DRAINAGE ANALYSIS
&
SEDIMENT AND EROSION
CONTROL PLAN

Prepared for:

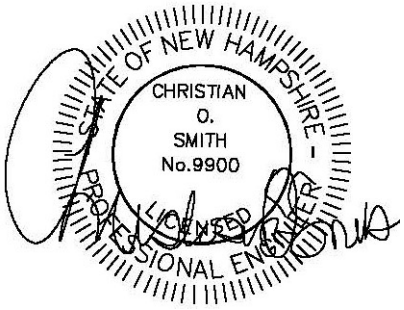
DR LEMIEUX BUILDERS, INC.
76 EXETER ROAD
NEWMARKET, NH 03857

Prepared by:

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

Project Number:
NH-1449
242 South Main Street
Newmarket, New Hampshire

May 23, 2023
Revised 8-22-23



DESIGN METHOD OBJECTIVES

DR Lemieux Builders is proposing a 32-unit age-restricted multi-family residential development on approximately 7.22-acres of land located at 242 So. Main St.in Newmarket, NH. The existing property is located on a parcel (Tax Map U4, Lot 69) consisting of forest, a single-family house and mowed fields. The development will include: on-site underground electric, telephone & cable; municipal water and sewer; and Low Impact Development/BMP storm water management and treatment. Proper erosion controls will be proposed where construction could result in sediment transport for the development. A drainage analysis of the proposed development including a proposed subdivided lot from the parent parcel 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 1", 2Yr, 10Yr, 25Yr and 50Yr – 24 Hr storm (100Yr storm for pond evaluation) events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment. As Newmarket is in the defined coastal region by NHDES, a factor of 15% Has been added to the 24 Hr rainfall values as provided by the Northeast Regional Climate Center at Cornell University. 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.

ANALYSIS POINT COMPONENT PEAK RATE of DISCHARGE (CFS)

Reach 100

2 YR		10 YR		25 YR		50YR		100YR	
Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
7.59	6.90	16.32	16.20	23.87	23.74	31.01	30.86	39.65	39.54

Stormwater Volume (AF)

Analysis Point

Reach 100

2 YR		10 YR		25 YR		50YR		100YR	
Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
0.929	0.834	1.934	1.813	2.812	2.674	3.675	3.516	4.732	4.566

The existing property is located on a parcel (Tax Map U4, Lot 69) consisting of wetlands, forest, a single-family house and mowed fields. The existing topography is such that the site analysis is a single analysis point reach. The reach flows offsite to the north-northwest through the parcel and ultimately flows into a large wetland system that ultimately drains toward the Piscassic River.

The proposed 32-unit development includes 220'+/- of proposed private driveway that intersects So Main Street. The proposed layout will divide the parcel into 4 different subcatchments. The peak rate of run-off from the proposed development is slightly decreased from that of the existing conditions. The addition of culverts, bioretention ponds, and stone roof infiltration trenches infiltrate and/or direct the cleaned run off overland to the analysis points. All roadway runoff receives treatment through a bioretention ponds and the natural buffer prior to discharge. In addition, the potential for increased erosion and sedimentation is handled by way of riprap outlet protection and erosion control fencing/berm. The use of Best Management Practices per the NH Stormwater Manual have 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.

Table of Contents

1.0 RAINFALL CHARACTERISTICS

This drainage report 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, & 50 Yr – 24 Hr storm events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment.

ANALYSIS POINT COMPONENT PEAK RATE of DISCHARGE (CFS)
Reach 100

2 YR		10 YR		25 YR		50YR		100YR	
Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
7.59	6.90	16.32	16.20	23.87	23.74	31.01	30.86	39.65	39.54

Stormwater Volume (AF)
Analysis Point
Reach 100

2 YR		10 YR		25 YR		50YR		100YR	
Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
0.929	0.834	1.934	1.813	2.812	2.674	3.675	3.516	4.732	4.566

2.0 EXISTING CONDITIONS

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

The existing property is located on a parcel (Tax Map U4, Lot 69) consisting of wetlands, forest, a single-family house and mowed fields. The existing topography is such that the site analysis is a single analysis point reach. The reach flows offsite to the north-northwest through the parcel and ultimately flows into a large wetland system that ultimately drains toward the Piscassic River.

Classified by NRCS Mapping, the land within the drainage analysis is composed of slopes ranging from 0% to 8% +, and soils categorized into the Hydrologic Soil Groups (HSG) C & D.

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 paved roadways, and the 32 unit building for the residential units 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 32-unit development includes 220'+/- of proposed private driveway that intersects So Main Street. The proposed layout will divide the parcel into 4 different subcatchments. The peak rate of run-off from the proposed development is slightly decreased from that of the existing conditions. The addition of culverts, bioretention ponds, and stone roof infiltration

trenches infiltrate and/or direct the cleaned run off overland to the analysis points. All driveway runoff receives treatment through a bioretention ponds and the natural buffer prior to discharge. Ksat values for the infiltration rates were from SSSNNE published values with a safety factor of 2. Based on these design features and the sequencing of pretreatment and treatment BMP's, the required 80% removal of TSS and 40% removal of TN & TP will be exceeded as required by Newmarket regulations (see removal efficiency summary table in appendices). In addition, the potential for increased erosion and sedimentation is handled by way of riprap outlet protection and erosion control fencing/berm. The use of Best Management Practices per the NH Stormwater Manual have 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.

In an effort to prevent the sedimentation of abutting property, the driveway and parking areas will convey stormwater to the bioretention ponds and overflow discharges to the natural buffer to the wetlands. During construction, appropriate 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 adequate treatment of stormwater run-off for sediment control.

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

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 NH 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 / Construction Fence

The plan set demonstrates the location of silt fence for sediment control. In areas where the limits of construction need to be emphasized to operators, construction fence for added visibility will be installed. Erosion and Sediment Control Details have 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 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 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 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.

4.5 Level Spreaders

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 filter strip, thus allowing for better filter strip efficiency and a lesser potential for erosion.

4.6 Filter Strips

Filter strips 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. Filter strips 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, 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.

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 0.25” 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 drainage structures will be constructed and 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 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 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.

4.11 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 at 242 So. Main St. in Newmarket, NH will have no adverse effect on the 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 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 culverts, bioretention ponds, stone drip edges for roof infiltration, and riprap outlet protection. 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 Site Specific, Terrain Alteration Permit (RSA 485: A-17) is not required for this project due to the area of disturbance being less than 100,000 square feet.

Respectfully Submitted,

BEALS ASSOCIATES, *PLLC.*

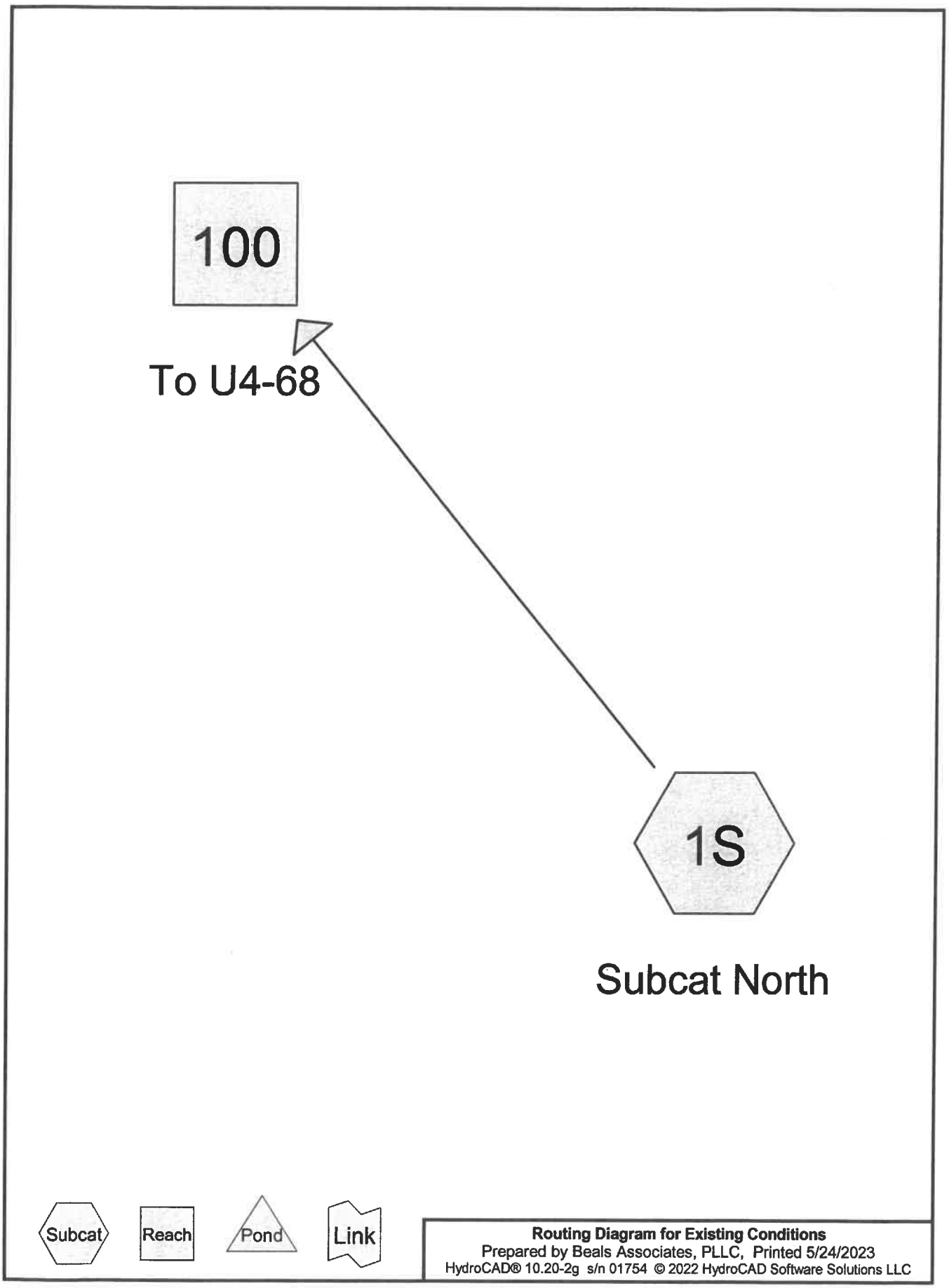
Christian O. Smith

Christian O. Smith, PE
Principal

APPENDIX I

Existing Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.62"
Complete 10 YR – 24 HR rainfall = 5.50"
Summary 25 YR – 24 HR rainfall = 6.99"
Summary 50 YR - 24 HR rainfall = 8.38"
Summary 100 YR – 24 HR rainfall = 10.06"



Routing Diagram for Existing Conditions
Prepared by Beals Associates, PLLC, Printed 5/24/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.470	74	>75% Grass cover, Good, HSG C (1S)
0.256	98	Paved roads w/curbs & sewers, HSG C (1S)
0.039	98	Roofs, HSG C (1S)
3.296	70	Woods, Good, HSG C (1S)
2.270	77	Woods, Good, HSG D (1S)
8.331	**74**	**TOTAL AREA**

Soil Listing (all nodes)

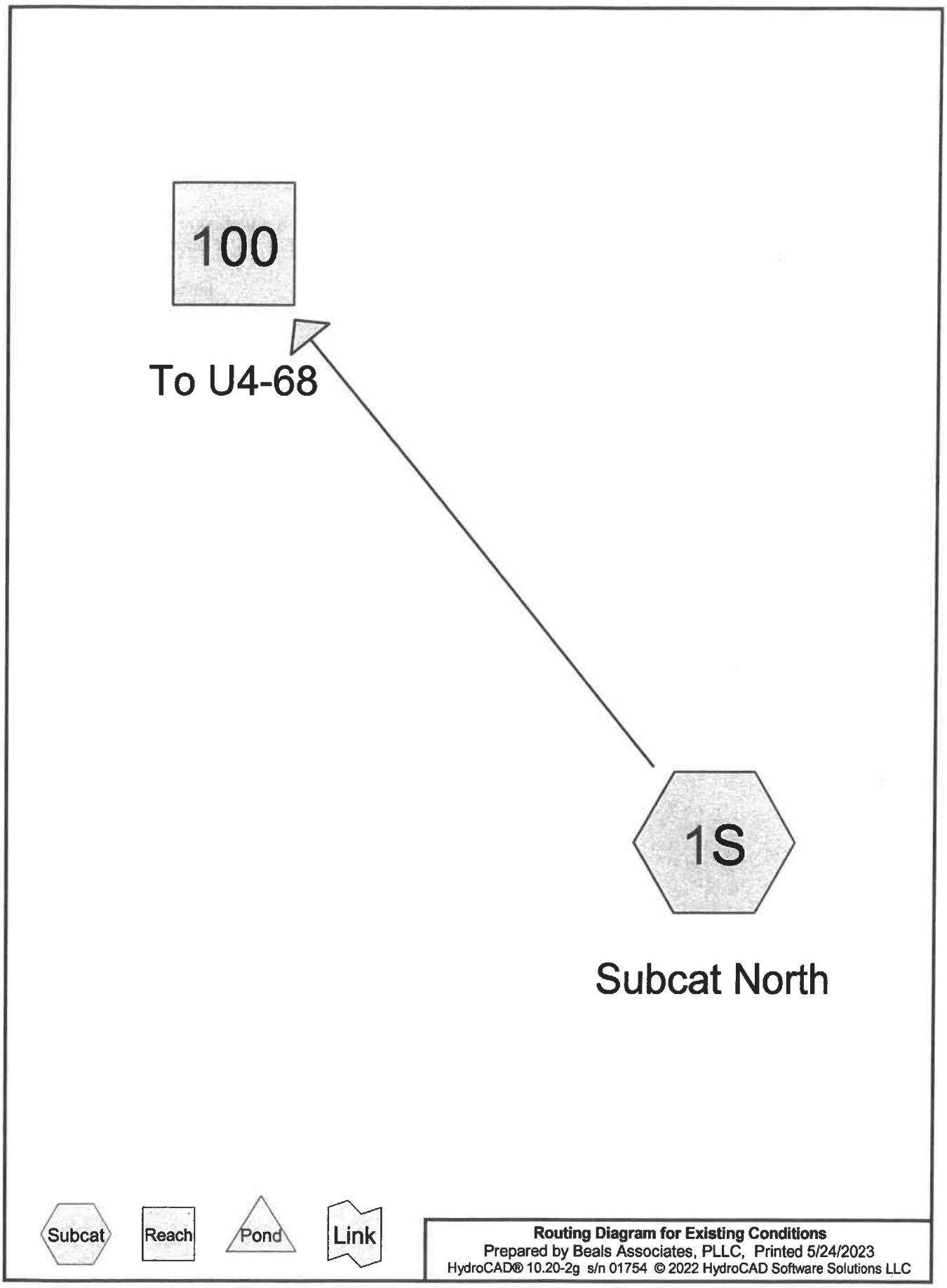
Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
6.061	HSG C	1S
2.270	HSG D	1S
0.000	Other	
8.331		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: Subcat North Runoff Area=362,906 sf 3.54% Impervious Runoff Depth=1.34"
Flow Length=860' Tc=26.1 min CN=74 Runoff=7.59 cfs 0.929 af

Reach 100: To U4-68 Inflow=7.59 cfs 0.929 af
Outflow=7.59 cfs 0.929 af

Total Runoff Area = 8.331 ac Runoff Volume = 0.929 af Average Runoff Depth = 1.34"
96.46% Pervious = 8.036 ac 3.54% Impervious = 0.295 ac



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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: Subcat North Runoff Area=362,906 sf 3.54% Impervious Runoff Depth=2.79"
Flow Length=860' Tc=26.1 min CN=74 Runoff=16.32 cfs 1.934 af

Reach 100: To U4-68 Inflow=16.32 cfs 1.934 af
Outflow=16.32 cfs 1.934 af

Total Runoff Area = 8.331 ac Runoff Volume = 1.934 af Average Runoff Depth = 2.79"
96.46% Pervious = 8.036 ac 3.54% Impervious = 0.295 ac

Summary for Subcatchment 1S: Subcat North

Runoff = 16.32 cfs @ 12.38 hrs, Volume= 1.934 af, Depth= 2.79"
Routed to Reach 100 : To U4-68

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.52"

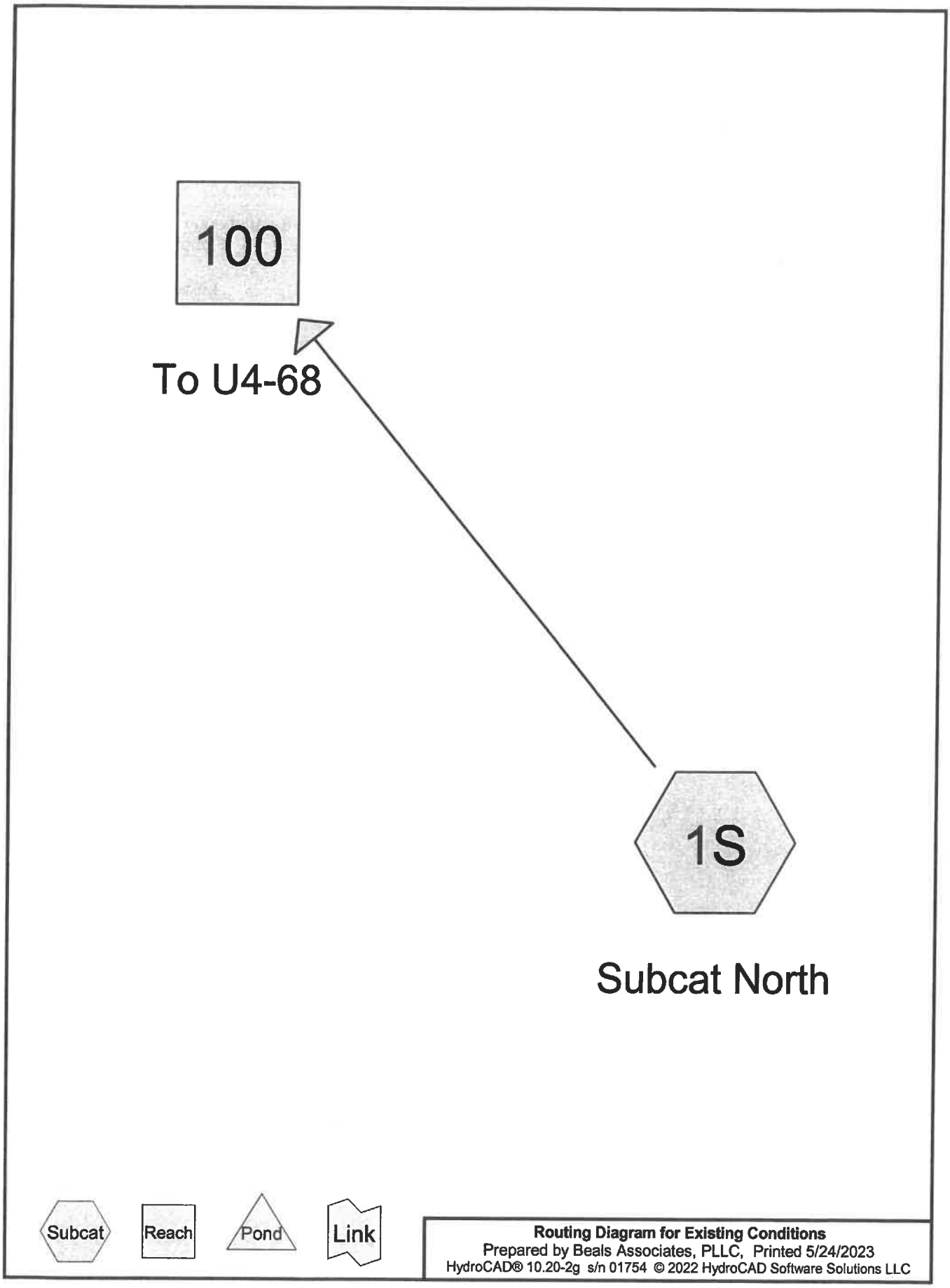
Area (sf)	CN	Description
11,149	98	Paved roads w/curbs & sewers, HSG C
1,703	98	Roofs, HSG C
107,605	74	>75% Grass cover, Good, HSG C
143,557	70	Woods, Good, HSG C
98,892	77	Woods, Good, HSG D
362,906	74	Weighted Average
350,054		96.46% Pervious Area
12,852		3.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0250	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.24"
12.6	397	0.0110	0.52		**Shallow Concentrated Flow, SC to VPD** Woodland Kv= 5.0 fps
2.3	413	0.0072	3.03	94.50	**Channel Flow, To Anal. pnt** Area= 31.2 sf Perim= 51.0' r= 0.61' n= 0.030 Earth, grassed & winding
26.1	860	Total			

Summary for Reach 100: To U4-68

Inflow Area = 8.331 ac, 3.54% Impervious, Inflow Depth = 2.79" for 10-Yr event
Inflow = 16.32 cfs @ 12.38 hrs, Volume= 1.934 af
Outflow = 16.32 cfs @ 12.38 hrs, Volume= 1.934 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Routing Diagram for Existing Conditions
Prepared by Beals Associates, PLLC, Printed 5/24/2023
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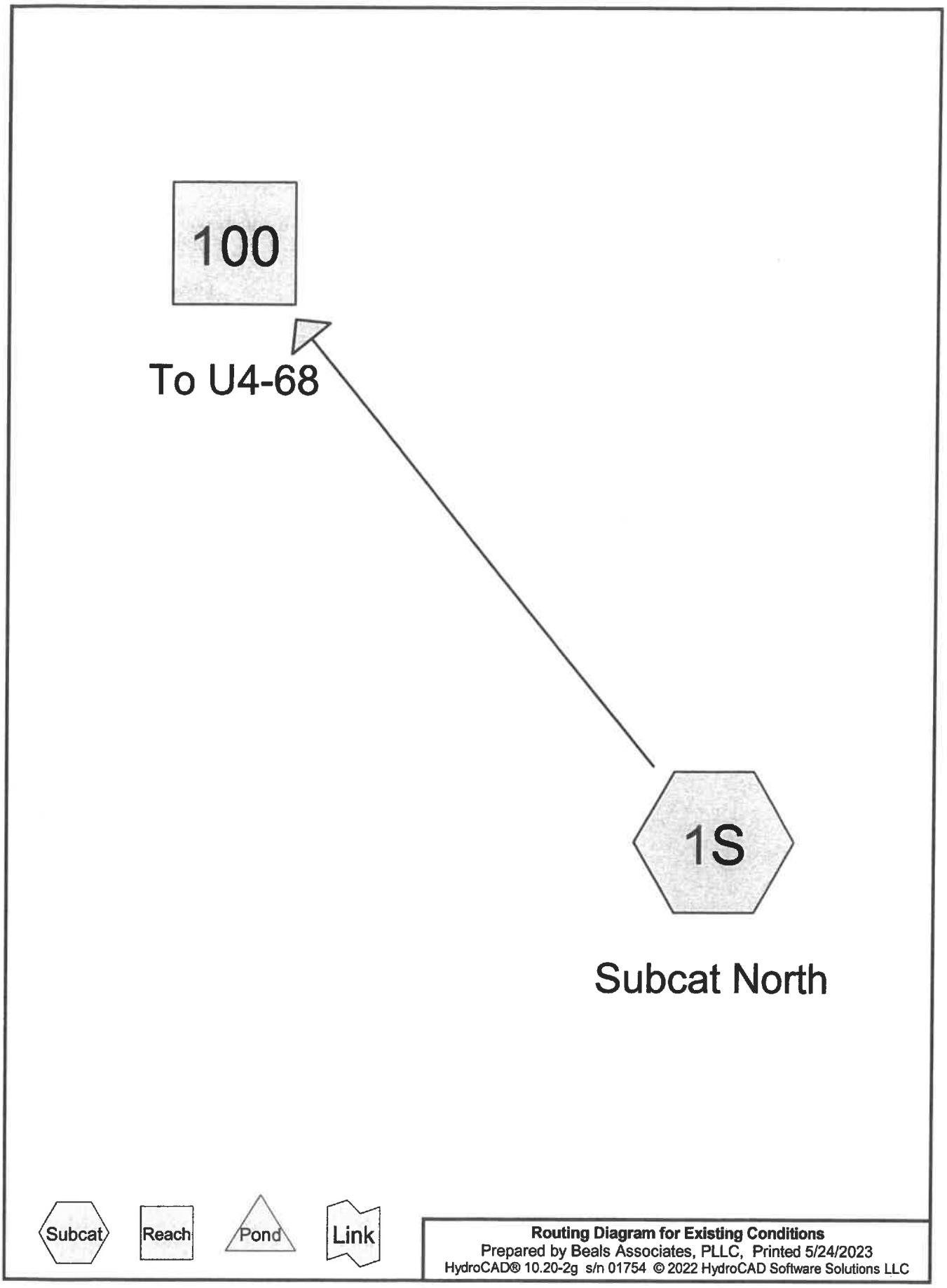
Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcat North Runoff Area=362,906 sf 3.54% Impervious Runoff Depth=4.05"
Flow Length=860' Tc=26.1 min CN=74 Runoff=23.78 cfs 2.812 af

Reach 100: To U4-68 Inflow=23.78 cfs 2.812 af
Outflow=23.78 cfs 2.812 af

Total Runoff Area = 8.331 ac Runoff Volume = 2.812 af Average Runoff Depth = 4.05"
96.46% Pervious = 8.036 ac 3.54% Impervious = 0.295 ac



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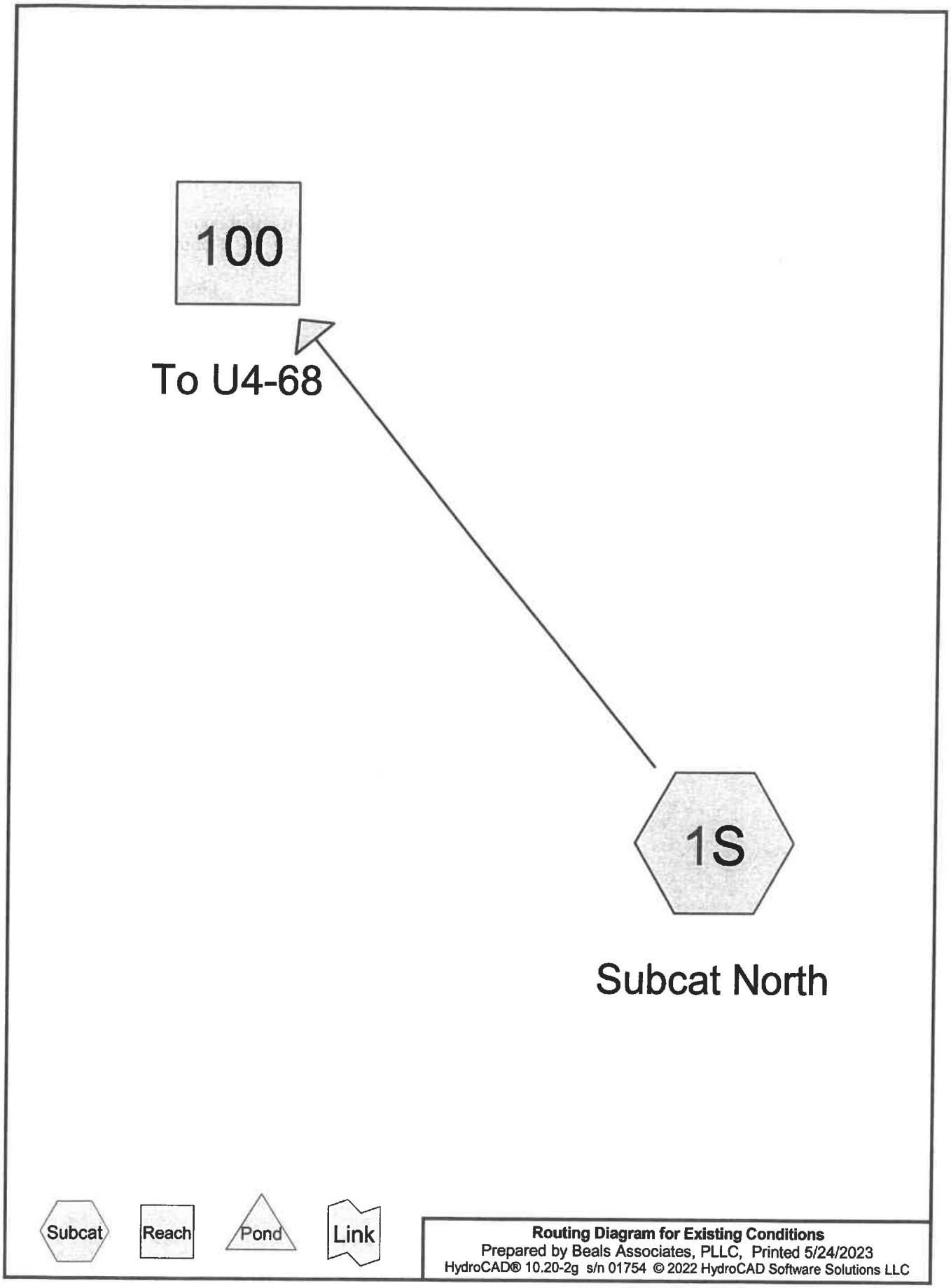
Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcat North Runoff Area=362,906 sf 3.54% Impervious Runoff Depth=5.29"
Flow Length=860' Tc=26.1 min CN=74 Runoff=31.01 cfs 3.675 af

Reach 100: To U4-68 Inflow=31.01 cfs 3.675 af
Outflow=31.01 cfs 3.675 af

Total Runoff Area = 8.331 ac Runoff Volume = 3.675 af Average Runoff Depth = 5.29"
96.46% Pervious = 8.036 ac 3.54% Impervious = 0.295 ac



Routing Diagram for Existing Conditions
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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: Subcat North Runoff Area=362,906 sf 3.54% Impervious Runoff Depth=6.80"
Flow Length=860' Tc=26.1 min CN=74 Runoff=39.65 cfs 4.723 af

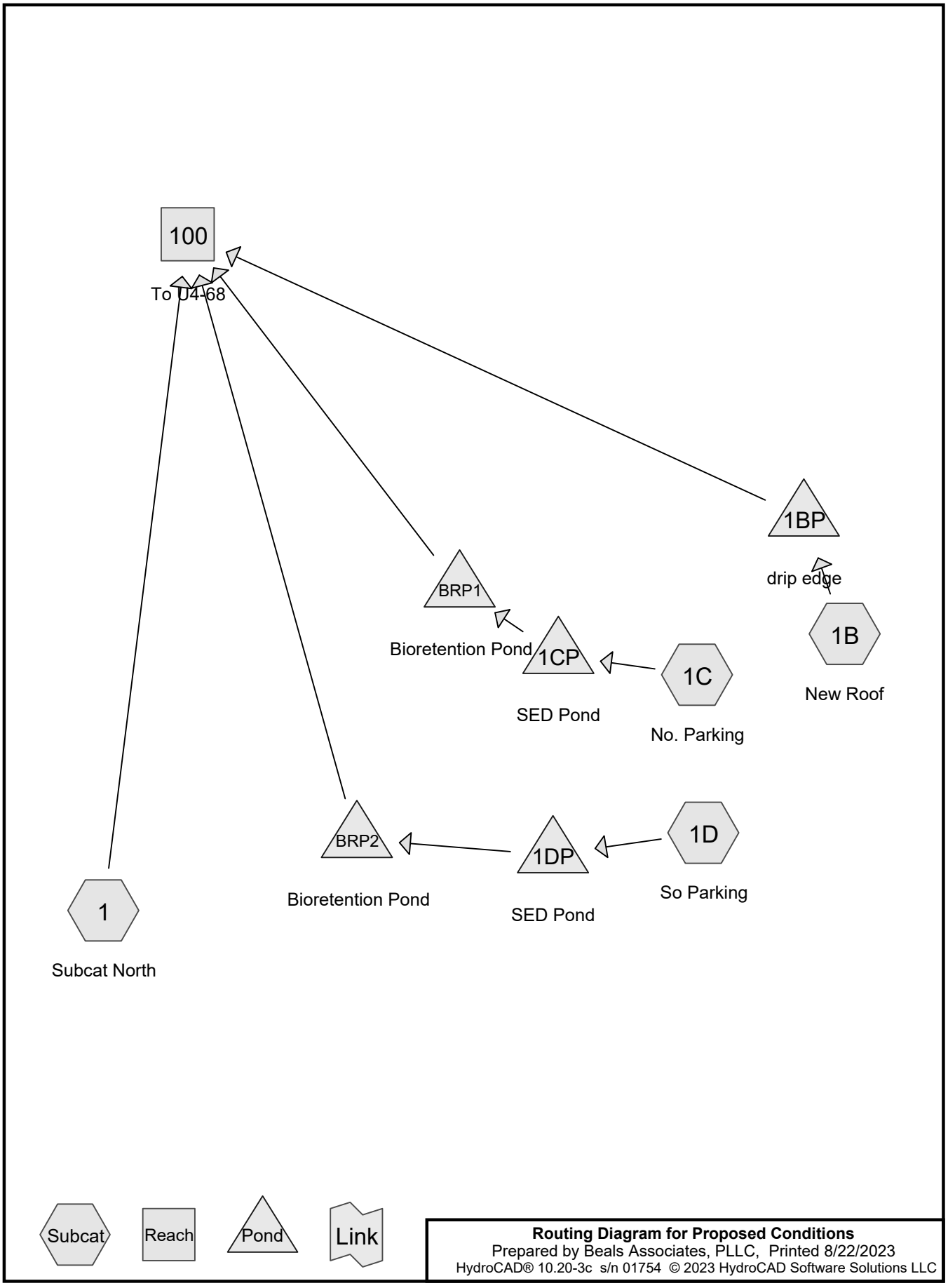
Reach 100: To U4-68 Inflow=39.65 cfs 4.723 af
Outflow=39.65 cfs 4.723 af

Total Runoff Area = 8.331 ac Runoff Volume = 4.723 af Average Runoff Depth = 6.80"
96.46% Pervious = 8.036 ac 3.54% Impervious = 0.295 ac

APPENDIX II

Proposed Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.62"
Complete 10 YR – 24 HR rainfall = 5.50”
Summary 25 YR – 24 HR rainfall = 6.99”
Summary 50 YR - 24 HR rainfall = 8.38"
Summary 100 YR – 24 HR rainfall = 10.06”



Routing Diagram for Proposed Conditions
Prepared by Beals Associates, PLLC, Printed 8/22/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.986	74	>75% Grass cover, Good, HSG C (1, 1B, 1C, 1D)
0.319	98	Paved parking, HSG C (1C, 1D)
0.256	98	Paved roads w/curbs & sewers, HSG C (1, 1D)
0.233	98	Roofs, HSG C (1, 1B)
3.296	70	Woods, Good, HSG C (1)
2.270	77	Woods, Good, HSG D (1)
8.360	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
6.090	HSG C	1, 1B, 1C, 1D
2.270	HSG D	1
0.000	Other	
8.360		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SubcatNorth Runoff Area=325,014 sf 3.07% Impervious Runoff Depth=1.32"
Flow Length=860' Tc=26.1 min CN=74 Runoff=6.72 cfs 0.823 af

Subcatchment1B: New Roof Runoff Area=9,146 sf 92.37% Impervious Runoff Depth=3.16"
Tc=6.0 min CN=96 Runoff=0.72 cfs 0.055 af

Subcatchment1C: No. Parking Runoff Area=7,993 sf 74.58% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=92 Runoff=0.57 cfs 0.042 af

Subcatchment1D: So Parking Runoff Area=22,018 sf 49.11% Impervious Runoff Depth=2.20"
Flow Length=61' Tc=11.4 min CN=86 Runoff=1.09 cfs 0.093 af

Reach100: To U4-68 Inflow=6.90 cfs 0.834 af
Outflow=6.90 cfs 0.834 af

Pond1BP: drip edge Peak Elev=51.01' Storage=640 cf Inflow=0.72 cfs 0.055 af
Discarded=0.04 cfs 0.047 af Primary=0.66 cfs 0.009 af Outflow=0.71 cfs 0.055 af

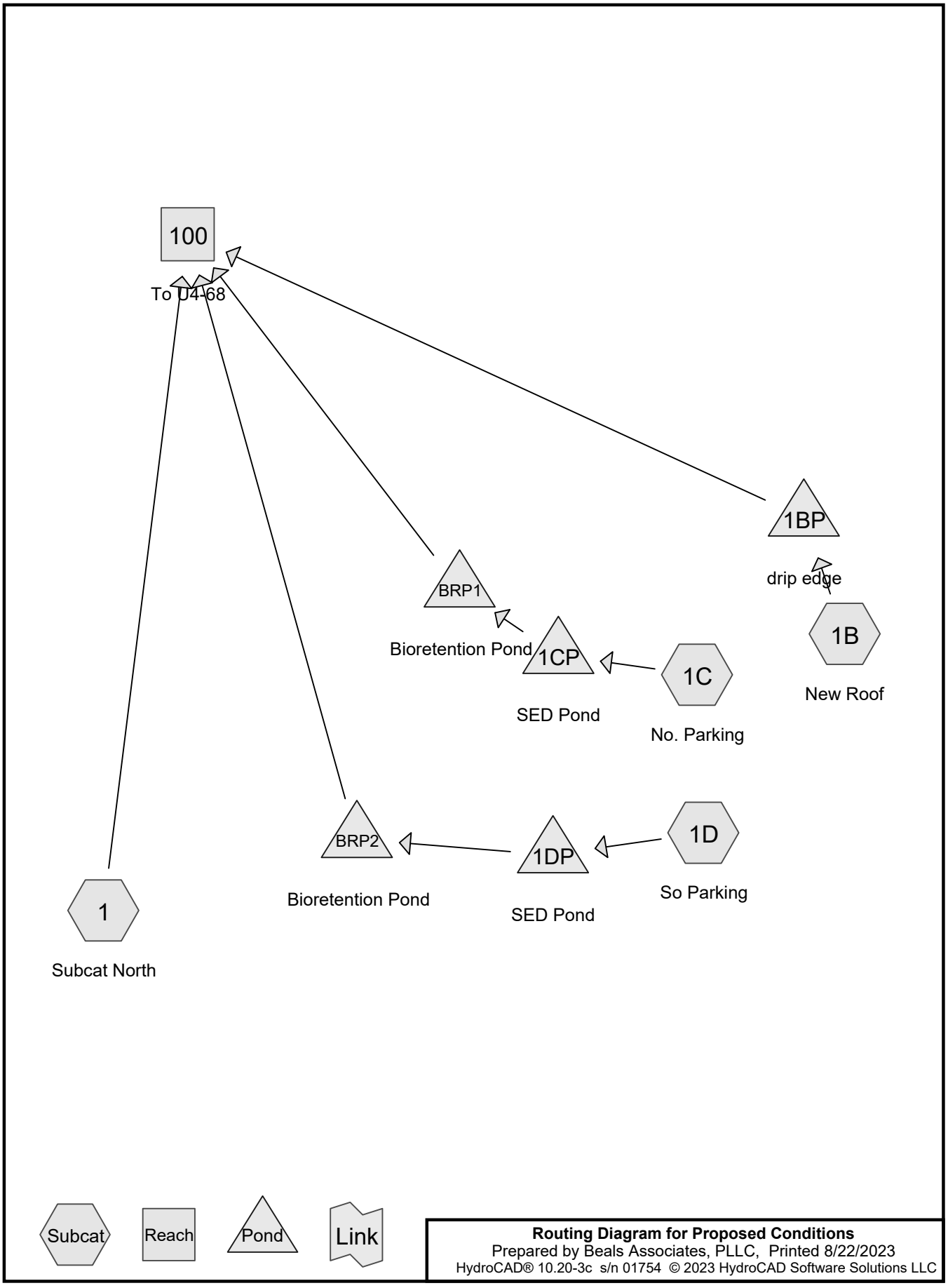
Pond1CP: SED Pond Peak Elev=50.71' Storage=303 cf Inflow=0.57 cfs 0.042 af
Outflow=0.57 cfs 0.042 af

Pond1DP: SED Pond Peak Elev=51.50' Storage=934 cf Inflow=1.09 cfs 0.093 af
Outflow=1.07 cfs 0.093 af

PondBRP1: BioretentionPond Peak Elev=50.70' Storage=859 cf Inflow=0.57 cfs 0.042 af
Discarded=0.05 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.042 af

PondBRP2: BioretentionPond Peak Elev=51.43' Storage=1,507 cf Inflow=1.07 cfs 0.093 af
Discarded=0.13 cfs 0.091 af Primary=0.06 cfs 0.002 af Outflow=0.19 cfs 0.093 af

Total Runoff Area = 8.360 ac Runoff Volume = 1.013 af Average Runoff Depth = 1.45"
90.33% Pervious = 7.552 ac 9.67% Impervious = 0.808 ac



Routing Diagram for Proposed Conditions
Prepared by Beals Associates, PLLC, Printed 8/22/2023

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SubcatNorth Runoff Area=325,014 sf 3.07% Impervious Runoff Depth=2.77"
Flow Length=860' Tc=26.1 min CN=74 Runoff=14.53 cfs 1.722 af

Subcatchment1B: New Roof Runoff Area=9,146 sf 92.37% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=96 Runoff=1.12 cfs 0.088 af

Subcatchment1C: No. Parking Runoff Area=7,993 sf 74.58% Impervious Runoff Depth=4.58"
Tc=6.0 min CN=92 Runoff=0.93 cfs 0.070 af

Subcatchment1D: So Parking Runoff Area=22,018 sf 49.11% Impervious Runoff Depth=3.94"
Flow Length=61' Tc=11.4 min CN=86 Runoff=1.92 cfs 0.166 af

Reach100: To U4-68 Inflow=16.20 cfs 1.813 af
Outflow=16.20 cfs 1.813 af

Pond1BP: drip edge Peak Elev=51.01' Storage=641 cf Inflow=1.12 cfs 0.088 af
Discarded=0.04 cfs 0.058 af Primary=1.08 cfs 0.030 af Outflow=1.12 cfs 0.088 af

Pond1CP: SED Pond Peak Elev=50.76' Storage=320 cf Inflow=0.93 cfs 0.070 af
Outflow=0.92 cfs 0.070 af

Pond1DP: SED Pond Peak Elev=51.58' Storage=994 cf Inflow=1.92 cfs 0.166 af
Outflow=1.89 cfs 0.166 af

PondBRP1: BioretentionPond Peak Elev=50.87' Storage=983 cf Inflow=0.92 cfs 0.070 af
Discarded=0.05 cfs 0.053 af Primary=0.64 cfs 0.017 af Outflow=0.69 cfs 0.070 af

PondBRP2: BioretentionPond Peak Elev=51.59' Storage=1,845 cf Inflow=1.89 cfs 0.166 af
Discarded=0.16 cfs 0.122 af Primary=1.07 cfs 0.044 af Outflow=1.23 cfs 0.166 af

Total Runoff Area = 8.360 ac Runoff Volume = 2.046 af Average Runoff Depth = 2.94"
90.33% Pervious = 7.552 ac 9.67% Impervious = 0.808 ac

Summary for Subcatchment 1: Subcat North

Runoff = 14.53 cfs @ 12.38 hrs, Volume= 1.722 af, Depth= 2.77"
Routed to Reach 100 : To U4-68

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.50"

Area (sf)	CN	Description
8,285	98	Paved roads w/curbs & sewers, HSG C
1,703	98	Roofs, HSG C
72,577	74	>75% Grass cover, Good, HSG C
143,557	70	Woods, Good, HSG C
98,892	77	Woods, Good, HSG D
325,014	74	Weighted Average
315,026		96.93% Pervious Area
9,988		3.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0250	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.24"
12.6	397	0.0110	0.52		**Shallow Concentrated Flow, SC to VPD** Woodland Kv= 5.0 fps
2.3	413	0.0072	3.03	94.50	**Channel Flow, To Anal. pnt** Area= 31.2 sf Perim= 51.0' r= 0.61' n= 0.030 Earth, grassed & winding
26.1	860	Total			

Summary for Subcatchment 1B: New Roof

Runoff = 1.12 cfs @ 12.08 hrs, Volume= 0.088 af, Depth= 5.03"
Routed to Pond 1BP : drip edge

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.50"

Area (sf)	CN	Description
8,448	98	Roofs, HSG C
698	74	>75% Grass cover, Good, HSG C
9,146	96	Weighted Average
698		7.63% Pervious Area
8,448		92.37% Impervious Area

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

Summary for Subcatchment 1C: No. Parking

Runoff = 0.93 cfs @ 12.08 hrs, Volume= 0.070 af, Depth= 4.58"
Routed to Pond 1CP : SED Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.50"

Area (sf)	CN	Description
5,961	98	Paved parking, HSG C
2,032	74	>75% Grass cover, Good, HSG C
7,993	92	Weighted Average
2,032		25.42% Pervious Area
5,961		74.58% Impervious Area

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

Summary for Subcatchment 1D: So Parking

Runoff = 1.92 cfs @ 12.15 hrs, Volume= 0.166 af, Depth= 3.94"
Routed to Pond 1DP : SED Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.50"

Area (sf)	CN	Description
2,864	98	Paved roads w/curbs & sewers, HSG C
7,950	98	Paved parking, HSG C
11,204	74	>75% Grass cover, Good, HSG C
22,018	86	Weighted Average
11,204		50.89% Pervious Area
10,814		49.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0090	0.07		**Sheet Flow, SHEET** Grass: Dense n= 0.240 P2= 3.24"
0.2	11	0.0120	0.77		**Shallow Concentrated Flow, SC TO POND** Short Grass Pasture Kv= 7.0 fps
11.4	61	Total			

Summary for Reach 100: To U4-68

Inflow Area = 8.360 ac, 9.67% Impervious, Inflow Depth = 2.60" for 10-Yr event
Inflow = 16.20 cfs @ 12.36 hrs, Volume= 1.813 af
Outflow = 16.20 cfs @ 12.36 hrs, Volume= 1.813 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1BP: drip edge

Inflow Area = 0.210 ac, 92.37% Impervious, Inflow Depth = 5.03" for 10-Yr event
Inflow = 1.12 cfs @ 12.08 hrs, Volume= 0.088 af
Outflow = 1.12 cfs @ 12.09 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.04 cfs @ 9.61 hrs, Volume= 0.058 af
Primary = 1.08 cfs @ 12.09 hrs, Volume= 0.030 af
Routed to Reach 100 : To U4-68

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 51.01' @ 12.09 hrs Surf.Area= 638 sf Storage= 641 cf
Flood Elev= 51.10' Surf.Area= 638 sf Storage= 664 cf

Plug-Flow detention time=79.1 min calculated for 0.088 af (100% of inflow)
Center-of-Mass det. time=79.1 min (839.2 - 760.2)

Volume	Invert	Avail.Storage	Storage Description
#1	48.50'	664 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.50	638	0.0	0	0
51.10	638	40.0	664	664

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.50'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	51.00'	**190.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 9.61 hrs HW=48.53' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.85 cfs @ 12.09 hrs HW=51.01' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.85 cfs @ 0.33 fps)

Summary for Pond 1CP: SED Pond

Inflow Area = 0.183 ac, 74.58% Impervious, Inflow Depth = 4.58" for 10-Yr event
Inflow = 0.93 cfs @ 12.08 hrs, Volume= 0.070 af
Outflow = 0.92 cfs @ 12.10 hrs, Volume= 0.070 af, Atten= 1%, Lag= 0.7 min
Primary = 0.92 cfs @ 12.10 hrs, Volume= 0.070 af
Routed to Pond BRP1 : Bioretention Pond

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 50.60' Surf.Area= 350 sf Storage= 262 cf
Peak Elev= 50.76' @ 12.10 hrs Surf.Area= 392 sf Storage= 320 cf (58 cf above start)
Flood Elev= 51.50' Surf.Area= 458 sf Storage= 424 cf (162 cf above start)

Plug-Flow detention time=72.7 min calculated for 0.064 af (91% of inflow)
Center-of-Mass det. time=1.6 min (781.4 - 779.8)

Volume	Invert	Avail.Storage	Storage Description
#1	49.00'	424 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
49.00	13	0.0	0	0
50.00	188	100.0	101	101
51.00	458	100.0	323	424

Device	Routing	Invert	Outlet Devices
#1	Primary	50.60'	**6.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.91 cfs @ 12.10 hrs HW=50.76' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.91 cfs @ 0.97 fps)

Summary for Pond 1DP: SED Pond

Inflow Area = 0.505 ac, 49.11% Impervious, Inflow Depth = 3.94" for 10-Yr event
Inflow = 1.92 cfs @ 12.15 hrs, Volume= 0.166 af
Outflow = 1.89 cfs @ 12.17 hrs, Volume= 0.166 af, Atten= 1%, Lag= 1.2 min
Primary = 1.89 cfs @ 12.17 hrs, Volume= 0.166 af
Routed to Pond BRP2 : Bioretention Pond

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 51.33' Surf.Area= 692 sf Storage= 808 cf
Peak Elev= 51.58' @ 12.17 hrs Surf.Area= 797 sf Storage= 994 cf (186 cf above start)
Flood Elev= 51.80' Surf.Area= 935 sf Storage= 1,182 cf (374 cf above start)

Plug-Flow detention time=82.5 min calculated for 0.147 af (89% of inflow)
Center-of-Mass det. time=3.1 min (809.0 - 805.9)

Volume	Invert	Avail.Storage	Storage Description
#1	49.00'	1,182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
49.00	53	0	0
50.00	276	165	165
51.50	745	766	930
51.80	935	252	1,182

Device	Routing	Invert	Outlet Devices
#1	Primary	51.33'	**6.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.89 cfs @ 12.17 hrs HW=51.58' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.89 cfs @ 1.25 fps)

Summary for Pond BRP1: Bioretention Pond

Inflow Area = 0.183 ac, 74.58% Impervious, Inflow Depth = 4.58" for 10-Yr event
Inflow = 0.92 cfs @ 12.10 hrs, Volume= 0.070 af
Outflow = 0.69 cfs @ 12.17 hrs, Volume= 0.070 af, Atten= 25%, Lag= 4.4 min
Discarded = 0.05 cfs @ 12.17 hrs, Volume= 0.053 af
Primary = 0.64 cfs @ 12.17 hrs, Volume= 0.017 af
Routed to Reach 100 : To U4-68

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 50.87' @ 12.17 hrs Surf.Area= 763 sf Storage= 983 cf
Flood Elev= 51.00' Surf.Area= 806 sf Storage= 1,083 cf

Plug-Flow detention time= 168.2 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 168.2 min (949.6 - 781.4)

Volume	Invert	Avail.Storage	Storage Description
#1	46.75'	1,083 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.75	219	0.0	0	0
47.75	219	40.0	88	88
49.25	219	30.0	99	186
51.00	806	100.0	897	1,083

Device	Routing	Invert	Outlet Devices
#1	Primary	50.75'	**6.0' long x 3.0' 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
Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72
2.81 2.92 2.97 3.07 3.32

#2	Discarded	46.75'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.05 cfs @ 12.17 hrs HW=50.87' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.62 cfs @ 12.17 hrs HW=50.87' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.62 cfs @ 0.85 fps)

Summary for Pond BRP2: Bioretention Pond

Inflow Area = 0.505 ac, 49.11% Impervious, Inflow Depth = 3.94" for 10-Yr event
Inflow = 1.89 cfs @ 12.17 hrs, Volume= 0.166 af
Outflow = 1.23 cfs @ 12.33 hrs, Volume= 0.166 af, Atten= 35%, Lag= 9.4 min
Discarded = 0.16 cfs @ 12.33 hrs, Volume= 0.122 af
Primary = 1.07 cfs @ 12.33 hrs, Volume= 0.044 af
Routed to Reach 100 : To U4-68

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 51.59' @ 12.33 hrs Surf.Area= 2,368 sf Storage= 1,845 cf
Flood Elev= 51.90' Surf.Area= 3,682 sf Storage= 2,783 cf

Plug-Flow detention time=86.2 min calculated for 0.166 af (100% of inflow)
Center-of-Mass det. time=86.2 min (895.2 - 809.0)

Volume	Invert	Avail.Storage	Storage Description
#1	48.83'	2,783 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.83	1,583	0.0	0	0
49.83	1,583	40.0	633	633
51.33	1,583	30.0	712	1,346
51.50	1,986	100.0	303	1,649
51.90	3,682	100.0	1,134	2,783

Device	Routing	Invert	Outlet Devices
#1	Primary	50.00'	**15.0" Round Culvert** L= 45.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 50.00' / 49.77' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	51.40'	**15.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	48.83'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.16 cfs @ 12.33 hrs HW=51.59' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=1.06 cfs @ 12.33 hrs HW=51.59' (Free Discharge)
↑—**1=Culvert** (Passes 1.06 cfs of 4.78 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 1.06 cfs @ 1.43 fps)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SubcatNorth Runoff Area=325,014 sf 3.07% Impervious Runoff Depth=4.03"
Flow Length=860' Tc=26.1 min CN=74 Runoff=21.21 cfs 2.508 af

Subcatchment1B: New Roof Runoff Area=9,146 sf 92.37% Impervious Runoff Depth=6.51"
Tc=6.0 min CN=96 Runoff=1.43 cfs 0.114 af

Subcatchment1C: No. Parking Runoff Area=7,993 sf 74.58% Impervious Runoff Depth=6.04"
Tc=6.0 min CN=92 Runoff=1.21 cfs 0.092 af

Subcatchment1D: So Parking Runoff Area=22,018 sf 49.11% Impervious Runoff Depth=5.36"
Flow Length=61' Tc=11.4 min CN=86 Runoff=2.58 cfs 0.226 af

Reach100: To U4-68 Inflow=23.74 cfs 2.674 af
Outflow=23.74 cfs 2.674 af

Pond1BP: drip edge Peak Elev=51.02' Storage=642 cf Inflow=1.43 cfs 0.114 af
Discarded=0.04 cfs 0.065 af Primary=1.38 cfs 0.049 af Outflow=1.43 cfs 0.114 af

Pond1CP: SED Pond Peak Elev=50.79' Storage=332 cf Inflow=1.21 cfs 0.092 af
Outflow=1.19 cfs 0.092 af

Pond1DP: SED Pond Peak Elev=51.64' Storage=1,037 cf Inflow=2.58 cfs 0.226 af
Outflow=2.55 cfs 0.226 af

PondBRP1: BioretentionPond Peak Elev=50.93' Storage=1,024 cf Inflow=1.19 cfs 0.092 af
Discarded=0.05 cfs 0.059 af Primary=1.09 cfs 0.033 af Outflow=1.14 cfs 0.092 af

PondBRP2: BioretentionPond Peak Elev=51.68' Storage=2,077 cf Inflow=2.55 cfs 0.226 af
Discarded=0.19 cfs 0.142 af Primary=1.91 cfs 0.084 af Outflow=2.10 cfs 0.226 af

Total Runoff Area = 8.360 ac Runoff Volume = 2.940 af Average Runoff Depth = 4.22"
90.33% Pervious = 7.552 ac 9.67% Impervious = 0.808 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SubcatNorth Runoff Area=325,014 sf 3.07% Impervious Runoff Depth=5.27"
Flow Length=860' Tc=26.1 min CN=74 Runoff=27.63 cfs 3.275 af

Subcatchment1B: New Roof Runoff Area=9,146 sf 92.37% Impervious Runoff Depth=7.90"
Tc=6.0 min CN=96 Runoff=1.72 cfs 0.138 af

Subcatchment1C: No. Parking Runoff Area=7,993 sf 74.58% Impervious Runoff Depth=7.42"
Tc=6.0 min CN=92 Runoff=1.46 cfs 0.113 af

Subcatchment1D: So Parking Runoff Area=22,018 sf 49.11% Impervious Runoff Depth=6.70"
Flow Length=61' Tc=11.4 min CN=86 Runoff=3.19 cfs 0.282 af

Reach100: To U4-68 Inflow=30.86 cfs 3.516 af
Outflow=30.86 cfs 3.516 af

Pond1BP: drip edge Peak Elev=51.02' Storage=643 cf Inflow=1.72 cfs 0.138 af
Discarded=0.04 cfs 0.071 af Primary=1.67 cfs 0.067 af Outflow=1.72 cfs 0.138 af

Pond1CP: SED Pond Peak Elev=50.81' Storage=343 cf Inflow=1.46 cfs 0.113 af
Outflow=1.45 cfs 0.113 af

Pond1DP: SED Pond Peak Elev=51.68' Storage=1,074 cf Inflow=3.19 cfs 0.282 af
Outflow=3.15 cfs 0.282 af

PondBRP1: BioretentionPond Peak Elev=50.95' Storage=1,045 cf Inflow=1.45 cfs 0.113 af
Discarded=0.05 cfs 0.065 af Primary=1.35 cfs 0.049 af Outflow=1.41 cfs 0.113 af

PondBRP2: BioretentionPond Peak Elev=51.74' Storage=2,254 cf Inflow=3.15 cfs 0.282 af
Discarded=0.21 cfs 0.158 af Primary=2.57 cfs 0.125 af Outflow=2.78 cfs 0.282 af

Total Runoff Area = 8.360 ac Runoff Volume = 3.809 af Average Runoff Depth = 5.47"
90.33% Pervious = 7.552 ac 9.67% Impervious = 0.808 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: SubcatNorth Runoff Area=325,014 sf 3.07% Impervious Runoff Depth=6.80"
Flow Length=860' Tc=26.1 min CN=74 Runoff=35.51 cfs 4.230 af

Subcatchment1B: New Roof Runoff Area=9,146 sf 92.37% Impervious Runoff Depth=9.58"
Tc=6.0 min CN=96 Runoff=2.07 cfs 0.168 af

Subcatchment1C: No. Parking Runoff Area=7,993 sf 74.58% Impervious Runoff Depth=9.09"
Tc=6.0 min CN=92 Runoff=1.77 cfs 0.139 af

Subcatchment1D: So Parking Runoff Area=22,018 sf 49.11% Impervious Runoff Depth=8.34"
Flow Length=61' Tc=11.4 min CN=86 Runoff=3.93 cfs 0.351 af

Reach100: To U4-68 Inflow=39.54 cfs 4.566 af
Outflow=39.54 cfs 4.566 af

Pond1BP: drip edge Peak Elev=51.02' Storage=644 cf Inflow=2.07 cfs 0.168 af
Discarded=0.04 cfs 0.077 af Primary=2.02 cfs 0.091 af Outflow=2.06 cfs 0.168 af

Pond1CP: SED Pond Peak Elev=50.84' Storage=354 cf Inflow=1.77 cfs 0.139 af
Outflow=1.76 cfs 0.139 af

Pond1DP: SED Pond Peak Elev=51.73' Storage=1,116 cf Inflow=3.93 cfs 0.351 af
Outflow=3.89 cfs 0.351 af

PondBRP1: BioretentionPond Peak Elev=50.98' Storage=1,068 cf Inflow=1.76 cfs 0.139 af
Discarded=0.06 cfs 0.070 af Primary=1.65 cfs 0.069 af Outflow=1.71 cfs 0.139 af

PondBRP2: BioretentionPond Peak Elev=51.80' Storage=2,433 cf Inflow=3.89 cfs 0.351 af
Discarded=0.23 cfs 0.174 af Primary=3.24 cfs 0.177 af Outflow=3.47 cfs 0.351 af

Total Runoff Area = 8.360 ac Runoff Volume = 4.888 af Average Runoff Depth = 7.02"
90.33% Pervious = 7.552 ac 9.67% Impervious = 0.808 ac

APPENDIX III

Charts, Graphs, and Calculations

RIP RAP CALCULATIONS

Age-Rstricted Development
DR Lemiuex Builders, Inc.
242 S Main St., Newmarket, NH

Beals Associates, PLLC
70 Portsmouth Avenue
Stratham, NH

Rip Rap equations were obtained from the NH *Stormwater Manual*

Rip Rap was sized for the 10 year storm event (5.5").

TAILWATER < HALF THE Do

La = (1.8 x Q) / Do 3/2 + (7 x Do) Q — Q = Peak Flow & Do is Diameter of Pipe
W = La + 3Do or defined channel width
d50 = (0.02 x Q4/3) / (Tw x Do) — Tw = Tailwater Depth
T = Largest stone size of d50 x 1.5 — T= Thickness of Apron
d50= Median Stone Size (0.25' Min.)

Culvert or Catch Basin (Sta. No.)	Tail Water (Feet) Tw	Dischg. (C.F.S.) Q	Dia. of Pipe Do	Length of Rip Rap La (feet)	Width of Rip Rap W (feet)	Calculated Rip Rap **(0.25 Min)**	Actual Rip Rap (Feet)	Thickness of Apron (Feet)
15" HDPE (Pond #BRP2)	1.00	0.86	1.25	9.9	13.6	0.01	0.25	0.56

Table 7-24 -- Recommended Rip Rap Gradation Ranges

d50 Size =	0.25	Feet	3	Inches	0.5	Feet	6	Inches
% of Weight Smaller Than the Given d50 Size		Size of Stone (Inches) From		To		Size of Stone (Inches) From		To
100%		5		6		9		12
85%		4		5		8		11
50%		3		5		6		9
15%		1		2		2		3

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

GROUNDWATER RECHARGE VOLULME (GRV) CALCULATION (Env-Wq 1507.04)

	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
0.51	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.10	inches	Rd = Weighted groundwater recharge depth	
0.0513	ac-in	GRV = AI * Rd	
186	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

4,791 cf of stomrwater is infiltrated by the bioretention pond alone under a 2-YR storm event.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention pond/BRP1**

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).	
0.18 ac	A = Area draining to the practice	
0.14 ac	A_I = Impervious area draining to the practice	
0.74 decimal	I = Percent impervious area draining to the practice, in decimal form	
0.72 unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.13 ac-in	WQV= 1" x Rv x A	
478 cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
119 cf	25% x WQV (check calc for sediment forebay volume)	
358 cf	75% x WQV (check calc for surface sand filter volume)	
sed forebay	Method of Pretreatment? (not required for clean or roof runoff)	
162 cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:		
219 sf	A_{SA} = Surface area of the practice	
3.00 iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
Yes/No	(Use the calculations below)	
8.7 hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:		
ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
- hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
47.75 feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
46.75 feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
44.00 feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
47.75 feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
3.75 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'**
50.95 ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
51.00 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
995	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	8	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	≥ 3:1
Sheet	8	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
Sheet		Note what sheet in the plan set contains the filter course spec.	mod. 304.1 (see 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 1CP: SED Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
49.00	13	0
49.05	22	1
49.10	31	2
49.15	39	4
49.20	48	6
49.25	57	9
49.30	65	12
49.35	74	15
49.40	83	19
49.45	92	24
49.50	101	28
49.55	109	34
49.60	118	39
49.65	127	45
49.70	136	52
49.75	144	59
49.80	153	66
49.85	162	74
49.90	170	83
49.95	179	91
50.00	188	101
50.05	201	110
50.10	215	121
50.15	228	132
50.20	242	144
50.25	256	156
50.30	269	169
50.35	283	183
50.40	296	197
50.45	310	212
50.50	323	228
50.55	336	245
50.60	350	262
50.65	363	280
50.70	377	298
50.75	391	317
50.80	404	337
50.85	418	358
50.90	431	379
50.95	445	401
51.00	**458**	**424**
51.05	458	424
51.10	458	424
51.15	458	424
51.20	458	424
51.25	458	424
51.30	458	424
51.35	458	424
51.40	458	424
51.45	458	424
51.50	458	424

Stage-Area-Storage for Pond BRP1: Bioretention Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
46.75	219	0
46.80	219	4
46.85	219	9
46.90	219	13
46.95	219	18
47.00	219	22
47.05	219	26
47.10	219	31
47.15	219	35
47.20	219	39
47.25	219	44
47.30	219	48
47.35	219	53
47.40	219	57
47.45	219	61
47.50	219	66
47.55	219	70
47.60	219	74
47.65	219	79
47.70	219	83
47.75	219	88
47.80	219	91
47.85	219	94
47.90	219	97
47.95	219	101
48.00	219	104
48.05	219	107
48.10	219	111
48.15	219	114
48.20	219	117
48.25	219	120
48.30	219	124
48.35	219	127
48.40	219	130
48.45	219	134
48.50	219	137
48.55	219	140
48.60	219	143
48.65	219	147
48.70	219	150
48.75	219	153
48.80	219	157
48.85	219	160
48.90	219	163
48.95	219	166
49.00	219	170
49.05	219	173
49.10	219	176
49.15	219	180
49.20	219	183
49.25	219	186
49.30	236	198
49.35	253	210
49.40	269	223
49.45	286	237
49.50	303	251
49.55	320	267
49.60	336	283
49.65	353	301
49.70	370	319
49.75	387	338
49.80	403	357
49.85	420	378
49.90	437	399
49.95	454	422
50.00	471	445
50.05	487	469
50.10	504	493
50.15	521	519
50.20	538	546
50.25	554	573
50.30	571	601
50.35	588	630
50.40	605	660
50.45	622	690
50.50	638	722
50.55	655	754
50.60	672	787
50.65	689	821
50.70	705	856
50.75	722	892
50.80	739	929
50.85	756	966
50.90	772	1,004
50.95	789	1,043
51.00	**806**	**1,083**

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

INFILTRATION PRACTICE CRITERIA (Env-Wq 1508.06)

Type/Node Name: stone drip edge/1BP

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable.

yes		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	← yes
0.21	ac	A = Area draining to the practice	
0.19	ac	A_I = Impervious area draining to the practice	
0.90	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.86	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.18	ac-in	WQV= 1" x Rv x A	
659	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
165	cf	25% x WQV (check calc for sediment forebay 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
664	cf	V = Volume[1] (attach a stage-storage table)	≥ WQV
638	sf	A_{SA} = Surface area of the bottom of the pond	
3.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
4.1	hours	I_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
48.50	feet	E_{BTM} = Elevation of the bottom of the basin	
47.50	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
45.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	D_{SHWT} = Separation from SHWT	≥ *[3]
3.5	feet	D_{ROCK} = Separation from bedrock	≥ *[3]
	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	≥ 24"
	ft	D_T = Depth of trench, if trench proposed	4 - 10 ft
	Yes/No	If a trench or underground system is proposed, has observation well been provided?	←yes
		If a trench is proposed, does materialmeet Env-Wq 1508.06(k)(2) requirements.[4]	← yes
	Yes/No	If a basin is proposed, Is the perimeter curvilinear, and basin floor flat?	← yes
	:1	If a basin is proposed, pond side slopes.	≥3:1
51.01	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
51.02	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
51.10	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes:

Stage-Area-Storage for Pond 1BP: drip edge

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
48.50	**638**	0
48.55	638	13
48.60	638	26
48.65	638	38
48.70	638	51
48.75	638	64
48.80	638	77
48.85	638	89
48.90	638	102
48.95	638	115
49.00	638	128
49.05	638	140
49.10	638	153
49.15	638	166
49.20	638	179
49.25	638	191
49.30	638	204
49.35	638	217
49.40	638	230
49.45	638	242
49.50	638	255
49.55	638	268
49.60	638	281
49.65	638	293
49.70	638	306
49.75	638	319
49.80	638	332
49.85	638	345
49.90	638	357
49.95	638	370
50.00	638	383
50.05	638	396
50.10	638	408
50.15	638	421
50.20	638	434
50.25	638	447
50.30	638	459
50.35	638	472
50.40	638	485
50.45	638	498
50.50	638	510
50.55	638	523
50.60	638	536
50.65	638	549
50.70	638	561
50.75	638	574
50.80	638	587
50.85	638	600
50.90	638	612
50.95	638	625
51.00	638	638
51.05	638	651
51.10	638	**664**

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention pond/BRP2**

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).	
0.51	ac	A = Area draining to the practice	
0.24	ac	A_I = Impervious area draining to the practice	
0.48	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.48	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.24	ac-in	WQV= 1" x Rv x A	
876	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
219	cf	25% x WQV (check calc for sediment forebay volume)	
657	cf	75% x WQV (check calc for surface sand filter volume)	
sed forebay		Method of Pretreatment? (not required for clean or roof runoff)	
583	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
1,583	sf	A_{SA} = Surface area of the practice	
3.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
2.2	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
49.83	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
48.83	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
46.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
49.83	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
3.83	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'
51.74	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
51.90	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
898	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	8	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	≥ 3:1
Sheet	8	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 1DP: SED Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
49.00	53	0
49.05	64	3
49.10	75	6
49.15	86	10
49.20	98	15
49.25	109	20
49.30	120	26
49.35	131	32
49.40	142	39
49.45	153	46
49.50	165	54
49.55	176	63
49.60	187	72
49.65	198	82
49.70	209	92
49.75	220	102
49.80	231	114
49.85	243	126
49.90	254	138
49.95	265	151
50.00	276	165
50.05	292	179
50.10	307	194
50.15	323	209
50.20	339	226
50.25	354	243
50.30	370	261
50.35	385	280
50.40	401	300
50.45	417	320
50.50	432	342
50.55	448	364
50.60	464	386
50.65	479	410
50.70	495	434
50.75	511	459
50.80	526	485
50.85	542	512
50.90	557	540
50.95	573	568
51.00	589	597
51.05	604	627
51.10	620	657
51.15	636	689
51.20	651	721
51.25	667	754
51.30	682	788
51.35	698	822
51.40	714	857
51.45	729	893
51.50	745	930
51.55	777	968
51.60	808	1,008
51.65	840	1,049
51.70	872	1,092
51.75	903	1,136
51.80	**935**	**1,182**

Stage-Area-Storage for Pond BRP2: Bioretention Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
48.83	1,583	0
48.88	1,583	32
48.93	1,583	63
48.98	1,583	95
49.03	1,583	127
49.08	1,583	158
49.13	1,583	190
49.18	1,583	222
49.23	1,583	253
49.28	1,583	285
49.33	1,583	317
49.38	1,583	348
49.43	1,583	380
49.48	1,583	412
49.53	1,583	443
49.58	1,583	475
49.63	1,583	507
49.68	1,583	538
49.73	1,583	570
49.78	1,583	602
49.83	1,583	633
49.88	1,583	657
49.93	1,583	681
49.98	1,583	704
50.03	1,583	728
50.08	1,583	752
50.13	1,583	776
50.18	1,583	799
50.23	1,583	823
50.28	1,583	847
50.33	1,583	871
50.38	1,583	894
50.43	1,583	918
50.48	1,583	942
50.53	1,583	966
50.58	1,583	989
50.63	1,583	1,013
50.68	1,583	1,037
50.73	1,583	1,061
50.78	1,583	1,084
50.83	1,583	1,108
50.88	1,583	1,132
50.93	1,583	1,156
50.98	1,583	1,179
51.03	1,583	1,203
51.08	1,583	1,227
51.13	1,583	1,251
51.18	1,583	1,274
51.23	1,583	1,298
51.28	1,583	1,322
51.33	1,583	1,346
51.38	1,702	1,428
51.43	1,820	1,516
51.48	1,939	1,610
51.53	2,113	1,710
51.58	2,325	1,821
51.63	2,537	1,943
51.68	2,749	2,075
51.73	2,961	2,218
51.78	3,173	2,371
51.83	3,385	2,535
51.88	**3,597**	**2,710**

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	43.074 degrees North
Longitude	70.951 degrees West
Elevation	10 feet
Date/Time	Thu May 18 2023 09:06:35 GMT-0400 (Eastern Daylight Time)

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	0.82	1.04	**1yr**	0.70	0.98	1.21	1.56	2.01	2.63	2.85	**1yr**	2.33	2.74	3.14	3.86	4.46	**1yr**
2yr	0.32	0.49	0.61	0.81	1.02	1.29	**2yr**	0.88	1.17	1.50	1.92	2.45	3.15	3.49	**2yr**	2.79	3.36	3.86	4.59	5.23	**2yr**
5yr	0.37	0.58	0.72	0.97	1.23	1.59	**5yr**	1.07	1.45	1.86	2.40	3.09	4.00	4.48	**5yr**	3.54	4.31	4.92	5.83	6.60	**5yr**
10yr	0.41	0.64	0.81	1.10	1.43	1.86	**10yr**	1.23	1.70	2.20	2.85	3.69	4.79	5.42	**10yr**	4.24	5.21	5.93	6.99	7.87	**10yr**
25yr	0.47	0.75	0.95	1.31	1.74	2.29	**25yr**	1.50	2.11	2.73	3.57	4.66	6.08	6.96	**25yr**	5.38	6.70	7.57	8.90	9.95	**25yr**
50yr	0.52	0.84	1.08	1.50	2.03	2.70	**50yr**	1.75	2.48	3.22	4.24	5.57	7.29	8.43	**50yr**	6.46	8.10	9.11	10.68	11.88	**50yr**
100yr	0.59	0.95	1.23	1.73	2.36	3.17	**100yr**	2.03	2.92	3.81	5.04	6.65	8.75	10.20	**100yr**	7.74	9.81	10.97	12.82	14.20	**100yr**
200yr	0.65	1.07	1.39	1.99	2.75	3.74	**200yr**	2.37	3.44	4.51	6.01	7.95	10.49	12.35	**200yr**	9.29	11.87	13.21	15.41	16.98	**200yr**
500yr	0.77	1.27	1.66	2.40	3.37	4.63	**500yr**	2.91	4.28	5.61	7.54	10.06	13.35	15.90	**500yr**	11.82	15.29	16.90	19.65	21.52	**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	0.61	0.74	0.90	**1yr**	0.64	0.88	0.93	1.25	1.54	2.08	2.51	**1yr**	1.84	2.42	2.89	3.32	3.95	**1yr**
2yr	0.32	0.49	0.60	0.81	1.00	1.18	**2yr**	0.87	1.16	1.37	1.82	2.35	3.04	3.41	**2yr**	2.69	3.28	3.76	4.47	5.02	**2yr**
5yr	0.35	0.54	0.67	0.92	1.17	1.40	**5yr**	1.01	1.37	1.62	2.14	2.77	3.73	4.16	**5yr**	3.30	4.00	4.59	5.48	6.17	**5yr**
10yr	0.39	0.59	0.74	1.03	1.33	1.61	**10yr**	1.15	1.57	1.82	2.44	3.12	4.30	4.83	**10yr**	3.81	4.64	5.33	6.37	7.09	**10yr**
25yr	0.44	0.68	0.84	1.20	1.58	1.93	**25yr**	1.36	1.88	2.11	2.83	3.64	4.87	5.87	**25yr**	4.31	5.64	6.49	7.76	8.66	**25yr**
50yr	0.49	0.75	0.93	1.34	1.80	2.21	**50yr**	1.55	2.16	2.36	3.19	4.09	5.53	6.78	**50yr**	4.90	6.52	7.53	9.01	9.99	**50yr**
100yr	0.55	0.83	1.04	1.50	2.06	2.53	**100yr**	1.78	2.48	2.64	3.57	4.58	6.27	7.84	**100yr**	5.55	7.54	8.74	10.46	11.50	**100yr**
200yr	0.61	0.92	1.17	1.69	2.36	2.90	**200yr**	2.03	2.84	2.94	4.00	5.13	7.09	9.35	**200yr**	6.27	8.99	10.15	12.14	13.27	**200yr**
500yr	0.72	1.07	1.37	1.99	2.83	3.50	**500yr**	2.45	3.42	3.40	4.64	5.99	8.31	11.40	**500yr**	7.35	10.96	12.38	14.79	15.97	**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	0.88	1.08	**1yr**	0.76	1.05	1.25	1.73	2.19	2.88	3.05	**1yr**	2.55	2.93	3.46	4.20	4.88	**1yr**
2yr	0.33	0.51	0.63	0.85	1.04	1.25	**2yr**	0.90	1.22	1.48	1.95	2.49	3.32	3.59	**2yr**	2.93	3.45	3.97	4.74	5.49	**2yr**
5yr	0.39	0.61	0.76	1.04	1.32	1.59	**5yr**	1.14	1.55	1.86	2.48	3.17	4.27	4.81	**5yr**	3.78	4.63	5.28	6.20	7.02	**5yr**
10yr	0.46	0.71	0.88	1.23	1.59	1.93	**10yr**	1.37	1.89	2.24	3.03	3.81	5.29	6.02	**10yr**	4.69	5.79	6.57	7.64	8.61	**10yr**
25yr	0.56	0.86	1.07	1.53	2.01	2.50	**25yr**	1.73	2.44	2.88	3.93	4.88	7.32	8.10	**25yr**	6.48	7.79	8.76	10.10	11.16	**25yr**
50yr	0.65	1.00	1.24	1.78	2.40	3.02	**50yr**	2.07	2.95	3.50	4.78	5.90	9.12	10.17	**50yr**	8.07	9.78	10.91	12.48	13.69	**50yr**
100yr	0.77	1.16	1.45	2.09	2.87	3.65	**100yr**	2.48	3.57	4.25	5.85	7.15	11.36	12.76	**100yr**	10.06	12.27	13.58	15.43	16.80	**100yr**
200yr	0.89	1.34	1.70	2.46	3.43	4.44	**200yr**	2.96	4.34	5.18	7.14	8.65	14.21	15.60	**200yr**	12.57	15.00	16.91	19.08	20.64	**200yr**
500yr	1.09	1.63	2.09	3.04	4.33	5.71	**500yr**	3.73	5.58	6.70	9.33	11.14	19.10	20.98	**500yr**	16.91	20.17	22.60	25.31	27.14	**500yr**

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Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Abenaki	501	0.6	2.0	6.00	99.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy-skeletal	no	loamy over gravelly
Acton	146	2.0	20.0	2.00	20.0	B	3	Loose till, sandy textures	mesic	sandy-skeletal	no	cobbly loamy sand
Adams	36	6.0	20.0	20.00	99.0	A	1	Outwash and Stream Terraces	frigid	sandy	yes	
Agawam	24	6.0	20.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Allagash	127	0.6	2.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy	yes	loamy over sandy
Au Gres	516					B	5	Outwash and Stream Terraces	frigid	sandy	yes	single grain, loose
Bangor	572	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam
Becket	56	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Belgrade	532	0.6	2.0	0.06	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	strata of fine sand
Bemis	224	0.6	0.2	0.00	0.2	C	5	Firm, platy, loamy till	cryic	loamy	no	
Berkshire	72	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Bernardston	330	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Bice	226	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	no	sandy loam
Biddeford	234	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	frigid	fine	no	organic over clay
Binghamville	534	0.2	2.0	0.06	0.2	D	5	Terraces and glacial lake plains	mesic	silty	no	
Boscawen	220	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	no	loamy cap
Boxford	32	0.1	0.2	0.00	0.2	C	3	Silt and Clay Deposits	mesic	fine	no	silty clay loam
Brayton	240	0.6	2.0	0.06	0.6	C	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Buckland	237	0.6	2.0	0.06	0.2	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Bucksport	895					D	6	Organic Materials - Freshwater	frigid	sapric	no	deep organic
Burnham	131	0.2	6.0	0.02	0.2	D	6	Firm, platy, silty till, schist & phylitte	frigid	loamy	no	organic over silt
Buxton	232	0.1	0.6	0.00	0.2	C	3	Silt and Clay Deposits	frigid	fine	no	silty clay
Cabot	589	0.6	2.0	0.06	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Caesar	526	20.0	100.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	coarse sand	no	
Canaan	663	2.0	20.0	2.00	20.0	C	4	Weathered Bedrock Till	frigid	loamy-skeletal	yes	less than 20 in. deep
Canterbury	166	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Canton	42	2.0	6.0	6.00	20.0	B	2	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Cardigan	357	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	20 to 40 in. deep
Catden	296					A/D	6	Organic Materials - Freshwater	mesic	sapric	no	deep organic
Champlain	35	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	gravelly sand	no	
Charles	209	0.6	100.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	silty	no	
Charlton	62	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Chatfield	89	0.6	6.0	0.60	6.0	B	4	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Chatfield Var.	289	0.6	6.0	0.60	6.0	B	3	Loose till, bedrock	mesic	loamy	no	mwd to swpd
Chesuncook	126	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Chichester	442	0.6	2.0	2.00	6.0	B		Loose till, sandy textures	frigid	loamy over sandy	no	loamy over loamy sand
Chocorua	395			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Cohas	505	0.6	2.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	co. loamy over sandy (skeletal)	no	
Colonel	927	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	loam in Cd
Colton	22	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Colton, gravelly	21	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Croghan	613	20.0	100.0	20.00	100.0	B	3	Outwash and Stream Terraces	frigid	sandy	yes	single grain in C
Dartmouth	132	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	thin strata silty clay loam
Deerfield	313	6.0	20.0	20.00	100.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	single grain in C
Dixfield	378	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Dixmont	578	0.6	2.0	0.60	2.0	C	3	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam, platy in C
Duane	413	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	cemented (ortstein)
Dutchess	366	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	mesic	loamy	no	very channery
Eldridge	38	6.0	20.0	0.06	0.6	C	3	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Elliottsville	128	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	20 to 40 in. deep
Elmridge	238	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	loamy over clayey	no	
Elmwood	338	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	
Finch	116					C	3	Outwash and Stream Terraces	frigid	sandy	yes	cemented (ortstein)

GOVE ENVIRONMENTAL SERVICES, INC.

TEST PIT DATA

Project 242 South Main Street, Newmarket, NH
Client D.R. Lemeiux Builders, LLC
GES Project No. 2022280
MM/DD/YY Staff 04-10-2023 James Gove, CSS#004

Test Pit No.	**1**	Soils Series:	Eldridge
ESHWT::	26"	Landscape:	Flat
Termination @	60"	Slope:	A
Refusal:	None	Parent Material:	Sand over silt
Obs. Water:	None	Ksat (above ESHWT):	6 in/hr.

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-10"	10YR3/2	loamy sand	granular-friable-none
Bw 10-26"	10YR4/4	loamy sand	granular-friable-none
B/C 26-48"	10YR4/3	loamy fine sand	massive-friable-2.5Y5/3
Cd 48-60"	2.5Y5/2	silty clay loam	blocky-firm-7.5YR5/8

Hydrologic Soil Group of this Eldridge soil test pit is C.

Test Pit No.	**2**	Soils Series:	Eldridge
ESHWT::	24"	Landscape:	Flat
Termination @	60"	Slope:	A
Refusal:	None	Parent Material:	Sand over silt
Obs. Water:	59"	Ksat (above ESHWT):	6 in/hr.

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-13"	10YR3/2	loamy sand	granular-friable-none
Bw 13-24"	10YR4/4	loamy sand	granular-friable-none
B/C 24-31"	10YR4/3	loamy fine sand	massive-friable-2.5Y5/3
Cd 31-60"	2.5Y5/2	silty clay loam	blocky-firm-7.5YR5/8

Hydrologic Soil Group of this Eldridge soil test pit is C.

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Test Pit No.	**3**	Soils Series:	Eldridge
ESHWT::	15"	Landscape:	Flat
Termination @	60"	Slope:	A
Refusal:	None	Parent Material:	Sand over silt
Obs. Water:	46"	Ksat (above ESHWT):	6 in/hr.

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-8"	10YR3/2	loamy sand	granular-friable-none
Bw 8-15"	10YR4/6	loamy sand	granular-friable-none
B/C 15-30"	10YR4/6	loamy fine sand	massive-friable-2.5Y5/3
Cd 30-60"	2.5Y5/2	silty clay loam	blocky-firm-7.5YR5/8

Hydrologic Soil Group of this Eldridge soil test pit is C.

Test Pit No.	**4**	Soils Series:	Eldridge
ESHWT::	30"	Landscape:	Flat
Termination @	60"	Slope:	A
Refusal:	None	Parent Material:	Sand over silt
Obs. Water:	30"	Ksat (above ESHWT):	6 in/hr.

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-12"	10YR3/2	loamy sand	granular-friable-none
E 12-24"	2.5Y7/2	loamy sand	granular-friable-none
Bhs 24-30"	7.5YR4/6	loamy fine sand	massive-friable-none
Cd 30-60"	2.5Y5/2	silty clay loam	blocky-firm-7.5YR5/8

Hydrologic Soil Group of this Eldridge soil test pit is C.

BMP Type	BMP [1,2,3,4,5,6,7]	Notes	Lit. Ref.	Values accepted for Loading Analyses		
				TSS	TN	TP
Stormwater Ponds	Wet Pond		B,F	70%	35%	45%
	Wet Extended Detention Pond		A,B	80%	55%	68%
	Micropool Extended Detention Pond	TBA				
	Multiple Pond System	TBA				
	Pocket Pond	TBA				
Stormwater Wetlands	Shallow Wetland		A,B,F,I	80%	55%	45%
	Extended Detention Wetland		A,B,F,I	80%	55%	45%
	Pond/Wetland System	TBA				
	Gravel Wetland		H	95%	85%	64%
Infiltration Practices	Infiltration Trench (≥75 ft from surface water)		B,D,I	90%	55%	60%
	Infiltration Trench (<75 ft from surface water)		B,D,I	90%	10%	60%
	Infiltration Basin (≥75 ft from surface water)		A,F,B,D,I	90%	60%	65%
	Infiltration Basin (<75 ft from surface water)		A,F,B,D,I	90%	10%	65%
	Dry Wells			90%	55%	60%
	Drip Edges			90%	55%	60%
Filtering Practices	Aboveground or Underground Sand Filter that infiltrates WQV (≥75 ft from surface water)		A,F,B,D,I	90%	60%	65%
	Aboveground or Underground Sand Filter that infiltrates WQV (<75 ft from surface water)		A,F,B,D,I	90%	10%	65%
	Aboveground or Underground Sand Filter with underdrain		A,I,F,G,H	85%	10%	45%
	Tree Box Filter	TBA				
	Bioretention System		I,G,H	90%	65%	65%
	Permeable Pavement that infiltrates WQV (≥75 ft from surface water)		A,F,B,D,I	90%	60%	65%
	Permeable Pavement that infiltrates WQV (<75 ft from surface water)		A,F,B,D,I	90%	10%	65%
	Permeable Pavement with underdrain		Use TN and TP values for sand filter w/ underdrain and outlet pipe	90%	10%	45%
Treatment Swales	Flow Through Treatment Swale	TBA				
Vegetated Buffers	Vegetated Buffers		A,B,I	73%	40%	45%
Pre-Treatment Practices	Sediment Forebay	TBA				
	Vegetated Filter Strip[8]		A,B,I	73%	40%	45%
	Vegetated Swale		A,B,C,F,H,I	65%	20%	25%
	Flow-Through Device - Hydrodynamic Separator		A,B,G,H	35%	10%	5%
	Flow-Through device - ADS Underground Multichamber Water Quality Unit (WQU)		G,H	72%	10%	9%
	Other Flow-Through Devices	TBA				
	Off-line Deep Sump Catch Basin		J,K,L,M	15%	5%	5%