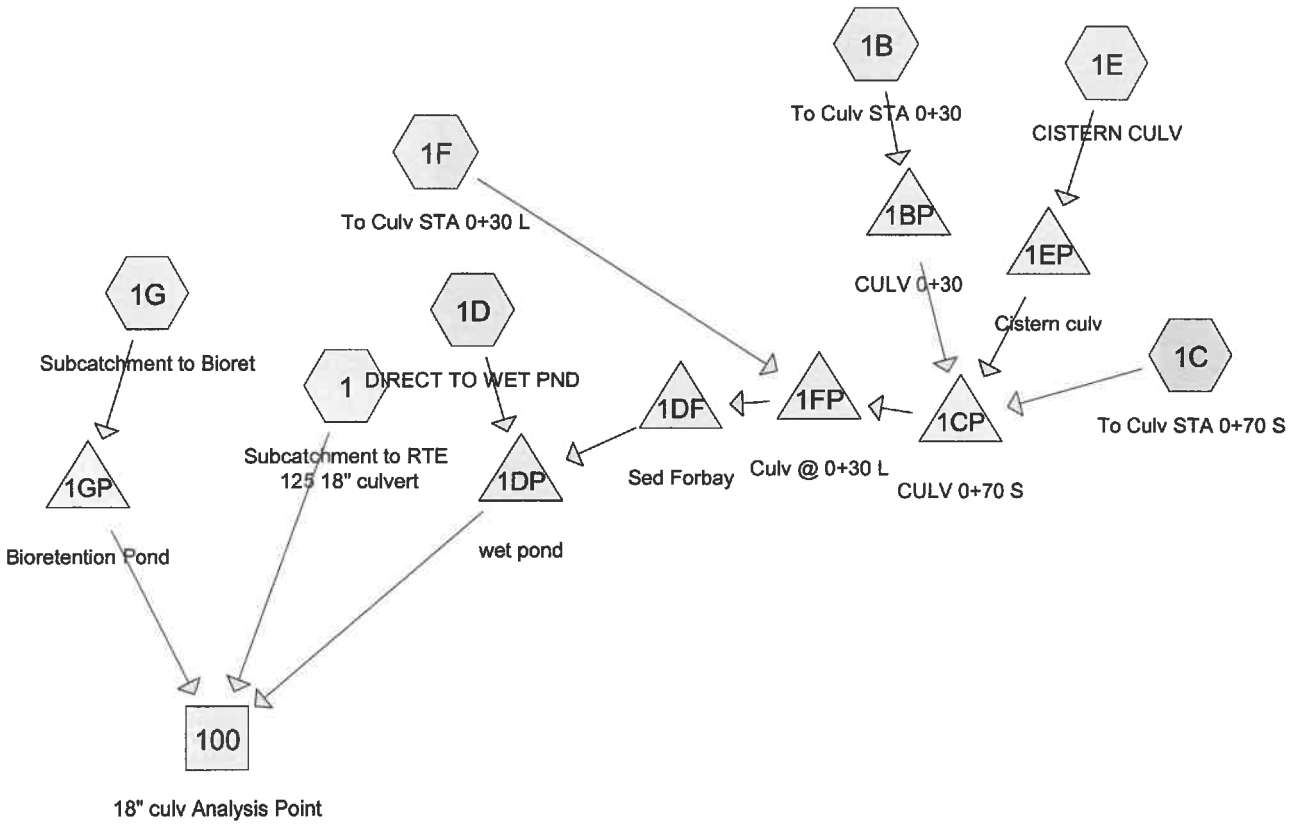
Total Runoff Area = 8.025 ac Runoff Volume = 2.490 af Average Runoff Depth = 3.72"
97.09% Pervious = 7.791 ac 2.91% Impervious = 0.234 ac

APPENDIX II

Proposed Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.08"
Complete 10 YR - 24 HR rainfall = 4.64"
Summary 50 YR - 24 HR rainfall = 7.00"
Sheet W-2 Proposed Conditions Watershed Plan

APPENDIX III



Subcat Reach Pond Link

Routing Diagram for NH-1144.1-Proposed 10-13-21
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.951	77	2 acre lots, 12% imp, HSG C (1B)
2.013	74	>75% Grass cover, Good, HSG C (1, 1D, 1F, 1G)
0.649	98	Paved parking, HSG C (1F, 1G)
2.049	92	Paved roads w/open ditches, 50% imp, HSG C (1, 1B, 1C, 1E, 1F)
0.323	98	Roofs, HSG C (1F, 1G)
1.253	94	Urban commercial, 85% imp, HSG C (1C)
1.916	70	Woods, Good, HSG C (1, 1C, 1G)
11.153	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
11.153	HSG C	1, 1B, 1C, 1D, 1E, 1F, 1G
0.000	HSG D	
0.000	Other	
11.153		**TOTAL AREA**

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE 125 Runoff Area=67,513 sf 8.42% Impervious Runoff Depth=0.96"
Flow Length=628' Tc=18.6 min CN=74 Runoff=1.13 cfs 0.124 af

Subcatchment 1B: To Culv STA 0+30 Runoff Area=151,100 sf 17.67% Impervious Runoff Depth=1.25"
Flow Length=534' Tc=17.1 min CN=79 Runoff=3.56 cfs 0.361 af

Subcatchment 1C: To Culv STA 0+70 S Runoff Area=85,702 sf 63.18% Impervious Runoff Depth=1.97"
Flow Length=534' Tc=18.6 min CN=89 Runoff=3.15 cfs 0.323 af

Subcatchment 1D: DIRECT TO WET PND Runoff Area=35,232 sf 0.00% Impervious Runoff Depth=0.96"
Flow Length=178' Tc=8.5 min CN=74 Runoff=0.78 cfs 0.065 af

Subcatchment 1E: CISTERN CULV Runoff Area=5,338 sf 50.00% Impervious Runoff Depth=2.24"
Tc=6.0 min CN=92 Runoff=0.31 cfs 0.023 af

Subcatchment 1F: To Culv STA 0+30 L Runoff Area=67,238 sf 46.28% Impervious Runoff Depth=1.89"
Flow Length=1,270' Tc=8.5 min CN=88 Runoff=3.13 cfs 0.243 af

Subcatchment 1G: Subcatchment to Bioret Runoff Area=73,714 sf 38.59% Impervious Runoff Depth=1.44"
Flow Length=425' Tc=14.1 min CN=82 Runoff=2.20 cfs 0.203 af

Reach 100: 18" culv Analysis Point Inflow=1.40 cfs 1.103 af
Outflow=1.40 cfs 1.103 af

Pond 1BP: CULV 0+30 Peak Elev=241.80' Storage=105 cf Inflow=3.56 cfs 0.361 af
24.0" Round Culvert n=0.013 L=44.0' S=0.0227 '/' Outflow=3.55 cfs 0.361 af

Pond 1CP: CULV 0+70 S Peak Elev=225.06' Storage=333 cf Inflow=6.86 cfs 0.707 af
24.0" Round Culvert n=0.013 L=53.0' S=0.0049 '/' Outflow=6.82 cfs 0.707 af

Pond 1DF: Sed Forbay Peak Elev=224.25' Storage=1,463 cf Inflow=8.74 cfs 0.950 af
Outflow=8.74 cfs 0.922 af

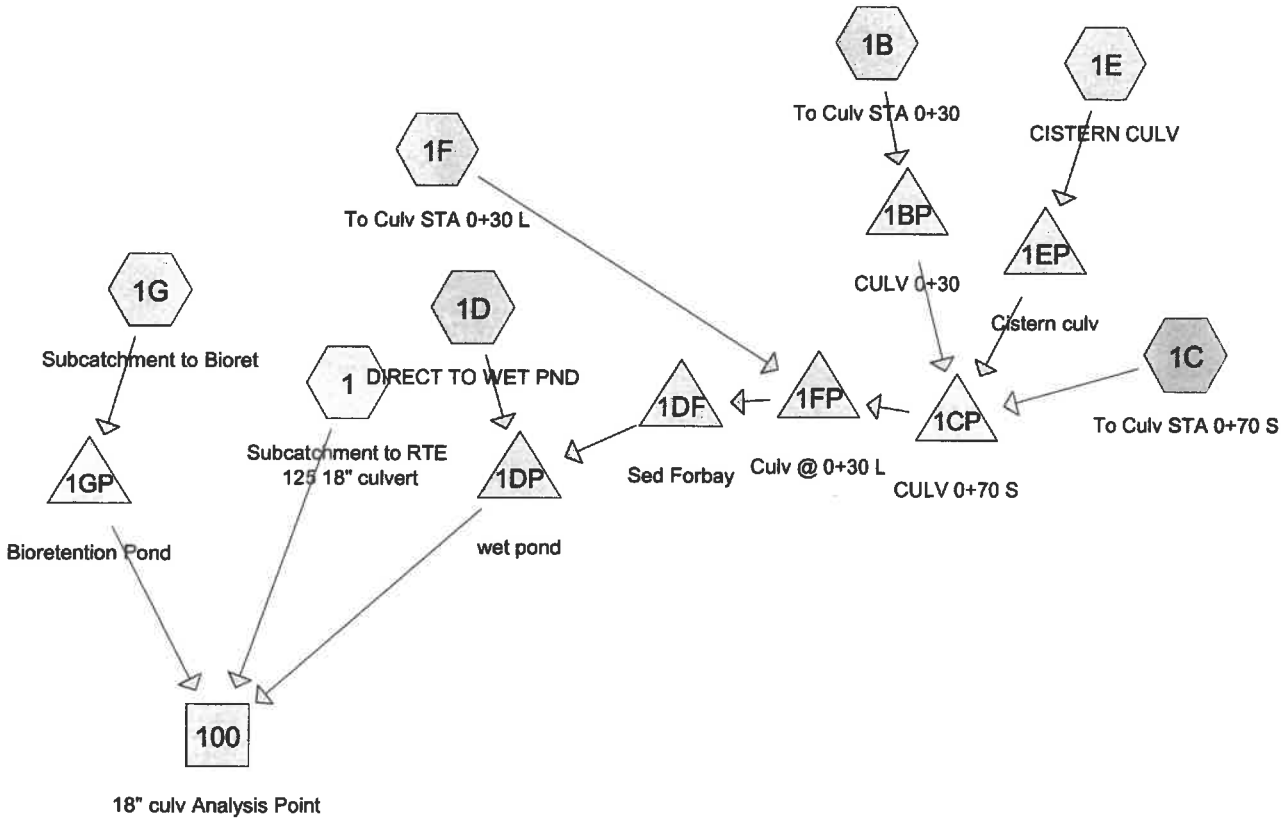
Pond 1DP: wet pond Peak Elev=225.55' Storage=54,115 cf Inflow=9.28 cfs 0.987 af
Outflow=0.40 cfs 0.979 af

Pond 1EP: Cistern culv Peak Elev=243.26' Storage=3 cf Inflow=0.31 cfs 0.023 af
15.0" Round Culvert n=0.013 L=94.0' S=0.0745 '/' Outflow=0.31 cfs 0.023 af

Pond 1FP: Culv @ 0+30 L Peak Elev=224.77' Storage=480 cf Inflow=8.77 cfs 0.950 af
30.0" Round Culvert n=0.013 L=33.0' S=0.0100 '/' Outflow=8.74 cfs 0.950 af

Pond 1GP: Bioretention Pond Peak Elev=229.73' Storage=5,665 cf Inflow=2.20 cfs 0.203 af
Discarded=0.08 cfs 0.203 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.203 af

Total Runoff Area = 11.153 ac Runoff Volume = 1.342 af Average Runoff Depth = 1.44"
69.38% Pervious = 7.738 ac 30.62% Impervious = 3.415 ac



Subcat Reach Pond Link

Routing Diagram for NH-1144.1-Proposed 10-13-21
Prepared by {enter your company name here}, Printed 2/8/2022

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE 125 Runoff Area=67,513 sf 8.42% Impervious Runoff Depth=2.08"
Flow Length=628' Tc=18.6 min CN=74 Runoff=2.60 cfs 0.269 af

Subcatchment 1B: To Culv STA 0+30 Runoff Area=151,100 sf 17.67% Impervious Runoff Depth=2.49"
Flow Length=534' Tc=17.1 min CN=79 Runoff=7.28 cfs 0.721 af

Subcatchment 1C: To Culv STA 0+70 S Runoff Area=85,702 sf 63.18% Impervious Runoff Depth=3.43"
Flow Length=534' Tc=18.6 min CN=89 Runoff=5.39 cfs 0.562 af

Subcatchment 1D: DIRECT TO WET PND Runoff Area=35,232 sf 0.00% Impervious Runoff Depth=2.08"
Flow Length=178' Tc=8.5 min CN=74 Runoff=1.79 cfs 0.140 af

Subcatchment 1E: CISTERN CULV Runoff Area=5,338 sf 50.00% Impervious Runoff Depth=3.74"
Tc=6.0 min CN=92 Runoff=0.51 cfs 0.038 af

Subcatchment 1F: To Culv STA 0+30 L Runoff Area=67,238 sf 46.28% Impervious Runoff Depth=3.33"
Flow Length=1,270' Tc=8.5 min CN=88 Runoff=5.43 cfs 0.428 af

Subcatchment 1G: Subcatchment to Bioret Runoff Area=73,714 sf 38.59% Impervious Runoff Depth=2.76"
Flow Length=425' Tc=14.1 min CN=82 Runoff=4.24 cfs 0.389 af

Reach 100: 18" culv Analysis Point Inflow=8.73 cfs 2.161 af
Outflow=8.73 cfs 2.161 af

Pond 1BP: CULV 0+30 Peak Elev=242.19' Storage=237 cf Inflow=7.28 cfs 0.721 af
24.0" Round Culvert n=0.013 L=44.0' S=0.0227 '/' Outflow=7.26 cfs 0.721 af

Pond 1CP: CULV 0+70 S Peak Elev=225.74' Storage=746 cf Inflow=12.89 cfs 1.321 af
24.0" Round Culvert n=0.013 L=53.0' S=0.0049 '/' Outflow=12.78 cfs 1.321 af

Pond 1DF: Sed Forbay Peak Elev=224.37' Storage=1,587 cf Inflow=15.96 cfs 1.749 af
Outflow=15.96 cfs 1.722 af

Pond 1DP: wet pond Peak Elev=226.23' Storage=62,179 cf Inflow=17.12 cfs 1.862 af
Outflow=7.44 cfs 1.853 af

Pond 1EP: Cistern culv Peak Elev=243.33' Storage=4 cf Inflow=0.51 cfs 0.038 af
15.0" Round Culvert n=0.013 L=94.0' S=0.0745 '/' Outflow=0.51 cfs 0.038 af

Pond 1FP: Culv @ 0+30 L Peak Elev=225.37' Storage=1,027 cf Inflow=16.03 cfs 1.749 af
30.0" Round Culvert n=0.013 L=33.0' S=0.0100 '/' Outflow=15.96 cfs 1.749 af

Pond 1GP: Bioretention Pond Peak Elev=230.54' Storage=11,047 cf Inflow=4.24 cfs 0.389 af
Discarded=0.09 cfs 0.349 af Primary=0.18 cfs 0.040 af Outflow=0.27 cfs 0.389 af

Total Runoff Area = 11.153 ac Runoff Volume = 2.547 af Average Runoff Depth = 2.74"
69.38% Pervious = 7.738 ac 30.62% Impervious = 3.415 ac

Summary for Subcatchment 1: Subcatchment to RTE 125 18" culvert

Runoff = 2.60 cfs @ 12.26 hrs, Volume= 0.269 af, Depth= 2.08"
Routed to Reach 100 : 18" culv Analysis Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
49,184	70	Woods, Good, HSG C
6,955	74	>75% Grass cover, Good, HSG C
11,374	92	Paved roads w/open ditches, 50% imp, HSG C
67,513	74	Weighted Average
61,826		91.58% Pervious Area
5,687		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0380	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.00"
4.0	285	0.0560	1.18		**Shallow Concentrated Flow, SC to wetland** Woodland Kv= 5.0 fps
4.7	293	0.0440	1.05		**Shallow Concentrated Flow, SC to Culv** Woodland Kv= 5.0 fps
18.6	628	Total			

Summary for Subcatchment 1B: To Culv STA 0+30

Runoff = 7.28 cfs @ 12.24 hrs, Volume= 0.721 af, Depth= 2.49"
Routed to Pond 1BP : CULV 0+30

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
22,552	92	Paved roads w/open ditches, 50% imp, HSG C
128,548	77	2 acre lots, 12% imp, HSG C
151,100	79	Weighted Average
124,398		82.33% Pervious Area
26,702		17.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	50	0.0140	0.06		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.00"
2.4	484	0.0450	3.42		**Shallow Concentrated Flow, SC TO CULV** Unpaved Kv= 16.1 fps
17.1	534	Total			

Summary for Subcatchment 1C: To Culv STA 0+70 S

Runoff = 5.39 cfs @ 12.25 hrs, Volume= 0.562 af, Depth= 3.43"
Routed to Pond 1CP : CULV 0+70 S

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
15,502	92	Paved roads w/open ditches, 50% imp, HSG C
54,585	94	Urban commercial, 85% imp, HSG C
15,615	70	Woods, Good, HSG C
85,702	89	Weighted Average
31,554		36.82% Pervious Area
54,148		63.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	50	0.0410	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.00"
9.0	484	0.0165	0.90		**Shallow Concentrated Flow, SC TO CULV** Short Grass Pasture Kv= 7.0 fps
18.6	534	Total			

Summary for Subcatchment 1D: DIRECT TO WET PND

Runoff = 1.79 cfs @ 12.12 hrs, Volume= 0.140 af, Depth= 2.08"
Routed to Pond 1DP : wet pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
35,232	74	>75% Grass cover, Good, HSG C
35,232		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0340	0.12		**Sheet Flow, Sheet** Grass: Dense n= 0.240 P2= 3.00"
1.7	128	0.0310	1.23		**Shallow Concentrated Flow, SC TO CULV** Short Grass Pasture Kv= 7.0 fps
8.5	178	Total			

Summary for Subcatchment 1E: CISTERN CULV

Runoff = 0.51 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 3.74"
Routed to Pond 1EP : Cistern culv

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
5,338	92	Paved roads w/open ditches, 50% imp, HSG C
2,669		50.00% Pervious Area
2,669		50.00% Impervious Area

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

Summary for Subcatchment 1F: To Culv STA 0+30 L

Runoff = 5.43 cfs @ 12.12 hrs, Volume= 0.428 af, Depth= 3.33"
Routed to Pond 1FP : Culv @ 0+30 L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
9,646	98	Paved parking, HSG C
34,489	92	Paved roads w/open ditches, 50% imp, HSG C
4,224	98	Roofs, HSG C
18,879	74	>75% Grass cover, Good, HSG C
67,238	88	Weighted Average
36,124		53.72% Pervious Area
31,115		46.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0180	0.14		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
2.4	1,220	0.0300	8.58	68.64	**Channel Flow, Swale TO Culv** Area= 8.0 sf Perim= 8.0' r= 1.00' n= 0.030 Earth, grassed & winding
8.5	1,270	Total			

Summary for Subcatchment 1G: Subcatchment to Bioret

Runoff = 4.24 cfs @ 12.19 hrs, Volume= 0.389 af, Depth= 2.76"
Routed to Pond 1GP : Bioretention Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.64"

Area (sf)	CN	Description
18,654	70	Woods, Good, HSG C
26,617	74	>75% Grass cover, Good, HSG C
18,603	98	Paved parking, HSG C
9,840	98	Roofs, HSG C
73,714	82	Weighted Average
45,271		61.41% Pervious Area
28,443		38.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0340	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.00"
2.7	161	0.0400	1.00		**Shallow Concentrated Flow, SC TO GRASS** Woodland Kv= 5.0 fps
1.1	214	0.0460	3.22		**Shallow Concentrated Flow, SC to pond** Grassed Waterway Kv= 15.0 fps
14.1	425	Total			

Summary for Reach 100: 18" culv Analysis Point

Inflow Area = 11.153 ac, 30.62% Impervious, Inflow Depth > 2.33" for 10 YR event
Inflow = 8.73 cfs @ 12.60 hrs, Volume= 2.161 af
Outflow = 8.73 cfs @ 12.60 hrs, Volume= 2.161 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1BP: CULV 0+30

Inflow Area = 3.469 ac, 17.67% Impervious, Inflow Depth = 2.49" for 10 YR event
Inflow = 7.28 cfs @ 12.24 hrs, Volume= 0.721 af
Outflow = 7.26 cfs @ 12.25 hrs, Volume= 0.721 af, Atten= 0%, Lag= 0.8 min
Primary = 7.26 cfs @ 12.25 hrs, Volume= 0.721 af
Routed to Pond 1CP : CULV 0+70 S

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 242.19' @ 12.25 hrs Surf.Area= 480 sf Storage= 237 cf

Plug-Flow detention time= 0.5 min calculated for 0.721 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (838.6 - 838.1)

Volume	Invert	Avail.Storage	Storage Description
#1	241.00'	915 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
241.00	14	0	0
242.00	309	162	162
243.00	1,198	754	915

Device	Routing	Invert	Outlet Devices
#1	Primary	241.00'	**24.0" Round Culvert** L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 241.00' / 240.00' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=7.26 cfs @ 12.25 hrs HW=242.19' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.26 cfs @ 3.72 fps)

Summary for Pond 1CP: CULV 0+70 S

Inflow Area = 5.559 ac, 34.49% Impervious, Inflow Depth = 2.85" for 10 YR event
Inflow = 12.89 cfs @ 12.25 hrs, Volume= 1.321 af
Outflow = 12.78 cfs @ 12.27 hrs, Volume= 1.321 af, Atten= 1%, Lag= 1.3 min
Primary = 12.78 cfs @ 12.27 hrs, Volume= 1.321 af
Routed to Pond 1FP : Culv @ 0+30 L

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 225.74' @ 12.27 hrs Surf.Area= 732 sf Storage= 746 cf

Plug-Flow detention time= 0.8 min calculated for 1.321 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (825.2 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1	223.70'	2,567 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.70	14	0	0
224.00	107	18	18
226.00	826	933	951
227.00	2,405	1,616	2,567

Device	Routing	Invert	Outlet Devices
#1	Primary	223.70'	**24.0" Round Culvert** L= 53.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.70' / 223.44' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.78 cfs @ 12.27 hrs HW=225.74' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.78 cfs @ 4.96 fps)

Summary for Pond 1DF: Sed Forbay

Inflow Area = 7.102 ac, 37.05% Impervious, Inflow Depth = 2.96" for 10 YR event
Inflow = 15.96 cfs @ 12.26 hrs, Volume= 1.749 af
Outflow = 15.96 cfs @ 12.26 hrs, Volume= 1.722 af, Atten= 0%, Lag= 0.3 min
Primary = 15.96 cfs @ 12.26 hrs, Volume= 1.722 af
Routed to Pond 1DP : wet pond

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 224.37' @ 12.26 hrs Surf.Area= 1,084 sf Storage= 1,587 cf
Flood Elev= 226.00' Surf.Area= 1,782 sf Storage= 3,921 cf

Plug-Flow detention time= 16.0 min calculated for 1.722 af (98% of inflow)
Center-of-Mass det. time= 6.3 min (826.9 - 820.6)

Volume	Invert	Avail.Storage	Storage Description
#1	222.00'	3,921 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.00	289	0	0
224.00	925	1,214	1,214
226.00	1,782	2,707	3,921

Device	Routing	Invert	Outlet Devices
#1	Primary	224.00'	**28.0' long x 4.0' breadth Broad-Crested Rectangular Weir** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=15.94 cfs @ 12.26 hrs HW=224.37' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 15.94 cfs @ 1.53 fps)

Summary for Pond 1DP: wet pond

Inflow Area = 7.911 ac, 33.26% Impervious, Inflow Depth = 2.82" for 10 YR event
Inflow = 17.12 cfs @ 12.24 hrs, Volume= 1.862 af
Outflow = 7.44 cfs @ 12.63 hrs, Volume= 1.853 af, Atten= 57%, Lag= 22.9 min
Primary = 7.44 cfs @ 12.63 hrs, Volume= 1.853 af
Routed to Reach 100 : 18" culv Analysis Point

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 222.50' Surf.Area= 7,825 sf Storage= 24,869 cf
Peak Elev= 226.23' @ 12.63 hrs Surf.Area= 12,264 sf Storage= 62,179 cf (37,310 cf above start)
Flood Elev= 227.70' Surf.Area= 14,082 sf Storage= 81,499 cf (56,629 cf above start)

Plug-Flow detention time= 982.2 min calculated for 1.282 af (69% of inflow)
Center-of-Mass det. time= 597.3 min (1,425.4 - 828.1)

Volume	Invert	Avail.Storage	Storage Description
#1	218.00'	81,499 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
218.00	3,396	0	0
220.00	5,221	8,617	8,617
222.00	7,260	12,481	21,098
224.00	9,520	16,780	37,878
226.00	11,943	21,463	59,341
226.75	12,969	9,342	68,683
227.50	13,777	10,030	78,713
227.70	14,082	2,786	81,499

Device	Routing	Invert	Outlet Devices
#1	Primary	222.00'	**16.0" Round Culvert** L= 34.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.00' / 220.50' S= 0.0441 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.40 sf
#2	Device 1	222.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	225.75'	**19.0" x 19.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" x 24.0" Grate (63% open area) Limited to weir flow at low heads

Primary OutFlow Max=7.43 cfs @ 12.63 hrs HW=226.23' (Free Discharge)
└─**1=Culvert** (Passes 7.43 cfs of 12.70 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 9.15 fps)
  └─**3=Orifice/Grate** (Weir Controls 6.98 cfs @ 2.28 fps)

Summary for Pond 1EP: Cistern culv

Inflow Area = 0.123 ac, 50.00% Impervious, Inflow Depth = 3.74" for 10 YR event
Inflow = 0.51 cfs @ 12.08 hrs, Volume= 0.038 af
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.1 min
Primary = 0.51 cfs @ 12.09 hrs, Volume= 0.038 af
Routed to Pond 1CP : CULV 0+70 S

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 243.33' @ 12.09 hrs Surf.Area= 14 sf Storage= 4 cf

Plug-Flow detention time= 0.3 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (785.4 - 785.1)

Volume	Invert	Avail.Storage	Storage Description
#1	243.00'	175 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
243.00	8	0	0
244.00	25	17	17
245.00	291	158	175

Device	Routing	Invert	Outlet Devices
#1	Primary	243.00'	**15.0" Round Culvert** L= 94.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 243.00' / 236.00' S= 0.0745 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.51 cfs @ 12.09 hrs HW=243.33' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.51 cfs @ 1.96 fps)

Summary for Pond 1FP: Culv @ 0+30 L

Inflow Area = 7.102 ac, 37.05% Impervious, Inflow Depth = 2.96" for 10 YR event
Inflow = 16.03 cfs @ 12.23 hrs, Volume= 1.749 af
Outflow = 15.96 cfs @ 12.26 hrs, Volume= 1.749 af, Atten= 0%, Lag= 1.4 min
Primary = 15.96 cfs @ 12.26 hrs, Volume= 1.749 af
Routed to Pond 1DF : Sed Forbay

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 225.37' @ 12.26 hrs Surf.Area= 1,097 sf Storage= 1,027 cf

Plug-Flow detention time= 0.8 min calculated for 1.749 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (820.6 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1	223.44'	3,581 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.44	8	0	0
224.00	286	82	82
226.00	1,473	1,759	1,841
227.00	2,006	1,740	3,581

Device	Routing	Invert	Outlet Devices
#1	Primary	223.44'	**30.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 223.44' / 223.11' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=15.96 cfs @ 12.26 hrs HW=225.37' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 15.96 cfs @ 5.43 fps)

Summary for Pond 1GP: Bioretention Pond

Inflow Area = 1.692 ac, 38.59% Impervious, Inflow Depth = 2.76" for 10 YR event
Inflow = 4.24 cfs @ 12.19 hrs, Volume= 0.389 af
Outflow = 0.27 cfs @ 15.02 hrs, Volume= 0.389 af, Atten= 94%, Lag= 169.4 min
Discarded = 0.09 cfs @ 15.02 hrs, Volume= 0.349 af
Primary = 0.18 cfs @ 15.02 hrs, Volume= 0.040 af
Routed to Reach 100 : 18" culv Analysis Point

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 230.54' @ 15.02 hrs Surf.Area= 7,732 sf Storage= 11,047 cf
Flood Elev= 231.00' Surf.Area= 8,293 sf Storage= 14,764 cf

Plug-Flow detention time= 1,137.0 min calculated for 0.389 af (100% of inflow)
Center-of-Mass det. time= 1,137.1 min (1,964.1 - 826.9)

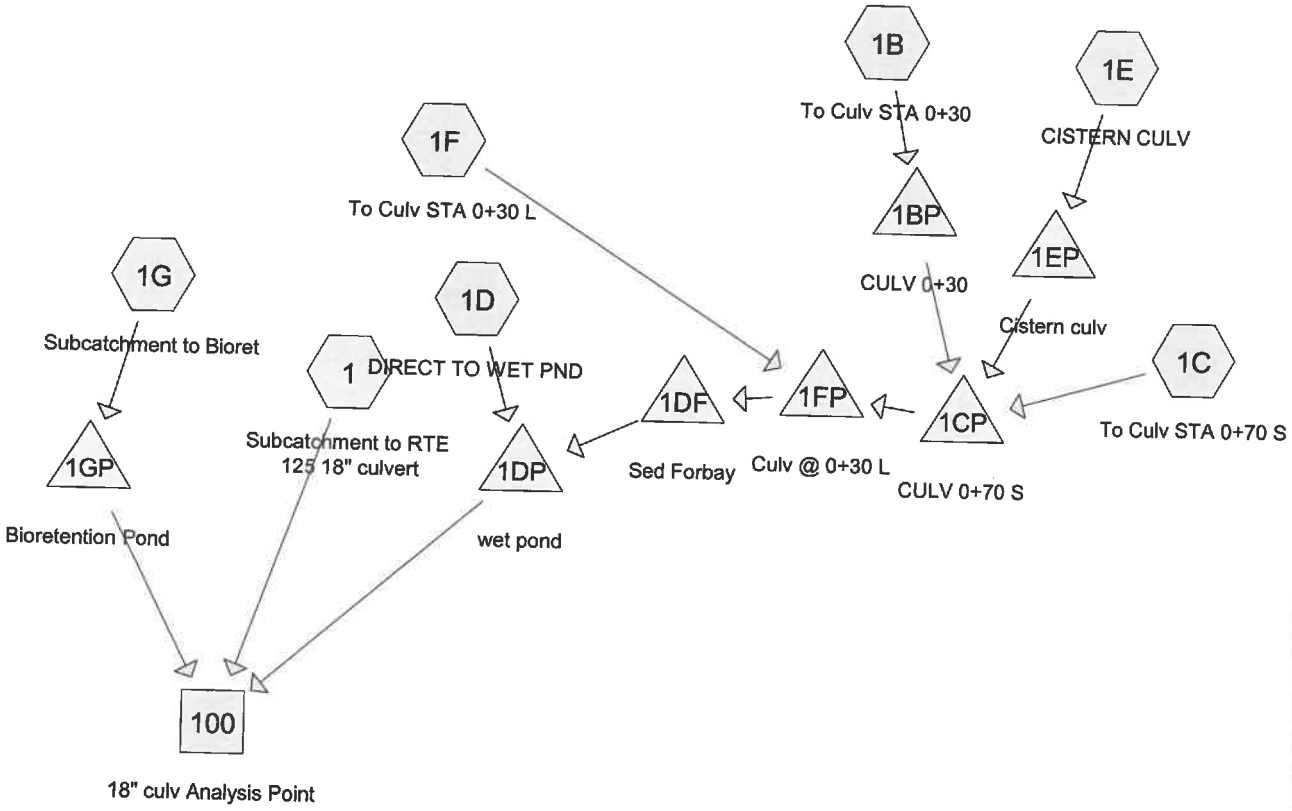
Volume	Invert	Avail.Storage	Storage Description
#1	227.33'	14,764 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.33	6,916	0.0	0	0	6,916
228.33	6,916	40.0	2,766	2,766	7,211
229.83	6,916	30.0	3,112	5,879	7,653
231.00	8,293	100.0	8,885	14,764	9,077

Device	Routing	Invert	Outlet Devices
#1	Primary	230.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	227.33'	**0.487 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.09 cfs @ 15.02 hrs HW=230.54' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.17 cfs @ 15.02 hrs HW=230.54' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 0.46 fps)



Subcat Reach Pond Link

Routing Diagram for NH-1144.1-Proposed 10-13-21
Prepared by {enter your company name here}, Printed 2/8/2022
HydroCAD® 10.10-7a s/n 01754 © 2021 HydroCAD Software Solutions LLC

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment to RTE 125 Runoff Area=67,513 sf 8.42% Impervious Runoff Depth=4.04"
Flow Length=628' Tc=18.6 min CN=74 Runoff=5.11 cfs 0.522 af

Subcatchment 1B: To Culv STA 0+30 Runoff Area=151,100 sf 17.67% Impervious Runoff Depth=4.58"
Flow Length=534' Tc=17.1 min CN=79 Runoff=13.33 cfs 1.325 af

Subcatchment 1C: To Culv STA 0+70 S Runoff Area=85,702 sf 63.18% Impervious Runoff Depth=5.71"
Flow Length=534' Tc=18.6 min CN=89 Runoff=8.76 cfs 0.936 af

Subcatchment 1D: DIRECT TO WET PND Runoff Area=35,232 sf 0.00% Impervious Runoff Depth=4.04"
Flow Length=178' Tc=8.5 min CN=74 Runoff=3.52 cfs 0.272 af

Subcatchment 1E: CISTERN CULV Runoff Area=5,338 sf 50.00% Impervious Runoff Depth=6.05"
Tc=6.0 min CN=92 Runoff=0.81 cfs 0.062 af

Subcatchment 1F: To Culv STA 0+30 L Runoff Area=67,238 sf 46.28% Impervious Runoff Depth=5.59"
Flow Length=1,270' Tc=8.5 min CN=88 Runoff=8.90 cfs 0.719 af

Subcatchment 1G: Subcatchment to Bioret Runoff Area=73,714 sf 38.59% Impervious Runoff Depth=4.92"
Flow Length=425' Tc=14.1 min CN=82 Runoff=7.46 cfs 0.693 af

Reach 100: 18" culv Analysis Point Inflow=21.74 cfs 4.127 af
Outflow=21.74 cfs 4.127 af

Pond 1BP: CULV 0+30 Peak Elev=242.75' Storage=648 cf Inflow=13.33 cfs 1.325 af
24.0" Round Culvert n=0.013 L=44.0' S=0.0227 '/' Outflow=13.17 cfs 1.325 af

Pond 1CP: CULV 0+70 S Peak Elev=226.94' Storage=2,430 cf Inflow=22.29 cfs 2.323 af
24.0" Round Culvert n=0.013 L=53.0' S=0.0049 '/' Outflow=21.02 cfs 2.323 af

Pond 1DF: Sed Forbay Peak Elev=224.49' Storage=1,724 cf Inflow=25.47 cfs 3.042 af
Outflow=25.47 cfs 3.014 af

Pond 1DP: wet pond Peak Elev=227.57' Storage=79,682 cf Inflow=27.40 cfs 3.287 af
Outflow=14.89 cfs 3.278 af

Pond 1EP: Cistern culv Peak Elev=243.42' Storage=5 cf Inflow=0.81 cfs 0.062 af
15.0" Round Culvert n=0.013 L=94.0' S=0.0745 '/' Outflow=0.81 cfs 0.062 af

Pond 1FP: Culv @ 0+30 L Peak Elev=226.10' Storage=1,985 cf Inflow=25.59 cfs 3.042 af
30.0" Round Culvert n=0.013 L=33.0' S=0.0100 '/' Outflow=25.47 cfs 3.042 af

Pond 1GP: Bioretention Pond Peak Elev=230.77' Storage=12,902 cf Inflow=7.46 cfs 0.693 af
Discarded=0.09 cfs 0.365 af Primary=3.50 cfs 0.328 af Outflow=3.59 cfs 0.693 af

Total Runoff Area = 11.153 ac Runoff Volume = 4.530 af Average Runoff Depth = 4.87"
69.38% Pervious = 7.738 ac 30.62% Impervious = 3.415 ac

Charts, Graphs, and Calculations

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	70.996 degrees West
Latitude	43.212 degrees North
Elevation	0 feet
Date/Time	Tue, 09 Nov 2021 10:24:23 -0500

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	0.49	0.65	0.81	1.02	**1yr**	0.70	0.98	1.19	1.53	1.97	2.56	2.81	**1yr**	2.27	2.71	3.12	3.84	4.41	**1yr**
2yr	0.32	0.49	0.61	0.80	1.01	1.28	**2yr**	0.87	1.16	1.49	1.89	2.41	3.08	3.43	**2yr**	2.73	3.30	3.80	4.52	5.15	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.57	**5yr**	1.06	1.44	1.84	2.36	3.03	3.89	4.38	**5yr**	3.44	4.22	4.84	5.70	6.45	**5yr**
10yr	0.40	0.63	0.80	1.09	1.42	1.84	**10yr**	1.22	1.69	2.17	2.80	3.60	4.64	5.28	**10yr**	4.11	5.08	5.81	6.79	7.64	**10yr**
25yr	0.46	0.74	0.94	1.30	1.72	2.27	**25yr**	1.49	2.08	2.69	3.49	4.53	5.86	6.77	**25yr**	5.19	6.51	7.41	8.57	9.58	**25yr**
50yr	0.52	0.83	1.06	1.49	2.01	2.67	**50yr**	1.73	2.45	3.17	4.15	5.40	7.00	8.16	**50yr**	6.20	7.85	8.91	10.23	11.37	**50yr**
100yr	0.58	0.94	1.21	1.71	2.33	3.13	**100yr**	2.01	2.88	3.74	4.92	6.43	8.37	9.85	**100yr**	7.41	9.47	10.72	12.21	13.50	**100yr**
200yr	0.65	1.05	1.37	1.96	2.71	3.68	**200yr**	2.34	3.39	4.42	5.85	7.67	10.01	11.89	**200yr**	8.85	11.43	12.90	14.58	16.03	**200yr**
500yr	0.76	1.25	1.63	2.37	3.33	4.55	**500yr**	2.87	4.21	5.50	7.32	9.66	12.68	15.25	**500yr**	11.22	14.66	16.48	18.45	20.15	**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	0.36	0.44	0.60	0.73	0.90	**1yr**	0.63	0.88	0.91	1.24	1.52	1.94	2.49	**1yr**	1.72	2.39	2.93	3.28	3.96	**1yr**
2yr	0.31	0.48	0.60	0.81	0.99	1.18	**2yr**	0.86	1.15	1.36	1.82	2.34	2.99	3.34	**2yr**	2.65	3.21	3.69	4.41	5.03	**2yr**
5yr	0.35	0.54	0.67	0.92	1.16	1.40	**5yr**	1.01	1.37	1.61	2.14	2.77	3.61	4.05	**5yr**	3.19	3.89	4.50	5.35	6.03	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.82	2.43	3.12	4.14	4.69	**10yr**	3.66	4.51	5.23	6.18	6.90	**10yr**

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
25yr	0.44	0.67	0.83	1.19	1.57	1.91	25yr	1.35	1.87	2.12	2.84	3.63	4.94	5.68	25yr	4.37	5.46	6.38	7.47	8.25	25yr
50yr	0.49	0.74	0.92	1.33	1.79	2.20	50yr	1.54	2.15	2.37	3.20	4.07	5.65	6.56	50yr	5.00	6.31	7.42	8.63	9.52	50yr
100yr	0.55	0.83	1.03	1.49	2.05	2.52	100yr	1.77	2.47	2.67	3.60	4.54	6.44	7.56	100yr	5.70	7.27	8.65	9.96	10.88	100yr
200yr	0.61	0.92	1.16	1.68	2.35	2.90	200yr	2.03	2.83	2.99	4.05	5.06	7.34	8.83	200yr	6.50	8.49	10.08	11.50	12.46	200yr
500yr	0.72	1.06	1.37	1.99	2.83	3.50	500yr	2.44	3.43	3.50	4.72	5.87	8.68	10.69	500yr	7.68	10.28	12.35	13.93	14.83	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	1.07	1yr	0.75	1.05	1.23	1.72	2.18	2.76	3.01	1yr	2.44	2.90	3.34	4.13	4.73	1yr
2yr	0.33	0.50	0.62	0.84	1.03	1.24	2yr	0.89	1.21	1.46	1.94	2.50	3.19	3.54	2yr	2.82	3.40	3.91	4.66	5.31	2yr
5yr	0.39	0.60	0.75	1.02	1.30	1.57	5yr	1.12	1.53	1.83	2.47	3.16	4.18	4.71	5yr	3.70	4.53	5.18	6.06	6.83	5yr
10yr	0.45	0.70	0.86	1.21	1.56	1.90	10yr	1.35	1.86	2.21	3.01	3.80	5.15	5.85	10yr	4.56	5.63	6.41	7.40	8.30	10yr
25yr	0.55	0.84	1.04	1.49	1.96	2.44	25yr	1.69	2.38	2.84	3.91	4.87	6.82	7.82	25yr	6.03	7.52	8.49	9.76	10.74	25yr
50yr	0.64	0.97	1.21	1.74	2.34	2.93	50yr	2.02	2.87	3.44	4.75	5.90	8.43	9.75	50yr	7.46	9.37	10.51	11.97	13.15	50yr
100yr	0.74	1.12	1.41	2.03	2.79	3.53	100yr	2.41	3.46	4.17	5.80	7.16	10.43	12.16	100yr	9.23	11.69	13.01	14.70	16.05	100yr
200yr	0.86	1.30	1.64	2.38	3.32	4.27	200yr	2.86	4.18	5.06	7.08	8.67	12.95	15.07	200yr	11.46	14.49	16.10	18.05	19.62	200yr
500yr	1.05	1.57	2.01	2.93	4.16	5.46	500yr	3.59	5.34	6.52	9.24	11.19	17.28	20.18	500yr	15.30	19.40	21.35	23.72	25.61	500yr

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Northeast Regional Climate Center

SITE-SPECIFIC SOIL SURVEY REPORT
Currier Road, Pelham, NH

1. MAPPING STANDARDS

Site-Specific Soil Mapping Standards for New Hampshire and Vermont. SSSNNE Special Publication No. 3, Version 5 .0, February 2017. This map product is within the technical standards of the National Cooperative Soil Survey. It is a special product, intended for the site specific soil survey. It was produced by a professional soil scientist and is not a product of the USDA Natural Resource Conservation Service.

2. DATE SOIL MAP PRODUCED
March 2, 2019

3. GEOGRAPHIC LOCATION AND SIZE OF SITE
The parcel is approximately 200+/- acres and is comprised of old overgrown fields with early successional vegetation, as well as mature and recently cut wooded areas and wetlands.

4. PURPOSE OF THE SOIL MAP
The preparation of this map was requested by Beals Associates, PLLC. for filing with NH AoT.

5. SOIL IDENTIFICATION LEGEND

SYMBOL	SOIL TAXONOMIC NAME	Hydrologic Soil Group
444	Newfields	B
66	Paxton	C
656	Ridgebury	C
656/P	Ridgebury Poorly Drained	C
49/VP	Whitman Very Poorly Drained	D

SOIL MAP UNIT DESCRIPTIONS

444 The Newfields series consists of very deep, moderately well drained soils formed in a loamy mantle underlain by sandy till on upland hills, moraines, till plains, and mountain side slopes. Saturated hydraulic conductivity is moderately high to very high. Slope ranges from 0 through 25 percent. The soils on site are comprised of loamy sands in the upper layers underlain by sandy loam and sands and gravel. No ESHWT was encountered within 40" of the surface and no restrictive layer was encountered.

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Ph (603) 778 0644 / *Fax* (603) 778 0654
info@gesinc.biz
www.gesinc.biz

66 The Paxton series consists of well drained loamy soils formed in lodgment till. The soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level to steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 45 percent. Saturated hydraulic conductivity is moderately high or high in the surface layer and subsoil and low or moderately low in the substratum. These soils on site are found to have fine sandy loam throughout the profile and have a mineral restrictive layer in the C horizon. EXHWT was found between 15-40".

656 The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in lodgment till derived mainly from granite, gneiss and/or schist. They are commonly shallow to a densic contact. They are nearly level to gently sloping soils in depressions in uplands. They also occur in drainageways in uplands, in toeslope positions of hills, drumlins, and ground moraines, and in till plains. Slope ranges from 0 to 15 percent. These soils on site are found just at the upper edges of the wet Ridgebury soils, but do not meet the hydric soil criteria. The soils have a loamy sand component throughout the profile.

656/P The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in lodgment till derived mainly from granite, gneiss and/or schist. They are commonly shallow to a densic contact. They are nearly level to gently sloping soils in depressions in uplands. They also occur in drainageways in uplands, in toeslope positions of hills, drumlins, and ground moraines, and in till plains. Slope ranges from 0 to 15 percent.

49/VP The Whitman series consists of very deep, very poorly drained soils formed in lodgment till derived mainly from granite, gneiss, and schist. They are shallow to a densic contact. These soils are nearly level or gently sloping soils in depressions and drainageways on uplands. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum

6. RESPONSIBLE SOIL SCIENTIST

Luke D. Hurley, CSS

7. OTHER DISTINGUISHING FEATURES OF SITE

No distinguishing features were noted

8. MAXIMUM SIZE OF LIMITING INCLUSIONS

No limiting inclusions were mapped

9. SPECIAL FEATURE SYMBOLS

No special feature symbols were used.

GES

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond/1GP**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
1.03	ac	A = Area draining to the practice	
0.59	ac	A_I = Impervious area draining to the practice	
0.57	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.57	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.58	ac-in	WQV= 1" x Rv x A	
2,113	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
528	cf	25% x WQV (check calc for sediment forebay volume)	
1,584	cf	75% x WQV (check calc for surface sand filter volume)	
N/A		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
6,916	sf	A_{SA} = Surface area of the practice	
0.49	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
N/A	Yes/No	(Use the calculations below)	
7.5	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
N/A	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
N/A	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
228.33	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
N/A	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
227.33	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
225.41	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
#VALUE!	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
2.92	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
1.00	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
230.58	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
231.00	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	< 10 ac
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ 75%WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	← yes
8,034	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ WQV
18.0	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet	29	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	> 3:1
Sheet	29	Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	≤ 5:1
	inches	D_{FC} = Filter course thickness	12", or 18" if within GPA mod. 304.1 (see spec)
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.
2. See lines 34, 40 and 48 for required depths of filter media.
3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Stage-Area-Storage for Pond 1GP: Bioretention Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
227.33	6,916	0
227.38	6,916	138
227.43	6,916	277
227.48	6,916	415
227.53	6,916	553
227.58	6,916	692
227.63	6,916	830
227.68	6,916	968
227.73	6,916	1,107
227.78	6,916	1,245
227.83	6,916	1,383
227.88	6,916	1,522
227.93	6,916	1,660
227.98	6,916	1,798
228.03	6,916	1,936
228.08	6,916	2,075
228.13	6,916	2,213
228.18	6,916	2,351
228.23	6,916	2,490
228.28	6,916	2,628
228.33	6,916	2,766
228.38	6,916	2,870
228.43	6,916	2,974
228.48	6,916	3,078
228.53	6,916	3,181
228.58	6,916	3,285
228.63	6,916	3,389
228.68	6,916	3,493
228.73	6,916	3,596
228.78	6,916	3,700
228.83	6,916	3,804
228.88	6,916	3,908
228.93	6,916	4,011
228.98	6,916	4,115
229.03	6,916	4,219
229.08	6,916	4,323
229.13	6,916	4,426
229.18	6,916	4,530
229.23	6,916	4,634
229.28	6,916	4,737
229.33	6,916	4,841
229.38	6,916	4,945
229.43	6,916	5,049
229.48	6,916	5,152
229.53	6,916	5,256
229.58	6,916	5,360
229.63	6,916	5,464
229.68	6,916	5,567
229.73	6,916	5,671
229.78	6,916	5,775
229.83	6,916	5,879
229.88	6,972	6,226
229.93	7,029	6,576
229.98	7,086	6,929
230.03	7,143	7,284
230.08	7,200	7,643
230.13	7,257	8,004
230.18	7,315	8,369
230.23	7,373	8,736
230.28	7,431	9,106
230.33	7,489	9,479
230.38	7,548	9,855
230.43	7,607	10,234
230.48	7,666	10,616
230.53	7,725	11,000
230.58	7,784	11,388
230.63	7,844	11,779
230.68	7,904	12,172
230.73	7,964	12,569
230.78	8,025	12,969
230.83	8,085	13,372
230.88	8,146	13,777
230.93	8,207	14,186
230.98	**8,268**	**14,598**

Stage-Area-Storage for Pond 1GP: Bioretention Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
227.33	6,916	0
227.38	6,916	138
227.43	6,916	277
227.48	6,916	415
227.53	6,916	553
227.58	6,916	692
227.63	6,916	830
227.68	6,916	968
227.73	6,916	1,107
227.78	6,916	1,245
227.83	6,916	1,383
227.88	6,916	1,522
227.93	6,916	1,660
227.98	6,916	1,798
228.03	6,916	1,936
228.08	6,916	2,075
228.13	6,916	2,213
228.18	6,916	2,351
228.23	6,916	2,490
228.28	6,916	2,628
228.33	6,916	2,766
228.38	6,916	2,870
228.43	6,916	2,974
228.48	6,916	3,078
228.53	6,916	3,181
228.58	6,916	3,285
228.63	6,916	3,389
228.68	6,916	3,493
228.73	6,916	3,596
228.78	6,916	3,700
228.83	6,916	3,804
228.88	6,916	3,908
228.93	6,916	4,011
228.98	6,916	4,115
229.03	6,916	4,219
229.08	6,916	4,323
229.13	6,916	4,426
229.18	6,916	4,530
229.23	6,916	4,634
229.28	6,916	4,737
229.33	6,916	4,841
229.38	6,916	4,945
229.43	6,916	5,049
229.48	6,916	5,152
229.53	6,916	5,256
229.58	6,916	5,360
229.63	6,916	5,464
229.68	6,916	5,567
229.73	6,916	5,671
229.78	6,916	5,775
229.83	6,916	5,879
229.88	6,972	6,226
229.93	7,029	6,576
229.98	7,086	6,929
230.03	7,143	7,284
230.08	7,200	7,643
230.13	7,257	8,004
230.18	7,315	8,369
230.23	7,373	8,736
230.28	7,431	9,106
230.33	7,489	9,479
230.38	7,548	9,855
230.43	7,607	10,234
230.48	7,666	10,616
230.53	7,725	11,000
230.58	7,784	11,388
230.63	7,844	11,779
230.68	7,904	12,172
230.73	7,964	12,569
230.78	8,025	12,969
230.83	8,085	13,372
230.88	8,146	13,777
230.93	8,207	14,186
230.98	**8,268**	**14,598**

The project proposes a bioretention pond to meet the GRV requirements per AoT. All are designed with sediment forebay's as pretreatment devices.

1.0 Location of Practice

A bioretention pond is proposed on Lot C2.

2.0 Existing topography at the location of the practice

The bioretention basin on lot C2 is designed in an area with a topographic slope of approximately 8.3% that is forested and HSG C soils.

3.0 Test Pit/boring locations

The bioretention basin on lot #C2 is 6,916 s.f. in area at the floor and the ESHWT, etc. was based on Test Pits conducted on 2-19-19 and 9-3-21 field located as shown on the drainage area plans.

4.0 Seasonal high-water table (SHWT) and bedrock elevations

The bioretention basin on lot #C2 has a bottom of practice elevation of 227.33' (bottom of filter course = 228.33') , TP #S2-3 has an ESHWT of 32", the high existing ground surface under the basin = 230.0', SHWT = 227.33'.
Bedrock not found to 52" or deeper than 225.67'

5.0 Profile descriptions

Logged by James Gove, CWS, CSS

Date: 10/02/2020

Test Pit No.	**D10**	Lot No.:	
ESHWT:	18"	WSPCD Group:	
Termination @	70"	Roots to:	18"
Refusal:	None	SCS Soil:	Woodbridge
Obs. Water:	none	HIS Type:	

Depth	Color	Texture	Structure	Consistence	Redox; Quantity/Contrast
0-10"	10YR3/3	Fine sandy loam	Granular	Friable	None
10-18"	10YR4/4	Fine sandy loam	Granular	Friable	None
18-70"	2.5Y5/3	Fine sandy Loam	Platy	Firm	7.5YR5/6, 30%, Distinct

Logged by Christian Smith, PE. Designer #1543 on 2-19-2019
Test Pit#: D3 (Pond 3IBP)

Depth (inches)	**Description**	
2" – 0"		Forest Mat
0" - 3"	10YR 3/3	Dark Brown,

		Fine Sandy Loam, Granular, Friable
3" - 17"	10YR 4/4	Dark Yellowish Brown, Fine Sandy Loam, Granular, Friable
17" - 33"	10YR 5/6	Yellowish Brown, Fine Sandy Loam, Blocky, Friable
33" – 65"	2.5Y 5/6	Light Olive Brown, Fine Sand Massive, Friable W/ Redox

ESHWT = 33 Inches
Roots to 36 Inches
Observed Ground Water - None
Restrictive - None
Refusal - None

Test Pit#: D5 (Pond 1P)

Depth (inches)	**Description**
2-0	Forest Mat
0-10	10YR3/3 Dark brown, very fine sandy loam, granular, friable
10-22	10YR5/6 Yellowish brown, loamy sand, granular, friable
22-38	10YR5/4 Yellowish brown, fine sandy loam, granular, friable
38-72	2.5Y5/3 Light olive brown, fine sand, massive, friable with redoximorphic features

Estimated Seasonal High Water Table: 38 Observed Water: None
Restrictive: none Refusal: None Roots: 48 Inches

(please see the test pit data performed by Tom Sokoloski, CSS, CWS at the end of this report)

6.0 Soil Plan in the area of the proposed practices

Grading/Soil Plans appears at the end of this report.

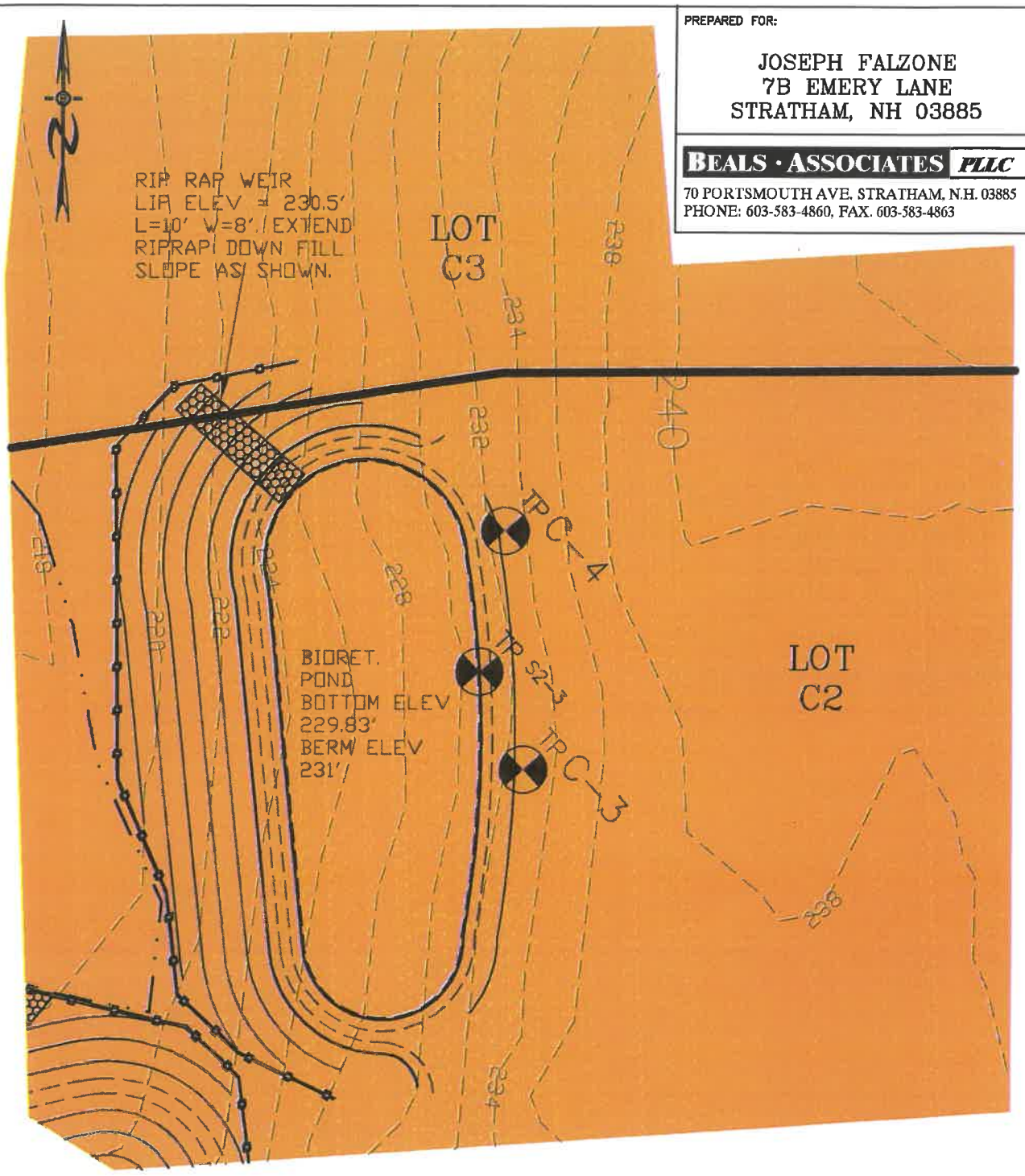
7.0 Summary of data used to determine infiltration rate

All infiltration rates calculated by Christian Smith, P.E.

The infiltration Rates were determined using amoozemeter testing results provided by TES Environmental Consultants, performed on 9-3-21 and 11-2-21.

The bioretention basin 1GP is in native material identified as SSS 29 or Woodbridge soil. Two complete amoozemeter test were conducted which resulted in average infiltration rates of 1.07 in/hr + 0.88 in/hr = (1.95in/hour)/2 = 0.975 in/hr averaged. Applying the required factor of safety of 2 gives the design rate of 0.49 in/hr.

(Amoozemeter field data sheets for all test appear at the end of this report behind the respective soil plans with the TES test pit logs)



PREPARED FOR:

JOSEPH FALZONE
7B EMERY LANE
STRATHAM, NH 03885

BEALS · ASSOCIATES PLLC
70 PORTSMOUTH AVE. STRATHAM, N.H. 03885
PHONE: 603-583-4860, FAX. 603-583-4863

– HSG "A"

– HSG "B"

– HSG "C"

– HSG "D"

REVISIONS:	DATE:

GRADING/SOIL PLAN
BIORETENTION POND

PLAN FOR:
RESIDENTIAL DEVELOPMENT
RT. 125 / OLD GREEN HILL RD.
BARRINGTON, NH

DATE:	SEPT., 2021	SCALE:	1" = 40'
PROJ. NO:	NH-1144	SHEET NO.	1 OF 1

TES

TES ENVIRONMENTAL CONSULTANTS, L.L.C.

TEST PIT LOG SHEET

Date: 9/3/2021	Project No: 21-0070	Lot: Lot C-2
CSS: Thomas E. Sokoloski	Project Name: Beals/Falzone/Rt. 125/Barrington	Test Pit No: S2-3

HOR	DEPTH	COLOR	TEXTURE	STRUCTURE	CONSISTENCY	REDOX FEATURES	NOTES
Oe	0-1"	2.5Y 2/2	--	--	--	--	Many fine, medium and coarse roots
A	1-4"	2.5Y 2/2	Fine sandy loam	Weak granular	Very friable	None	Many fine, medium and coarse roots
Bw	4-32"	10YR 4/6	Sandy loam	Subangular blocky	Friable	None	Common fine and medium roots
Cd	32-55"	2.5Y 5/3	Gravelly loamy sand	Massive	Firm	Many, coarse, distinct 10YR 5/6 concentrations @32"	Few fine roots
Ledge							

ESHWT: 32"

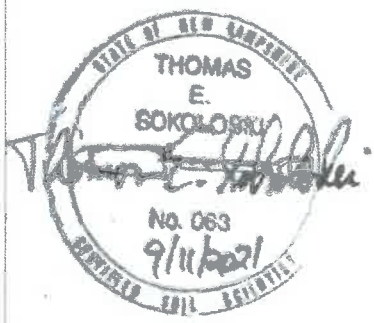
ROOTS: 48"

OBSERVED WATER: 32" (seeps)

LEDGE: 55"

RESTRICTIVE LAYER: 32"

NOTES:



CSS STAMP

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21	PERMEAMETER NO.: 1523		
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington	AIR TEMPERATURE:		
	BEGIN	52	
	FINAL	58	
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C	NOTES: Test D 3-4 Proposed Lot C2 in proposed stormwater basin		
HORIZON: Bw			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP S2-3)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	43	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	33	(SET TUBE FROM WATER LEVEL DOWN)

D3
Test 4
-0
-2
-4
-6
-8

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated Conversion Factor — 2 on = 105cm² *CF*

FIELD TEST 4 OF 21

DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		2 OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(*CF*)	cm³/hr.	(cm / hr)	(in / hr)
0.9	2	0.03	105	2835	3.30	1.30
0.8	2	0.03	105	2520	2.93	1.15
0.9	2	0.03	105	2835	3.30	1.30
0.8	2	0.03	105	2520	2.93	1.15
				Mean K_{SAT}	3.11	1.23
				StDev K_{SAT}	0.21	0.08

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21	PERMEAMETER NO.: 1523		
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington	AIR TEMPERATURE:		
	BEGIN	52	
	FINAL	52	
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C	NOTES: Test D3-5 Proposed Lot C2 in proposed stormwater basin.		
HORIZON: Bw2			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP S2-3)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	45	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	35	(SET TUBE FROM WATER LEVEL DOWN)

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated Conversion Factor — 2 on = 105cm² *CF*

FIELD TEST 5 OF 21

DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(*CF*)	cm³/hr.	(cm / hr)	(in / hr)
0.8	2	0.03	105	3520	2.93	1.15
0.6	2	0.03	105	1890	2.20	0.87
0.7	2	0.03	105	2205	2.56	1.01
0.5	2	0.03	105	1575	1.83	0.72
				Mean K_{SAT}	2.38	0.94
				StDev K_{SAT}	0.47	0.19

D3-5
Test 5
0
2
4
6
8

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21		PERMEAMETER NO.: 1523	
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington		AIR TEMPERATURE:	
		BEGIN	52
		FINAL	52
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C		NOTES: Test D3-6 Proposed Lot C2 in proposed stormwater basin.	
HORIZON: Bw			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP S2-3)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	46	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	36	(SET TUBE FROM WATER LEVEL DOWN)

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated *C*onversion *F*actor — 2 on = 105cm² *CF*

D3-
test 6
-0
-2
-4
-6
-8

FIELD TEST 6 OF 21

DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(CF)	cm³/hr.	(cm / hr)	(in / hr)
0.8	2	0.03	105	2520	2.93	1.15
0.7	2	0.03	105	2205	2.56	1.01
0.8	2	0.03	105	2520	2.93	1.15
0.6	2	0.03	105	1890	2.20	0.87
				Mean K_{SAT}	2.66	1.05
				StDev K_{SAT}	0.35	0.14

$\bar{X}$ (D3-1 – D3-6) = 1.07 in./hr.

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21	PERMEAMETER NO.: 1523		
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington	AIR TEMPERATURE:		
	BEGIN	52	
	FINAL	52	
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C	NOTES: Test D3-7 Proposed Lot C2 in proposed stormwater basin		
HORIZON: Bw			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP 52-3)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	40	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	30	(SET TUBE FROM WATER LEVEL DOWN)

D3-
Test 7
- 0
- 2
- 4
- 6
- 8

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated Conversion Factor — 2 on = 105cm² *CF*

FIELD TEST 7 OF 21

DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(CF)	cm³/hr.	(cm / hr)	(in / hr)
0.7	2	0.03	105	2205	2.56	1.01
0.7	2	0.03	105	2205	2.56	1.01
0.6	2	0.03	105	1890	2.20	0.87
0.5	2	0.03	105	1575	1.83	0.72
				Mean K_{SAT}	2.29	0.90
				StDev K_{SAT}	0.35	0.14

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21	PERMEAMETER NO.: 1523		
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington	AIR TEMPERATURE:		
	BEGIN	52	
	FINAL	52	
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C	NOTES: Test D3-8 Proposed Lot C2 in proposed stormwater basin.		
HORIZON: Bw			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP S2-3)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	42	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	32	(SET TUBE FROM WATER LEVEL DOWN)

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated *C*onversion *F*actor — 2 on = 105cm² *CF*

D3-8 Test 8

FIELD TEST	8	OF 21				
DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(CF)	$cm^3/hr.$	(cm / hr)	(in / hr)
0.5	2	0.03	105	1575	1.83	0.72
0.5	2	0.03	105	1575	1.83	0.72
0.4	2	0.03	105	1260	1.47	0.58
0.5	2	0.03	105	1575	1.83	0.72
				Mean K_{SAT}	1.74	0.69
				StDev K_{SAT}	0.18	0.07

Amoozemeter Field Data Sheet

TES Environmental Consultants, LLC

DATE: 11/2/21	PERMEAMETER NO.: 1523		
LOCATION: Tax Map 223, Lot 26 Rt. 125, Barrington	AIR TEMPERATURE:		
	BEGIN	52	
	FINAL	52	
TEST BY: Tom Sokoloski			
SOIL MAP UNIT: 29C	NOTES: Test D3-9 Proposed Lot C2 in proposed stormwater basin.		
HORIZON: Bt			
DISTURBED SITE: No			
SOIL LOG RECORDED: Yes (TP S23)			

SETUP CALCULATIONS			
HOLE DEPTH	d+	35	(BOTTOM OF HOLE TO SURFACE)
SURFACE TO REF. LINE	+	5	(ON AMOOZEMETER)
DEPTH OF H20 IN HOLE	H -	15	(15 CM MIN. – 5.9")
CHT TUBE SETTING	H1=	25	(SET TUBE FROM WATER LEVEL DOWN)

OUTFLOW CHAMBERS USED — 1 on = 20cm² *CF*

& associated Conversion Factor — 2 on = 105cm² *CF*

FIELD TEST	9	OF 21				
DROP IN WATER LEVEL IN FLOW RES. (1)	ELAPSED TIME (2)		2 OUTFLOW CHAMBER(S) USED (3)	OUTFLOW (Q) (1*3)/2 = (Q)	SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT}) = Q * Coeff A) A= 0.001163 when H=15cm	
cm	min	min/hr	(CF)	cm^3/hr.	(cm / hr)	(in / hr)
0.8	2	0.03	105	2520	2.93	1.15
0.7	2	0.03	105	2205	2.56	1.01
0.7	2	0.03	105	2205	2.56	1.01
0.7	2	0.03	105	2205	2.56	1.01
				Mean K_{SAT}	2.66	1.05
				StDev K_{SAT}	0.18	0.07

D3-9
test 9
-0
-2
-4
-6
-8

$\bar{X}$ (D3-7 – D3-9) = 0.88 in./hr.