STORMWATER MANAGEMENT
&
SEDIMENT AND EROSION CONTROL PLAN

Prepared for:

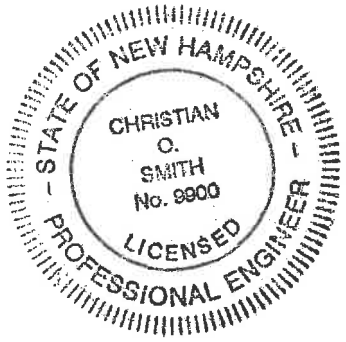
GEORGE TSOUKALAS
565 FRANKLIN PIERCE HWY, BARRINGTON,
NH 03825
(603) 692-8902
ROUTE 9 COMMERCIAL DEVELOPMENT

Prepared by:

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

Project Number:
NH-1445
NH Route 9
Barrington, New Hampshire

January 16, 2023



DESIGN METHOD OBJECTIVES

George Tsoukalas proposes a commercial development on approximately 2.0-acres of land located off NH Route 9 in Barrington, NH within an existing structure. 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, 25 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 the Ksat values provided in the Society of Soil Scientists of Northern New England SSSNNE Special Publication No. 5 September, 2009. The published values were then divided by 2 as a factor of safety as required by the NH Stormwater Manual. The Windsor soil series (SSS 111) the low Ksat in the C horizon is 6in per hour/2 = 3in/hr.

ANALYSIS COMPONENT PEAK RATE of DISCHARGE (CFS)

	2 YR		10 YR		25 YR		50 YR	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Reach #100	0.00	0.00	0.04	0.04	0.19	0.20	0.52	0.56
Reach #200	0.00	0.00	0.04	0.01	0.28	0.11	0.67	0.31

STORMWATER VOLUME COMPARISON (2-YR STORM IN AF)

	Existing	Proposed
Reach #100	0.00	0.00
Reach #200	0.00	0.00

The existing property is located on a parcel consisting of woods, an existing rehabilitated barn structure and recently graded area that has been grassed. The existing topography is such that the site analysis is divided into two subcatchments. The reaches flow offsite; easterly (to an abutting parcel also owned by Mr. Tsoukalas) and Northerly to an abutting parcel. Directions as can be seen on the existing conditions watershed plan (Sheet W1).

The proposed commercial development includes a private access drive that intersects NH Route 9 in a single location. The proposed layout will divide the parcel into four different subcatchments. The peak rate of run-off from the proposed development is equal to or decreased from that of the existing conditions under all design storms evaluated. The addition of swales, and a filtration pond direct the treated run off to recharge it back into the ground water matrix. Driveway and parking area runoff receive treatment through the filtration (bioretention) pond prior to infiltration to the groundwater matrix. The potential for increased erosion and sedimentation is handled by way of silt fence and/or erosion control berms. 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.

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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, 25 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)

	2 YR		10 YR		25 YR		50 YR	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Reach #100	0.00	0.00	0.04	0.04	0.19	0.20	0.52	0.56
Reach #200	0.00	0.00	0.04	0.01	0.28	0.11	0.67	0.31

STORMWATER VOLUME COMPARISON (2-YR STORM IN AF)

	Existing	Proposed
Reach #100	0.00	0.00
Reach #200	0.00	0.00

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 woods, an existing rehabilitated barn structure and recently graded area that has been grassed. The existing topography is such that the site analysis is divided into two subcatchments. The reaches flow offsite; easterly (to an abutting parcel also owned by Mr. Tsoukalas) and Northerly to an abutting parcel. Directions as can be seen on the existing conditions watershed plan (Sheet W1).
Classified by Site Specific Soil Mapping, the land within the drainage analysis is composed of slopes ranging from 0%-3%, and soils categorized into the Hydrologic Soil Groups (HSG) A. No flood hazard zone nor wetlands exist 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 paved drive and parking areas causes 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 four 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 on the parcel. The run-off is treated and infiltrated modeled as HydroCAD "reaches" and "ponds". These consist of constructed swales, existing flow paths through larger subcatchments, and a filtration basin. Required groundwater recharge will be exceeded by a single 2-YR storm (267 c.f. required and 827 c.f. provided by a 2-year storm).

The proposed commercial development includes a private access drive that intersects NH Route 9 in a single location. The peak rate of run-off from the proposed development is equal to or decreased (though the 50-YR storm shows a 0.04 cfs increase for Reach 100, this is negligible and Mr. Tsoukalas owns the abutting parcel) from that of the existing conditions under all design storms evaluated. The addition of swales, and a filtration pond direct the treated run off to recharge it back into the ground water matrix. Driveway and parking area runoff receive treatment through the filtration (bioretention) pond prior to infiltration to the groundwater matrix. The potential for increased erosion and sedimentation is handled by way of silt fence and/or erosion control berms. 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.

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 driveways 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 driveway 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 driveways/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 9 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 driveway 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 and a bioretention area. 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 not required for this project due to the area of disturbance being less than 100,000 square feet.

Respectfully Submitted,

BEALS ASSOCIATES, *PLLC.*

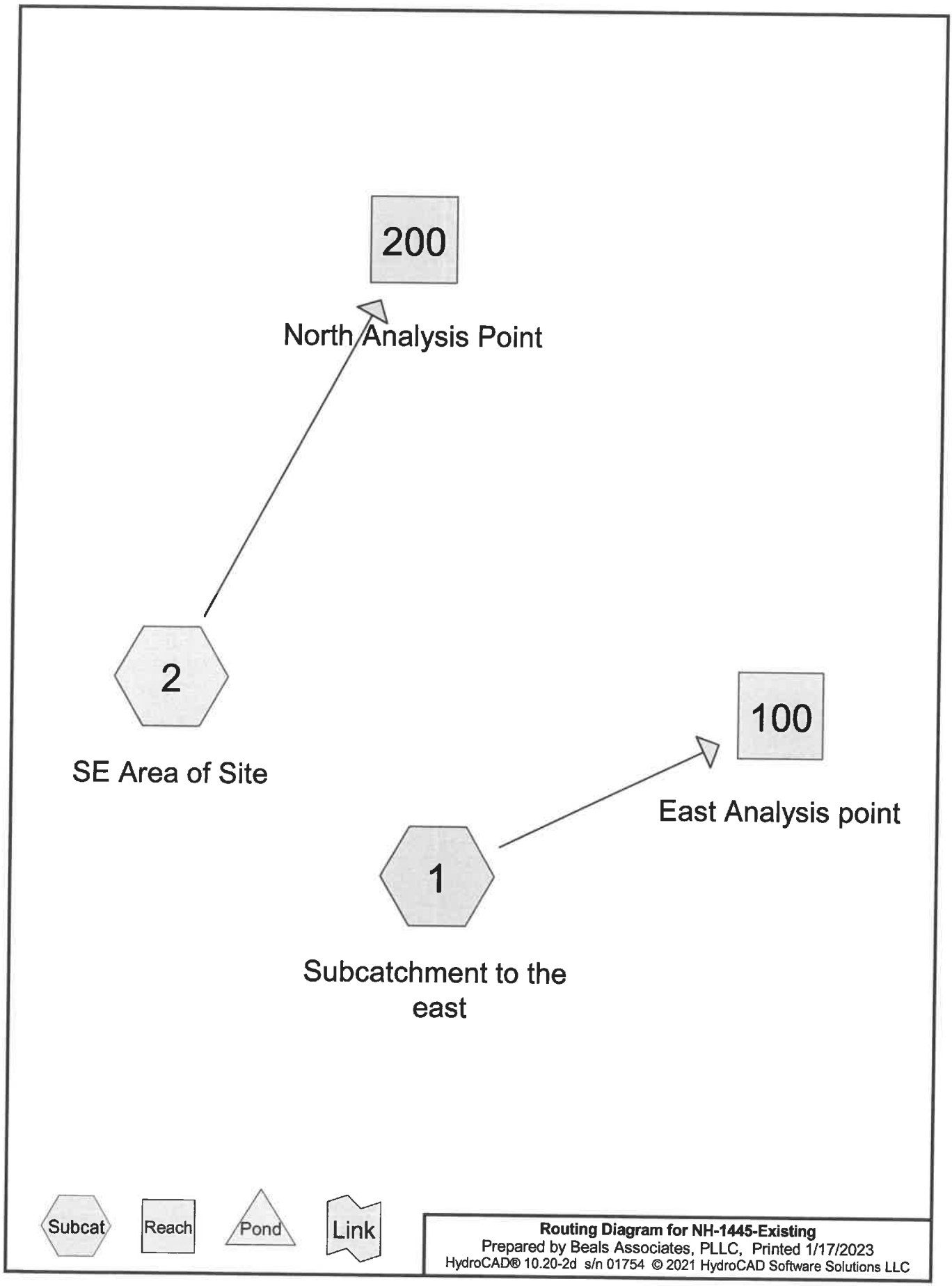
Christian O. Smith

Christian O. Smith, PE
Principal

APPENDIX I

Existing Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.08"
Complete 10 YR - 24 HR rainfall = 4.64"
Summary 25 YR - 24 HR rainfall = 5.86"
Summary 50 YR - 24 HR rainfall = 7.00"
Sheet W-1 Existing Conditions Watershed Plan


200
North Analysis Point
2
SE Area of Site
100
East Analysis point
1
Subcatchment to the east
Subcat
Reach
Pond
Link
Routing Diagram for NH-1445-Existing
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.621	39	>75% Grass cover, Good, HSG A (1, 2)
0.079	96	Gravel surface, HSG A (1, 2)
0.038	98	Roofs, HSG A (1, 2)
0.298	30	Woods, Good, HSG A (1, 2)
2.036	**41**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.036	HSG A	1, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.036		**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

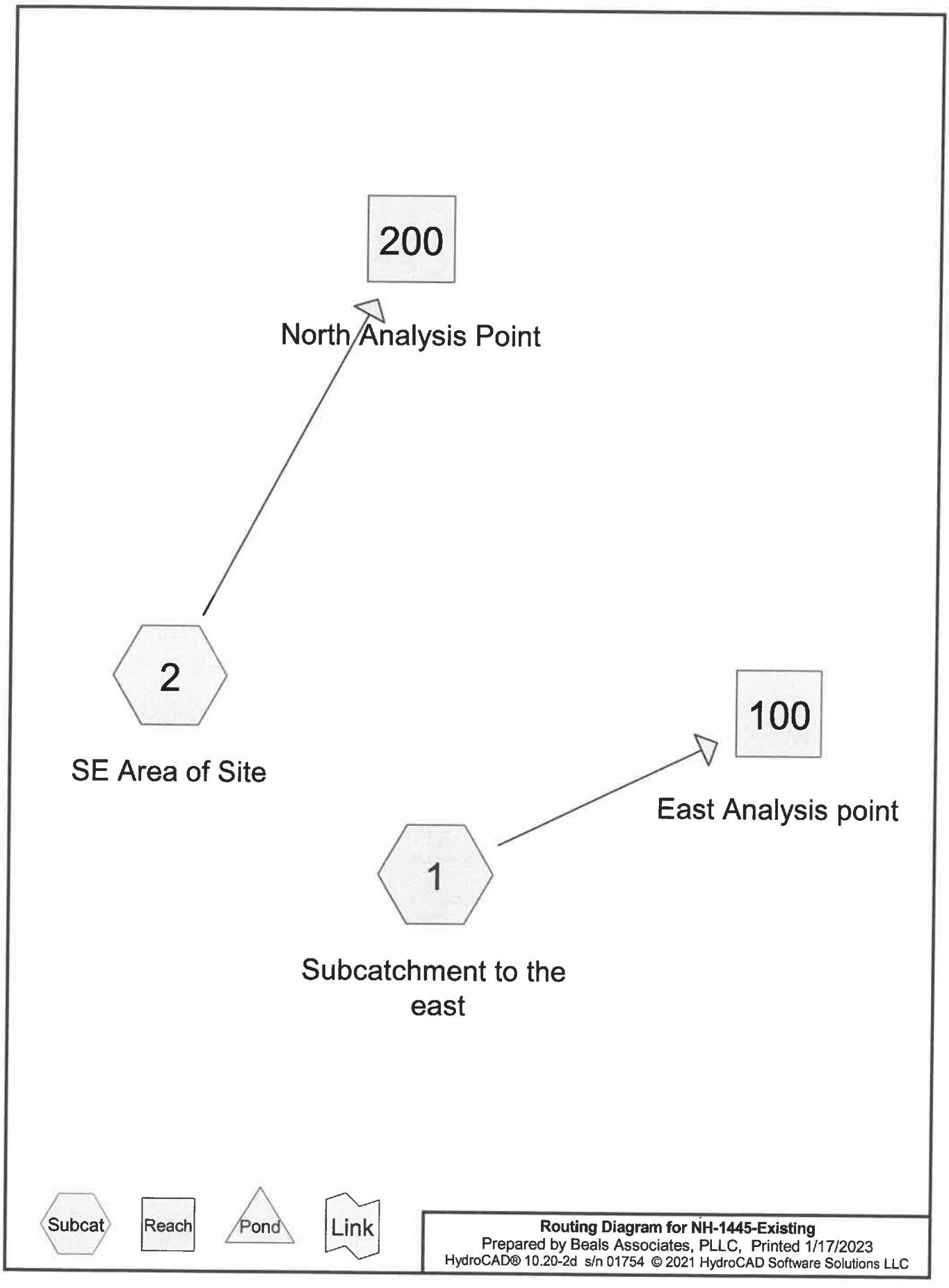
Subcatchment 1: Subcatchment to the east Runoff Area=30,492 sf 2.71% Impervious Runoff Depth=0.01"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment 2: SE Area of Site Runoff Area=58,198 sf 1.42% Impervious Runoff Depth=0.00"
Flow Length=416' Tc=13.7 min CN=41 Runoff=0.00 cfs 0.000 af

Reach 100: East Analysis point Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 200: North Analysis Point Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
98.14% Pervious = 1.998 ac 1.86% Impervious = 0.038 ac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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 the east Runoff Area=30,492 sf 2.71% Impervious Runoff Depth=0.22"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.04 cfs 0.013 af

Subcatchment 2: SE Area of Site Runoff Area=58,198 sf 1.42% Impervious Runoff Depth=0.19"
Flow Length=416' Tc=13.7 min CN=41 Runoff=0.04 cfs 0.021 af

Reach 100: East Analysis point Inflow=0.04 cfs 0.013 af
Outflow=0.04 cfs 0.013 af

Reach 200: North Analysis Point Inflow=0.04 cfs 0.021 af
Outflow=0.04 cfs 0.021 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.035 af Average Runoff Depth = 0.20"
98.14% Pervious = 1.998 ac 1.86% Impervious = 0.038 ac

Summary for Subcatchment 1: Subcatchment to the east

Runoff = 0.04 cfs @ 12.44 hrs, Volume= 0.013 af, Depth= 0.22"
Routed to Reach 100 : East 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
825	98	Roofs, HSG A
948	96	Gravel surface, HSG A
26,301	39	>75% Grass cover, Good, HSG A
2,418	30	Woods, Good, HSG A
30,492	42	Weighted Average
29,667		97.29% Pervious Area
825		2.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0260	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
0.9	115	0.0208	2.16		**Shallow Concentrated Flow, SC to east PL** Grassed Waterway Kv= 15.0 fps
6.1	165	Total			

Summary for Subcatchment 2: SE Area of Site

Runoff = 0.04 cfs @ 12.59 hrs, Volume= 0.021 af, Depth= 0.19"
Routed to Reach 200 : North 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
825	98	Roofs, HSG A
2,513	96	Gravel surface, HSG A
44,295	39	>75% Grass cover, Good, HSG A
10,565	30	Woods, Good, HSG A
58,198	41	Weighted Average
57,373		98.58% Pervious Area
825		1.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0120	0.12		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
6.6	366	0.0038	0.92		**Shallow Concentrated Flow, Sc to analysis point** Grassed Waterway Kv= 15.0 fps
13.7	416	Total			

Summary for Reach 100: East Analysis point

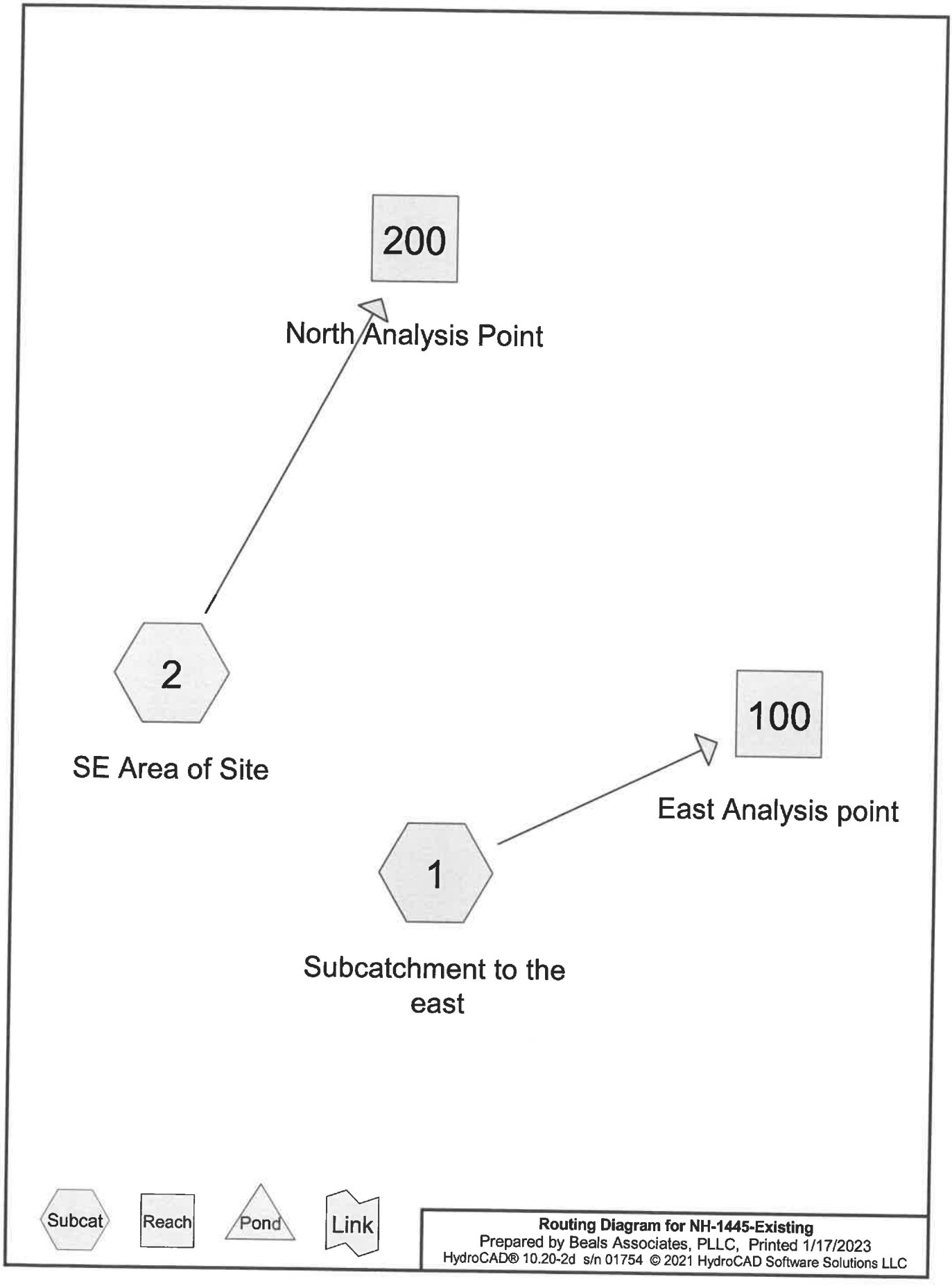
Inflow Area = 0.700 ac, 2.71% Impervious, Inflow Depth = 0.22" for 10 YR event
Inflow = 0.04 cfs @ 12.44 hrs, Volume= 0.013 af
Outflow = 0.04 cfs @ 12.44 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach 200: North Analysis Point

Inflow Area = 1.336 ac, 1.42% Impervious, Inflow Depth = 0.19" for 10 YR event
Inflow = 0.04 cfs @ 12.59 hrs, Volume= 0.021 af
Outflow = 0.04 cfs @ 12.59 hrs, Volume= 0.021 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

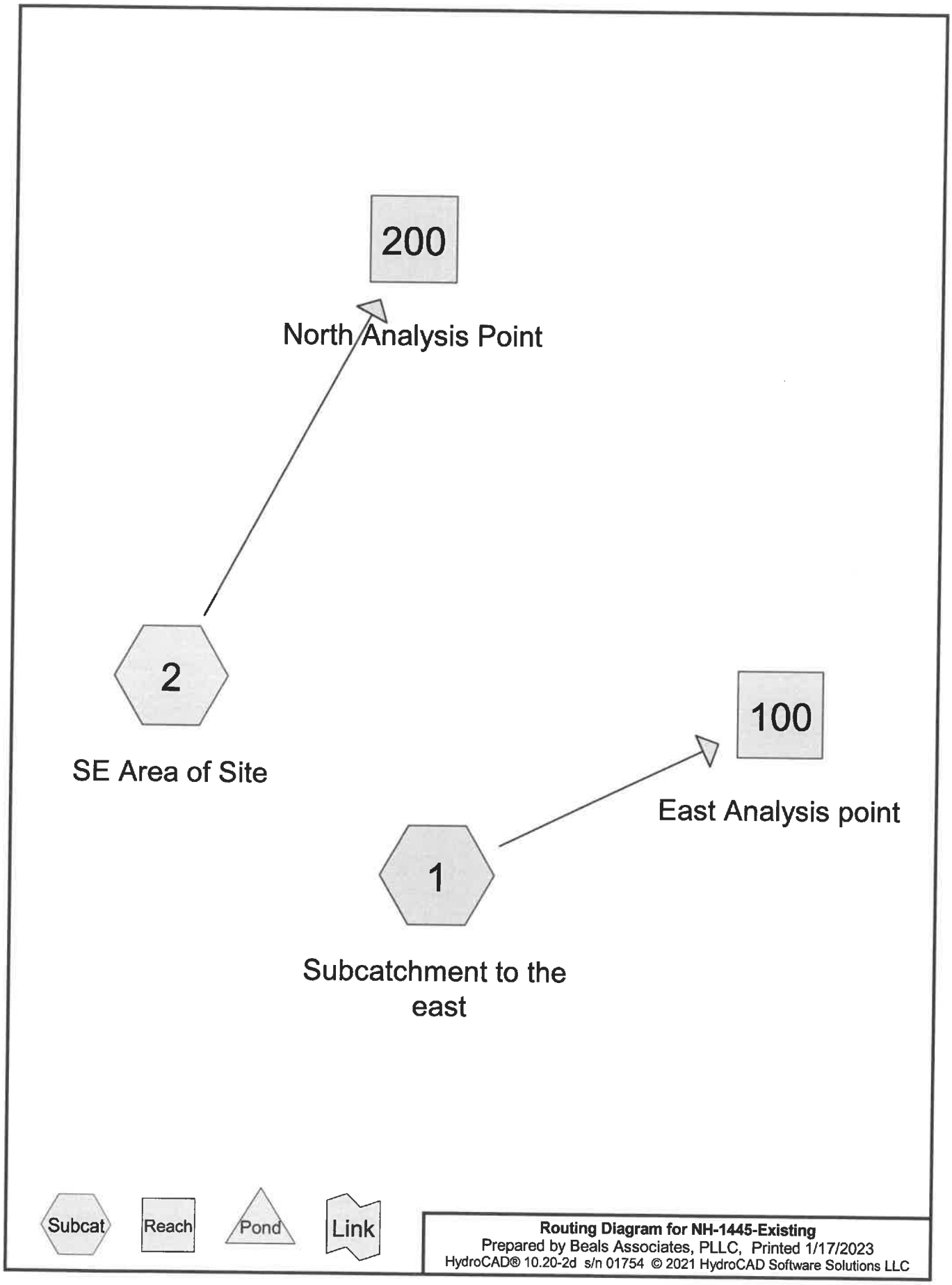
Subcatchment 1: Subcatchment to the east Runoff Area=30,492 sf 2.71% Impervious Runoff Depth=0.57"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.19 cfs 0.033 af

Subcatchment 2: SE Area of Site Runoff Area=58,198 sf 1.42% Impervious Runoff Depth=0.51"
Flow Length=416' Tc=13.7 min CN=41 Runoff=0.28 cfs 0.057 af

Reach 100: East Analysis point Inflow=0.19 cfs 0.033 af
Outflow=0.19 cfs 0.033 af

Reach 200: North Analysis Point Inflow=0.28 cfs 0.057 af
Outflow=0.28 cfs 0.057 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.090 af Average Runoff Depth = 0.53"
98.14% Pervious = 1.998 ac 1.86% Impervious = 0.038 ac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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 the east Runoff Area=30,492 sf 2.71% Impervious Runoff Depth=1.00"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.52 cfs 0.058 af

Subcatchment 2: SE Area of Site Runoff Area=58,198 sf 1.42% Impervious Runoff Depth=0.92"
Flow Length=416' Tc=13.7 min CN=41 Runoff=0.67 cfs 0.102 af

Reach 100: East Analysis point Inflow=0.52 cfs 0.058 af
Outflow=0.52 cfs 0.058 af

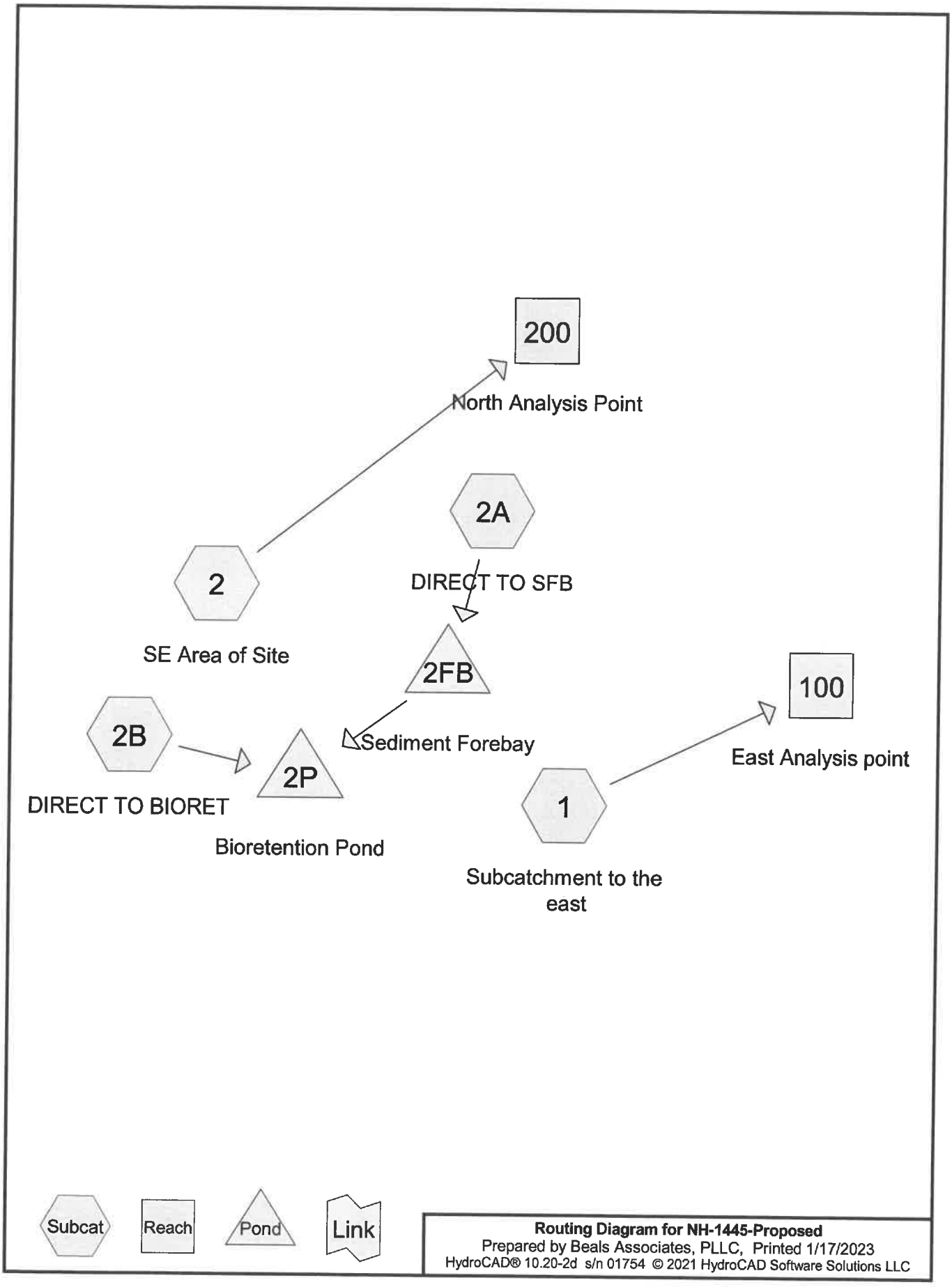
Reach 200: North Analysis Point Inflow=0.67 cfs 0.102 af
Outflow=0.67 cfs 0.102 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.160 af Average Runoff Depth = 0.94"
98.14% Pervious = 1.998 ac 1.86% Impervious = 0.038 ac

APPENDIX II

Proposed Conditions Drainage Analysis

Summary 2 YR - 24 HR rainfall = 3.08"
Complete 10 YR - 24 HR rainfall = 4.64"
Summary 25 YR - 24 HR rainfall = 5.86"
Summary 50 YR - 24 HR rainfall = 7.00"
Sheet W-2 Proposed Conditions Watershed Plan



Routing Diagram for NH-1445-Proposed
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.516	39	>75% Grass cover, Good, HSG A (1, 2, 2A, 2B)
0.184	98	Paved parking, HSG A (1, 2A)
0.038	98	Roofs, HSG A (1, 2)
0.298	30	Woods, Good, HSG A (1, 2)
2.036	**44**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.036	HSG A	1, 2, 2A, 2B
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.036		**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 the east Runoff Area=32,897 sf 5.42% Impervious Runoff Depth=0.01"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment 2: SE Area of Site Runoff Area=42,434 sf 1.94% Impervious Runoff Depth=0.00"
Flow Length=416' Tc=13.7 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment 2A: DIRECT TO SFB Runoff Area=9,931 sf 71.14% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=81 Runoff=0.36 cfs 0.026 af

Subcatchment 2B: DIRECT TO BIORET Runoff Area=3,416 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

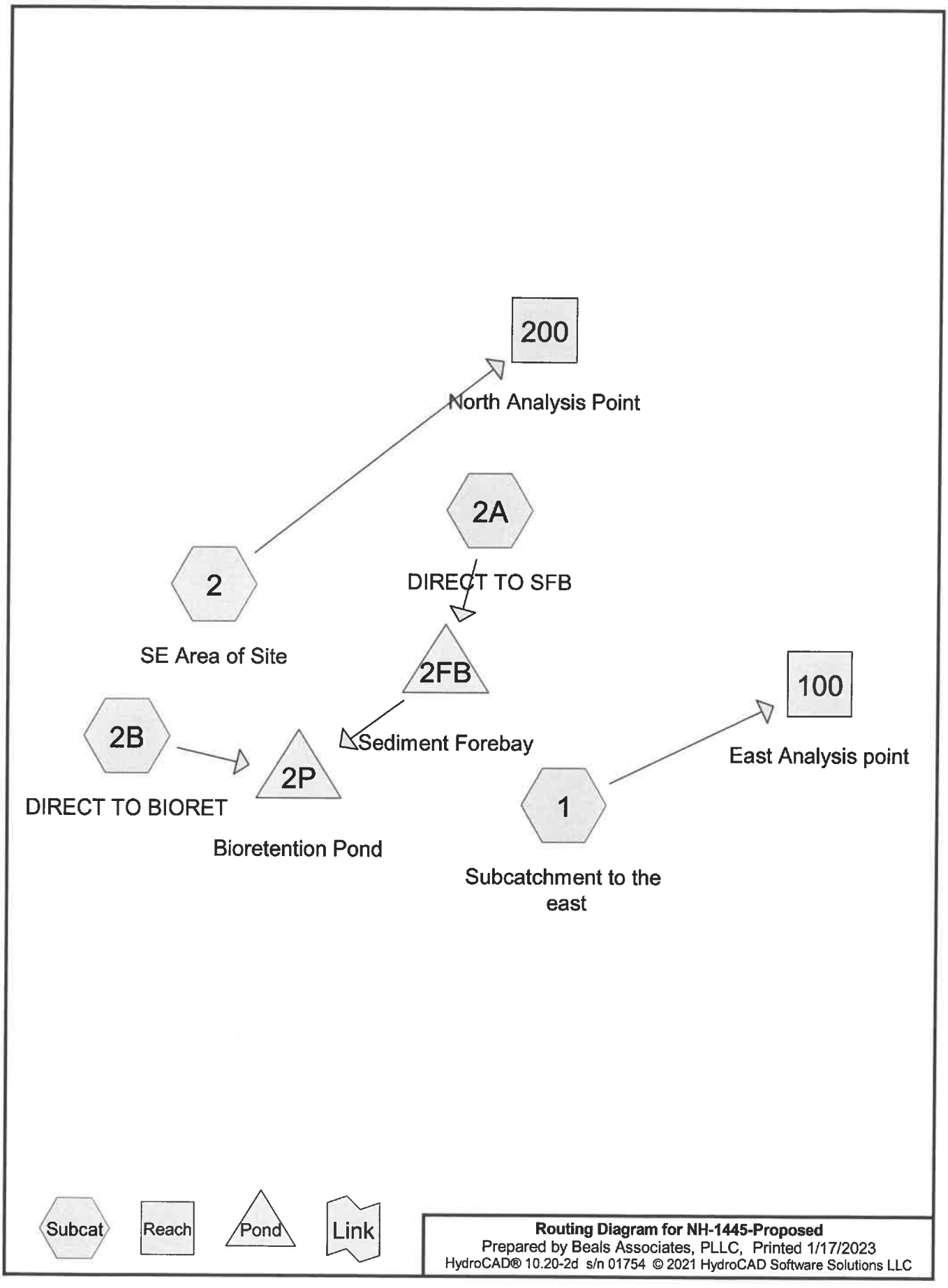
Reach 100: East Analysis point Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 200: North Analysis Point Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 2FB: Sediment Forebay Peak Elev=203.09' Storage=334 cf Inflow=0.36 cfs 0.026 af
Outflow=0.24 cfs 0.019 af

Pond 2P: Bioretention Pond Peak Elev=199.38' Storage=158 cf Inflow=0.24 cfs 0.019 af
Outflow=0.07 cfs 0.019 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.027 af Average Runoff Depth = 0.16"
89.09% Pervious = 1.814 ac 10.91% Impervious = 0.222 ac



Routing Diagram for NH-1445-Proposed
Prepared by Beals Associates, PLLC, Printed 1/17/2023

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 the east Runoff Area=32,897 sf 5.42% Impervious Runoff Depth=0.22"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.04 cfs 0.014 af

Subcatchment 2: SE Area of Site Runoff Area=42,434 sf 1.94% Impervious Runoff Depth=0.11"
Flow Length=416' Tc=13.7 min CN=38 Runoff=0.01 cfs 0.009 af

Subcatchment 2A: DIRECT TO SFB Runoff Area=9,931 sf 71.14% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=81 Runoff=0.71 cfs 0.051 af

Subcatchment 2B: DIRECT TO BIORET Runoff Area=3,416 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Reach 100: East Analysis point Inflow=0.04 cfs 0.014 af
Outflow=0.04 cfs 0.014 af

Reach 200: North Analysis Point Inflow=0.01 cfs 0.009 af
Outflow=0.01 cfs 0.009 af

Pond 2FB: Sediment Forebay Peak Elev=203.17' Storage=384 cf Inflow=0.71 cfs 0.051 af
Outflow=0.68 cfs 0.044 af

Pond 2P: Bioretention Pond Peak Elev=201.14' Storage=771 cf Inflow=0.68 cfs 0.045 af
Outflow=0.07 cfs 0.045 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.074 af Average Runoff Depth = 0.44"
89.09% Pervious = 1.814 ac 10.91% Impervious = 0.222 ac

Summary for Subcatchment 1: Subcatchment to the east

Runoff = 0.04 cfs @ 12.44 hrs, Volume= 0.014 af, Depth= 0.22"
Routed to Reach 100 : East 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
825	98	Roofs, HSG A
959	98	Paved parking, HSG A
28,695	39	>75% Grass cover, Good, HSG A
2,418	30	Woods, Good, HSG A
32,897	42	Weighted Average
31,113		94.58% Pervious Area
1,784		5.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0260	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
0.9	115	0.0208	2.16		**Shallow Concentrated Flow, SC to east PL** Grassed Waterway Kv= 15.0 fps
6.1	165	Total			

Summary for Subcatchment 2: SE Area of Site

Runoff = 0.01 cfs @ 14.90 hrs, Volume= 0.009 af, Depth= 0.11"
Routed to Reach 200 : North 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
825	98	Roofs, HSG A
31,044	39	>75% Grass cover, Good, HSG A
10,565	30	Woods, Good, HSG A
42,434	38	Weighted Average
41,609		98.06% Pervious Area
825		1.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0120	0.12		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
6.6	366	0.0038	0.92		**Shallow Concentrated Flow, Sc to analysis point** Grassed Waterway Kv= 15.0 fps
13.7	416	Total			

Summary for Subcatchment 2A: DIRECT TO SFB

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.051 af, Depth= 2.67"
Routed to Pond 2FB : Sediment Forebay

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
7,065	98	Paved parking, HSG A
2,866	39	>75% Grass cover, Good, HSG A
9,931	81	Weighted Average
2,866		28.86% Pervious Area
7,065		71.14% Impervious Area

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

Summary for Subcatchment 2B: DIRECT TO BIORET

Runoff = 0.00 cfs @ 14.54 hrs, Volume= 0.001 af, Depth= 0.13"
Routed to Pond 2P : 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
3,416	39	>75% Grass cover, Good, HSG A
3,416		100.00% Pervious Area

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

Summary for Reach 100: East Analysis point

Inflow Area = 0.755 ac, 5.42% Impervious, Inflow Depth = 0.22" for 10 YR event
Inflow = 0.04 cfs @ 12.44 hrs, Volume= 0.014 af
Outflow = 0.04 cfs @ 12.44 hrs, Volume= 0.014 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 Reach 200: North Analysis Point

Inflow Area = 0.974 ac, 1.94% Impervious, Inflow Depth = 0.11" for 10 YR event
Inflow = 0.01 cfs @ 14.90 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 14.90 hrs, Volume= 0.009 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 2FB: Sediment Forebay

Inflow Area = 0.228 ac, 71.14% Impervious, Inflow Depth = 2.67" for 10 YR event
Inflow = 0.71 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.68 cfs @ 12.12 hrs, Volume= 0.044 af, Atten= 5%, Lag= 1.6 min
Primary = 0.68 cfs @ 12.12 hrs, Volume= 0.044 af
Routed to Pond 2P : Bioretention Pond

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 203.17' @ 12.12 hrs Surf.Area= 603 sf Storage= 384 cf
Flood Elev= 203.50' Surf.Area= 816 sf Storage= 616 cf

Plug-Flow detention time= 87.8 min calculated for 0.044 af (87% of inflow)
Center-of-Mass det. time= 28.6 min (850.9 - 822.3)

Volume	Invert	Avail.Storage	Storage Description
#1	201.00'	616 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.00	4	0	0
202.00	42	23	23
203.00	491	267	290
203.50	816	327	616

Device	Routing	Invert	Outlet Devices
#1	Primary	203.00'	**4.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.67 cfs @ 12.12 hrs HW=203.17' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.67 cfs @ 0.97 fps)

Summary for Pond 2P: Bioretention Pond

Inflow Area = 0.306 ac, 52.93% Impervious, Inflow Depth = 1.76" for 10 YR event
Inflow = 0.68 cfs @ 12.12 hrs, Volume= 0.045 af
Outflow = 0.07 cfs @ 11.88 hrs, Volume= 0.045 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.88 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 201.14' @ 13.06 hrs Surf.Area= 1,039 sf Storage= 771 cf
Flood Elev= 203.50' Surf.Area= 1,461 sf Storage= 2,914 cf

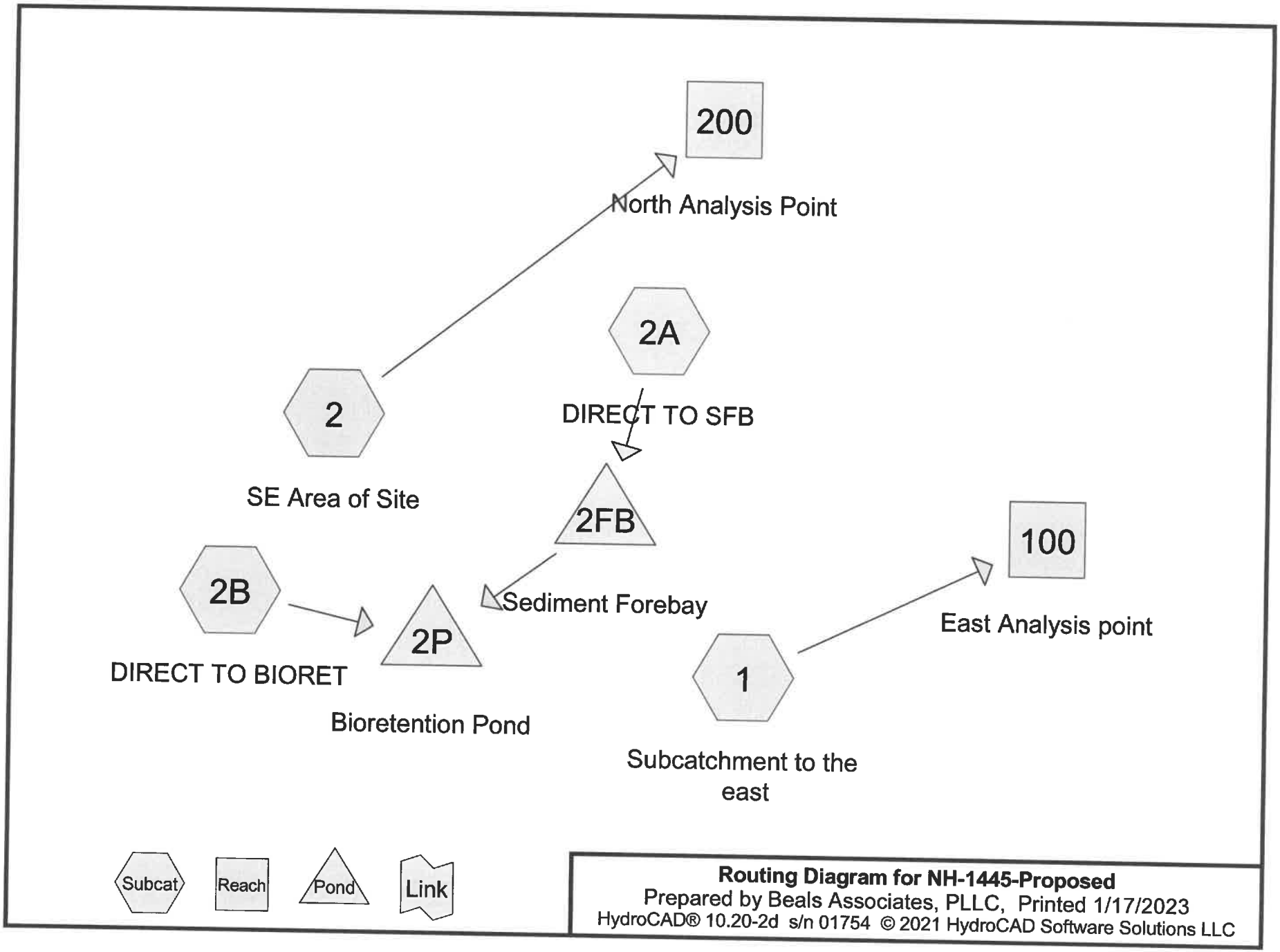
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 97.8 min (952.3 - 854.6)

Volume	Invert	Avail.Storage	Storage Description
#1	199.00'	2,914 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.00	1,039	0.0	0	0
200.00	1,039	40.0	416	416
202.00	1,039	30.0	623	1,039
203.50	1,461	100.0	1,875	2,914

Device	Routing	Invert	Outlet Devices
#1	Discarded	199.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.07 cfs @ 11.88 hrs HW=199.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)



Routing Diagram for NH-1445-Proposed
Prepared by Beals Associates, PLLC, Printed 1/17/2023
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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 the east Runoff Area=32,897 sf 5.42% Impervious Runoff Depth=0.57"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.20 cfs 0.036 af

Subcatchment 2: SE Area of Site Runoff Area=42,434 sf 1.94% Impervious Runoff Depth=0.36"
Flow Length=416' Tc=13.7 min CN=38 Runoff=0.11 cfs 0.029 af

Subcatchment 2A: DIRECT TO SFB Runoff Area=9,931 sf 71.14% Impervious Runoff Depth=3.76"
Tc=6.0 min CN=81 Runoff=1.00 cfs 0.071 af

Subcatchment 2B: DIRECT TO BIORET Runoff Area=3,416 sf 0.00% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.003 af

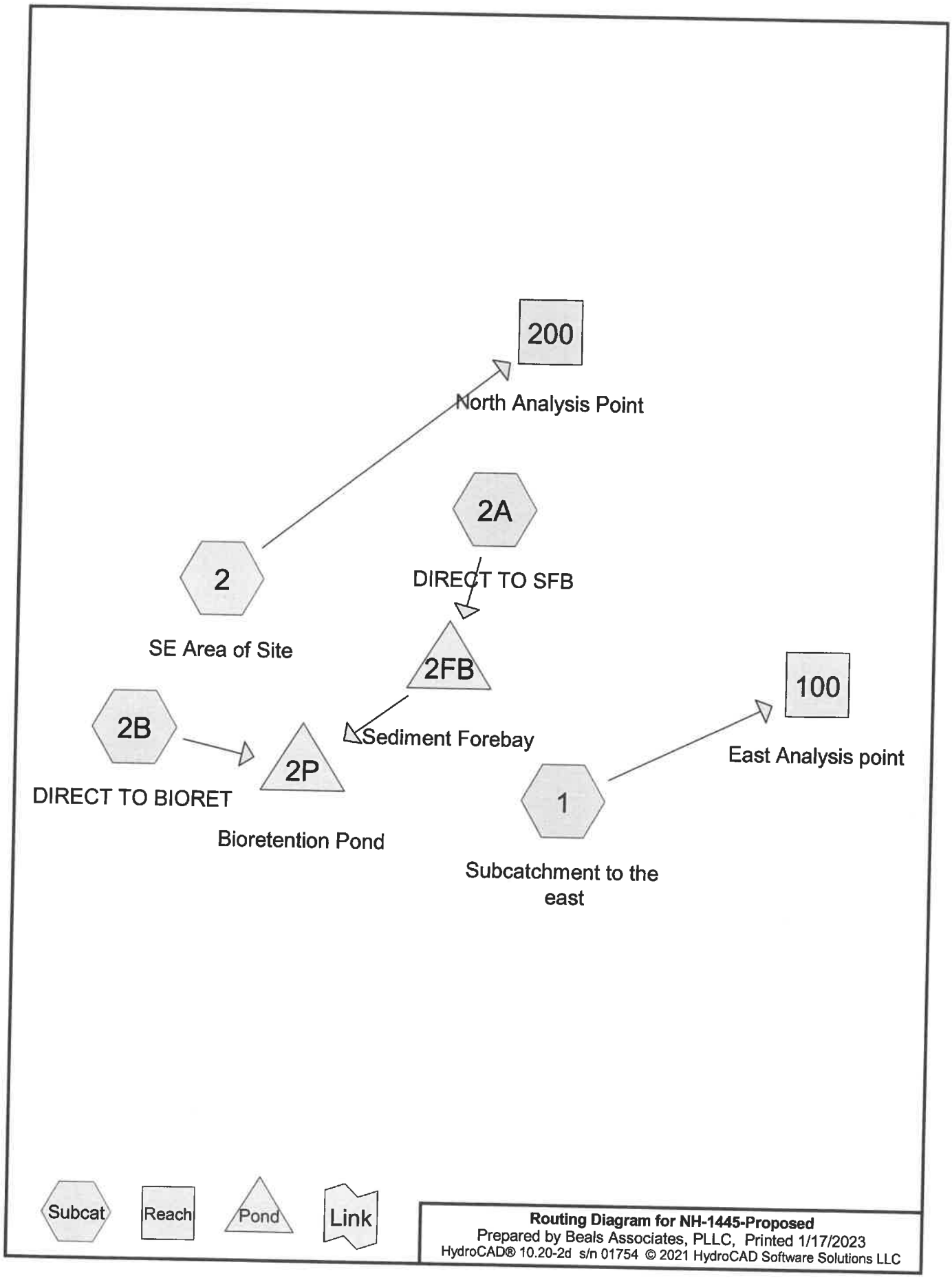
Reach 100: East Analysis point Inflow=0.20 cfs 0.036 af
Outflow=0.20 cfs 0.036 af

Reach 200: North Analysis Point Inflow=0.11 cfs 0.029 af
Outflow=0.11 cfs 0.029 af

Pond 2FB: Sediment Forebay Peak Elev=203.22' Storage=411 cf Inflow=1.00 cfs 0.071 af
Outflow=0.96 cfs 0.065 af

Pond 2P: Bioretention Pond Peak Elev=202.26' Storage=1,322 cf Inflow=0.96 cfs 0.067 af
Outflow=0.08 cfs 0.067 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.139 af Average Runoff Depth = 0.82"
89.09% Pervious = 1.814 ac 10.91% Impervious = 0.222 ac



Routing Diagram for NH-1445-Proposed
Prepared by Beals Associates, PLLC, Printed 1/17/2023
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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 the east Runoff Area=32,897 sf 5.42% Impervious Runoff Depth=1.00"
Flow Length=165' Tc=6.1 min CN=42 Runoff=0.56 cfs 0.063 af

Subcatchment 2: SE Area of Site Runoff Area=42,434 sf 1.94% Impervious Runoff Depth=0.70"
Flow Length=416' Tc=13.7 min CN=38 Runoff=0.31 cfs 0.057 af

Subcatchment 2A: DIRECT TO SFB Runoff Area=9,931 sf 71.14% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=81 Runoff=1.27 cfs 0.091 af

Subcatchment 2B: DIRECT TO BIORET Runoff Area=3,416 sf 0.00% Impervious Runoff Depth=0.77"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.005 af

Reach 100: East Analysis point Inflow=0.56 cfs 0.063 af
Outflow=0.56 cfs 0.063 af

Reach 200: North Analysis Point Inflow=0.31 cfs 0.057 af
Outflow=0.31 cfs 0.057 af

Pond 2FB: Sediment Forebay Peak Elev=203.25' Storage=435 cf Inflow=1.27 cfs 0.091 af
Outflow=1.22 cfs 0.085 af

Pond 2P: Bioretention Pond Peak Elev=202.72' Storage=1,856 cf Inflow=1.25 cfs 0.090 af
Outflow=0.09 cfs 0.090 af

Total Runoff Area = 2.036 ac Runoff Volume = 0.215 af Average Runoff Depth = 1.27"
89.09% Pervious = 1.814 ac 10.91% Impervious = 0.222 ac

APPENDIX III

Charts, Graphs, and Calculations

GOVE ENVIRONMENTAL SERVICES, INC.

September 8, 2022

Christian O. Smith, P.E.
Beals Associates, PLLC.
70 Portsmouth, Ave. 3rd Floor
Stratham, NH 03885

Subject: Wetland Delineation
565 Franklin Pierce Highway
Barrington, NH

Dear Mr. Smith:

This letter documents the wetland investigation performed at 565 Franklin Pierce Highway (Map238 Lot 8) in Barrington, NH. The investigation was performed on September 1, 2022, utilizing the following standards to identify wetlands:

1. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, (Version 2.0) January 2012, U.S. Army Corps of Engineers.*
2. *Field Indicators of Hydric Soils in the United States, A Guide for Identifying and Delineating Hydric Soils, Version 8.2. United States Department of Agriculture (2018).*
3. *New England Hydric Soils Technical Committee. 2020 Version 4, Field Indicators for*
4. *Identifying Hydric Soils in New England. New England Interstate Water Pollution Control Commission, Lowell, MA.*
5. *U.S. Army Corps of Engineers National Wetland Plant List, version 3.5. (2020)*

The small 2.1-acre lot was found to be largely cleared with evidence that the former house on the property had been recently demolished. Despite this disturbance, the absence of wetland indicators remained clear and no wetlands were identified on the property. If you have any questions about this report or if I can be of further assistance, please feel free to contact me at (603) 778-0644.

Sincerely,

STATE OF NEW HAMPSHIRE
BRENDAN
J.
QUIGLEY
No. 249
CERTIFIED WETLAND SCIENTIST

9-8-22

Brendan Quigley, NHCWS
Gove Environmental Services, Inc.

8 Continental Dr Unit H, Exeter, NH 03833-7507
Ph (603) 778 0644 / *Fax* (603) 778 0654
www.gesinc.biz
info@gesinc.biz

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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

0.18	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"
	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"
0.40	inches	Rd = Weighted groundwater recharge depth	
0.0736	ac-in	GRV = AI * Rd	
267	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):

Over 827 cu ft of stormwater is infitrated under a single 2-YR storm event.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Biroet Pond /2P**

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).	
0.31	ac	A = Area draining to the practice	
0.16	ac	A_I = Impervious area draining to the practice	
0.53	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.52	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.16	ac-in	WQV= 1" x Rv x A	
582	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
145	cf	25% x WQV (check calc for sediment forebay volume)	
436	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
326	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
1,039	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
200.00	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
197.23	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
197.23	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
200.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
2.77	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
2.77	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
202.72	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
203.50	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
2,914	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ WQV
24.0	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet	3	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	≥ 3:1
Sheet	3	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 2FB: Sediment Forebay

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
201.00	4	0
201.05	6	0
201.10	8	1
201.15	10	1
201.20	12	2
201.25	14	2
201.30	15	3
201.35	17	4
201.40	19	5
201.45	21	6
201.50	23	7
201.55	25	8
201.60	27	9
201.65	29	11
201.70	31	12
201.75	33	14
201.80	34	15
201.85	36	17
201.90	38	19
201.95	40	21
202.00	42	23
202.05	64	26
202.10	87	29
202.15	109	34
202.20	132	40
202.25	154	48
202.30	177	56
202.35	199	65
202.40	222	76
202.45	244	87
202.50	267	100
202.55	289	114
202.60	311	129
202.65	334	145
202.70	356	162
202.75	379	181
202.80	401	200
202.85	424	221
202.90	446	243
202.95	469	266
203.00	491	290
203.05	524	315
203.10	556	342
203.15	589	370
203.20	621	401
203.25	654	433
203.30	686	466
203.35	718	501
203.40	751	538
203.45	783	576
203.50	**816**	**616**

Stage-Area-Storage for Pond 2P: Bioretention Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
199.00	1,039	0
199.05	1,039	21
199.10	1,039	42
199.15	1,039	62
199.20	1,039	83
199.25	1,039	104
199.30	1,039	125
199.35	1,039	145
199.40	1,039	166
199.45	1,039	187
199.50	1,039	208
199.55	1,039	229
199.60	1,039	249
199.65	1,039	270
199.70	1,039	291
199.75	1,039	312
199.80	1,039	332
199.85	1,039	353
199.90	1,039	374
199.95	1,039	395
200.00	1,039	416
200.05	1,039	431
200.10	1,039	447
200.15	1,039	462
200.20	1,039	478
200.25	1,039	494
200.30	1,039	509
200.35	1,039	525
200.40	1,039	540
200.45	1,039	556
200.50	1,039	571
200.55	1,039	587
200.60	1,039	603
200.65	1,039	618
200.70	1,039	634
200.75	1,039	649
200.80	1,039	665
200.85	1,039	681
200.90	1,039	696
200.95	1,039	712
201.00	1,039	727
201.05	1,039	743
201.10	1,039	758
201.15	1,039	774
201.20	1,039	790
201.25	1,039	805
201.30	1,039	821
201.35	1,039	836
201.40	1,039	852
201.45	1,039	868
201.50	1,039	883
201.55	1,039	899
201.60	1,039	914
201.65	1,039	930
201.70	1,039	945
201.75	1,039	961
201.80	1,039	977
201.85	1,039	992
201.90	1,039	1,008
201.95	1,039	1,023
202.00	1,039	1,039
202.05	1,053	1,091
202.10	1,067	1,144
202.15	1,081	1,198
202.20	1,095	1,252
202.25	1,109	1,308
202.30	1,123	1,363
202.35	1,137	1,420
202.40	1,152	1,477
202.45	1,166	1,535
202.50	1,180	1,594
202.55	1,194	1,653
202.60	1,208	1,713
202.65	1,222	1,774
202.70	1,236	1,835
202.75	1,250	1,897
202.80	1,264	1,960
202.85	1,278	2,024
202.90	1,292	2,088
202.95	1,306	2,153
203.00	1,320	2,219
203.05	1,334	2,285
203.10	1,348	2,352
203.15	1,363	2,420
203.20	1,377	2,488
203.25	1,391	2,558
203.30	1,405	2,627
203.35	1,419	2,698
203.40	1,433	2,769
203.45	1,447	2,841
203.50	**1,461**	**2,914**

NH-1445 – 565 Franklin Pierce Hwy Barrington, NH
Test Pits – Brian Holdsworth of Beals Associates, PLLC- #1681

9/15/2022
Witness:

Test Pit #1

0" – 8"	10 YR 3/3	Dark Brown, Fine Sandy Loam, Granular/Friable
8" - 14"	10 YR 4/6	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
14" – 28"	10 YR 5/6	Yellowish Brown, Medium Sand Massive/Friable
28" - 74"	2.5Y 5/4	Yellowish Brown, Fine Sand Single Grain/Loose

ESHWT = none
Roots to Few (lawn) Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches

NEW HAMPSHIRE
Designer
of
Subsurface Disposal
Systems
* * *
Brian E. Holdsworth
No. 1681
Department of Environmental Services

Test Pit #2

0" – 8"	10 YR 3/3	Dark Brown, Fine Sandy Loam, Granular/Friable
8" - 26"	10 YR 4/6	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
26" – 40"	10 YR 5/6	Yellowish Brown, Fine Loamy Sand Massive/Loose
40" - 72"	2.5Y 5/4	Yellowish Brown, Coarse Sand Single Grain/Loose

ESHWT = none
Roots to Few Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches

NH-1445 – 565 Franklin Pierce Hwy Barrington, NH
Test Pits – Brian Holdsworth of Beals Associates, PLLC- #1681

9/15/2022
Witness:

Test Pit #3

0" – 10"	10 YR 3/3	Dark Brown, Fine Sandy Loam, Granular/Friable
10" - 16"	10 YR 4/6	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
16" – 28"	10 YR 4/6	Dark Yellowish Brown, Coarse Gravelly Sand Massive/Loose
28" - 72"	2.5Y 6/3	Light Yellowish Brown, Fine Sand Single Grain/Loose

ESHWT = none
Roots to Few (lawn) Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches

NEW HAMPSHIRE
Designer
of
Subsurface Disposal
Systems
★ ★ ★
Brian E. Holdsworth
No. 1681
Department of Environmental Services

Test Pit #4

0" – 12"	10 YR 3/4	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
12" - 26"	10 YR 4/4	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
26" – 40"	10 YR 6/4	Light Yellowish Brown, Medium Coarse Sand Single Grain/Loose
40" - 72"	2.5Y 5/3	Light Olive Brown, Fine Sand Single Grain/Loose

ESHWT = none
Roots to 14 Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches

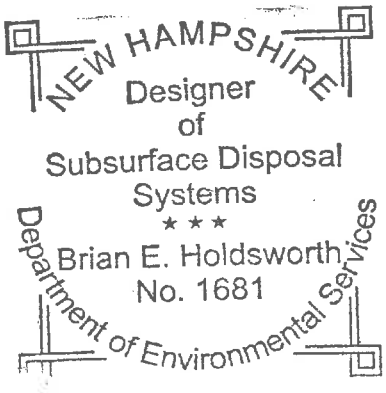
NH-1445 – 565 Franklin Pierce Hwy Barrington, NH
Test Pits – Brian Holdsworth of Beals Associates, PLLC- #1681

9/15/2022
Witness:

Test Pit #5

0" – 8"	10 YR 3/3	Dark Brown, Fine Sandy Loam, Granular/Friable
8" - 24"	10 YR 4/6	Dark Yellowish Brown, Fine Sandy Loam, Granular/Friable
24" – 30"	10 YR 6/4	Dark Brown, Medium Sand Massive/Loose
30" - 76"	2.5Y 6/3	Light Yellowish Brown, Fine Sand Single Grain/Loose

ESHWT = none
Roots to 48 Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches



Test Pit #6

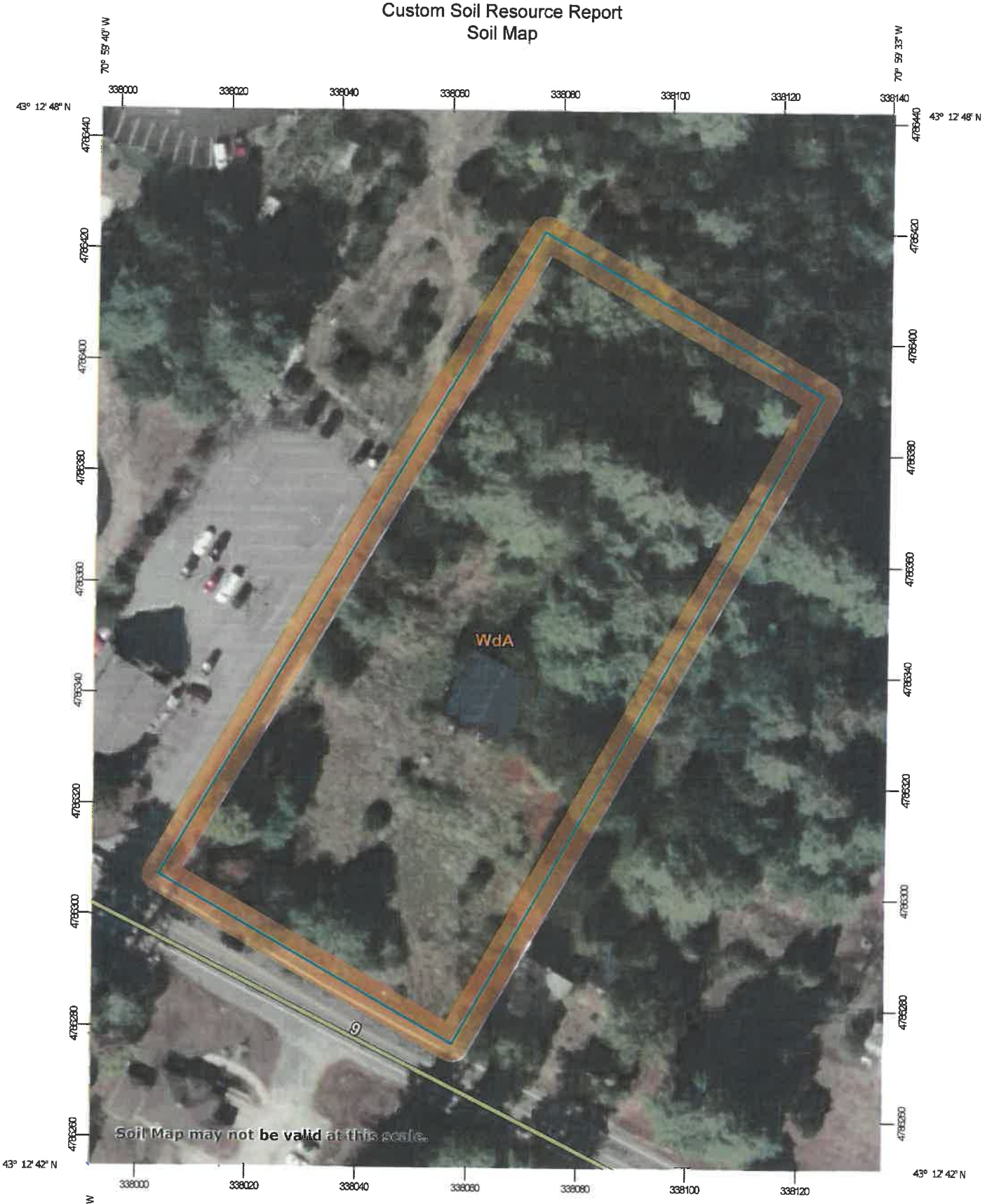
0" – 10"	10 YR 3/3	Dark Brown, Fine Sandy Loam, Granular/Friable
10" - 26"	10 YR 5/6	Yellowish Brown, Fine, Loamy, Sand Granular/Friable
26" – 36"	10 YR 6/4	Light Yellowish Brown, Medium Sand Massive/Friable
36" - 72"	2.5Y 6/3	Light Yellowish Brown, Fine Sand Single Grain/Loose

ESHWT = none
Roots to 36 Inches
Observed Ground Water – none inches
Refusal: none
Restrictive Layer: none Inches

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
Suffield	536	0.6	2.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	silty over clayey	no	deep to clay C
Sunapee	168	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	
Sunapee var	269	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	frigid dystrudept
Suncook	2	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Suncook	402	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	frequent flooding
Sunday	102	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	occasionally flooded
Sunday	202	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	frequently flooded
Surplus	669	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	mwd, sandy loam in Cd
Sutton	68	0.6	6.0	0.60	6.0	B	3	Loose till, loamy textures	mesic	loamy	no	
Swanton	438	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	frigid	co. loamy over clayey	no	
Telos	123	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Thorndike	84	0.6	2.0	0.60	2.0	C/D	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Timakwa	393			6.00	100.0	D	6	Organic Materials - Freshwater	mesic	sandy or sandy-skeletal	no	organic over sand
Tunbridge	99	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Unadilla	30	0.6	2.0	2.00	20.0	B	2	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Vassalboro	150					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Walpole	546	2.0	6.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Wareham	34	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Warwick	210	2.0	6.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	loamy-skeletal	no	loamy over slate gravel
Waskish	195					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Waumbeck	58	2.0	20.0	6.00	20.0	B	3	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Westbrook	597			0.00	2.0	D	6	Tidal Flat	mesic	loamy	no	organic over loam
Whitman	49	0.0	0.2	0.00	0.2	D	6	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Windsor	26	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	sandy	no	
Winnecook	88	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Winooski	9	0.6	6.0	0.60	6.0	B		Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Winooski	103	0.6	6.0	0.60	6.0	B	3	Flood Plain (Bottom Land)	mesic	silty	no	very fine sandy loam
Wonsqueak	995			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Woodbridge	29	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Woodstock	93	2.0	6.0	2.00	6.0	C/D	4	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep

no longer recognized organic materials

Custom Soil Resource Report
Soil Map



Map Scale: 1:928 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WdA	Windsor loamy sand, 0 to 3 percent slopes	2.0	100.0%
Totals for Area of Interest		**2.0**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Strafford County, New Hampshire

WdA—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

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

Map Unit Composition

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

Description of Windsor, Loamy Sand

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

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

Minor Components

Deerfield, loamy sand

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

Hinckley, loamy sand

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

Route 9 Barrington

Legend

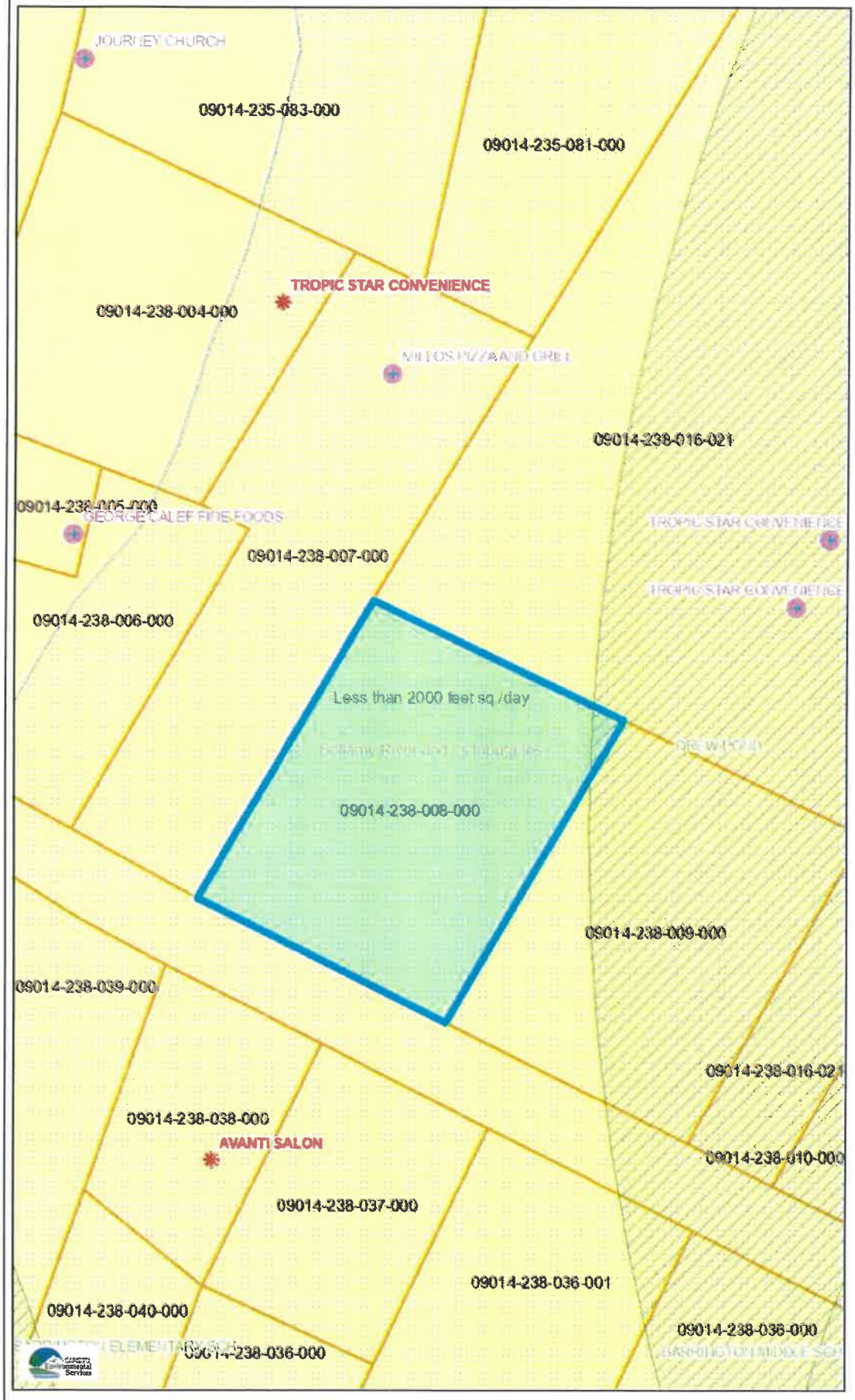
Surface Waters with Impairm
2022 with Quarter Mile Buffe
Parcels
Parcel Polygons
Attributes for Additional Lines

Map Scale
1: 1,624

Map Generated: 1/13/2023

Notes

Route 9 Barrington



Legend

- Surface Waters with Impairm 2022 with Quarter Mile Buffe
- Remediation Sites
- 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
- Class A Lakes with a Quarte Buffer
- Class A - All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Watersheds with Chloride Impairments

Parcels

- Parcel Polygons
- Attributes for Additional Lines

Aquifer Transmissivity

- Less than 2000 feet sq./day
- 2000 - 4000 feet sq./day
- Greater than 4000 feet sq./day

Map Scale

1: 1,624

Map Generated: 1/13/2023

Notes