# STORMWATER MANAGEMENT NARRATIVE

for

**CC Railroad Street Newmarket, LLC**

**Site Plan**

## Project Description

This proposed project site is located at the intersection of N.H. Route 152 and Railroad Street. The property address is 3 Railroad Street. The site contains an existing building with adjacent gravel parking and partially paved driveway. The driveway and some of the parking is on the adjacent parcel Tax Map U4 Lot 16, which has an easement for access. Both parcels are currently owned by the applicant.

## Existing Site Conditions

In the construction area, slopes range from 1% to more than 5%, with most slopes in the construction area around less than 3%. The subject parcel, a combination of three lots is bound to the west by Railroad Street, to the north by South Main Street and to the east by the railroad tracks.

The soil types in the proposed disturbance area (per NRCS Web Soil Survey) are a Chatfield silt loam, designated with hydrologic ratings of soil Group B. These soils have a medium infiltration rate, with a Ksat value of 0.6 to 6.0 inches/hour. The site is mostly grass and woods, with the exception of the existing buildings and adjacent gravel access and parking areas.

Subsequent testing of the soil has revealed an infiltration rate from 3.5 to 7.5 inches per hour. Test pit data is attached to this report in the appendix.

Currently the subject parcel contains roughly 18,400 square feet of impervious cover between roofs, gravel surface and pavement.

Since the development includes a portion of the adjacent parcel, the site area is modeled using two subcatchments for the existing drainage analysis:

## Proposed Site Conditions

In the proposed conditions, the size and shape of the subcatchment areas are altered due to the placement of new site features. Four subcatchment areas have been identified in the post development condition to allow for sizing of stormwater features. The two study points remain the same.

An underground infiltration system consists of a stone reservoir embedded with perforated pipe. This system collects the majority of the new driveway and parking area

and half of the new roof, equaling just more than 24,000 square feet of impervious surfaces. The underground system provides a level of detention along with treatment for the area that is collected, infiltrating a majority of the stormwater that is directed there.

Overall, the increase in impervious cover on the site from pre-development to post-Development is 12,850 square feet. The treatment system proposed provides treatment and detention for nearly double this increase.

## Study Methodology

Runoff and routing calculations have been performed for the watershed areas affected by the proposed development. Times of concentration and runoff curve number calculations have been determined using the method described in the Natural Resource Conservation Service (NRCS) Technical Release 55, (TR-55). Time of concentration calculations have been amended where the values given by the TR-55 method is less than five minutes. In these cases a standard minimum value of five minutes has been used to keep this parameter within the acceptable working range of the model. Each Tc path and corresponding length and slope is identified in the pre and post development drainage area plan. The TR-20 based HydroCAD (version 10.0) modeling software has been utilized to perform the complex runoff and routing calculations.

## Calculation Results

### Preface

Existing-development and post-development calculations have been calculated for the 2-, 10-, 25-, and 50-year storm frequency in accordance with Town of Newmarket's Development Regulations. The SCS TR-20 method was used with a Type III 24-hour storm. The Time of Concentration (Tc) is calculated using the Lag Method. Two Study Points (**SP-1 AND SP-2**) were used for comparison of post-development runoff values with those from existing conditions.

### Results

***Peak Rate (cfs)***

| | ***2 Yr.*** | ***10 Yr.*** | ***25 Yr.*** | ***50 Yr.*** | ***100 Yr.*** |
|---|---|---|---|---|---|
| ***SP-1*** | | | | | |
| Existing | 0.8 | 1.8 | 2.6 | 3.4 | 4.4 |
| Proposed | 0.5 | 1.0 | 1.5 | 2.0 | 4.0 |
| ***SP-2*** | | | | | |
| Existing | 0.5 | 1.2 | 1.9 | 2.6 | 3.5 |
| Proposed | 0.4 | 1.1 | 1.7 | 2.2 | 3.0 |

***Volume (cf)***

| | ***2 Yr.*** | ***10 Yr.*** | ***25 Yr.*** | ***50 Yr.*** | ***100 Yr.*** |
|---|---|---|---|---|---|
| ***SP-1*** | | | | | |
| Existing | 3,200 | 6,900 | 10,000 | 13,200 | 17,100 |
| Proposed | 1,600 | 3500 | 5,200 | 7,900 | 11,400 |
| | | | | | |
| ***SP-2*** | | | | | |
| Existing | 2,600 | 6,100 | 9,400 | 12,700 | 16,900 |
| Proposed | 2,300 | 5,400 | 8,100 | 10,900 | 14,500 |

**Summary**

There is a reduction in peak flow and volume of stormwater runoff at both analysis points for all the design storm events. This is due to the underground infiltration system.

Per Appendix B of the New Hampshire Stormwater Manual infiltration BMP's remove 90% TSS, 60% total nitrogen and 60% total phosphorous.

This will help reduce the runoff generated from the site, increase the groundwater recharge, and further protect the water quality of the downstream areas.

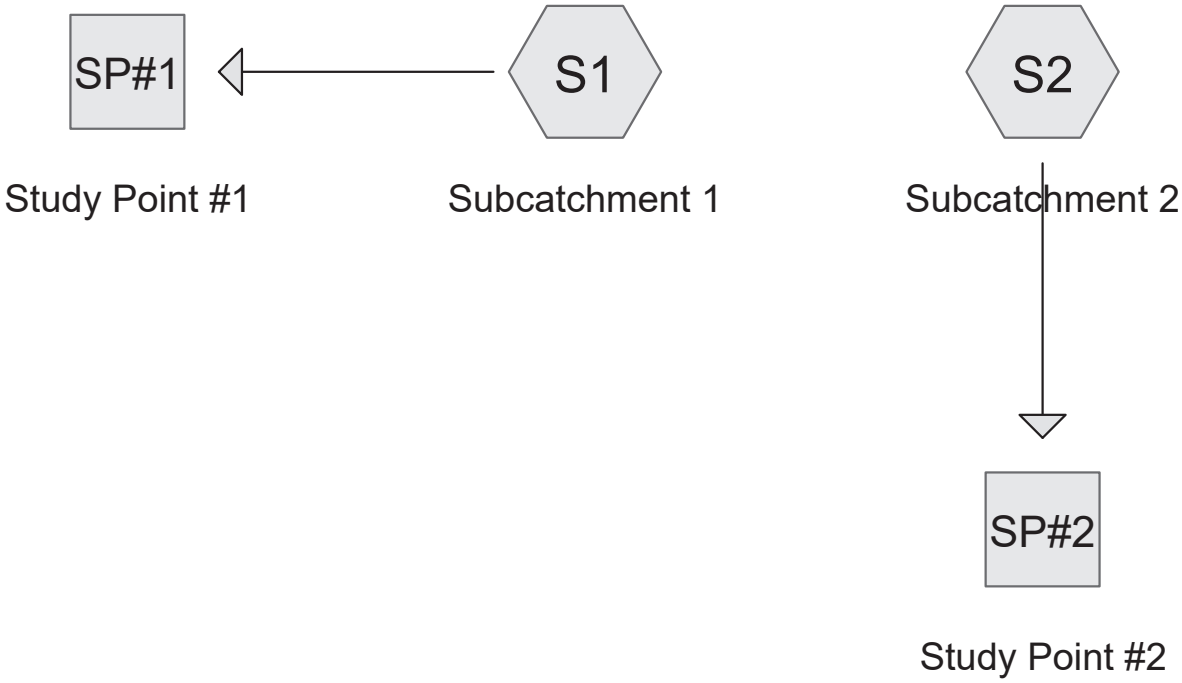
In addition to collecting and treating nearly double the amount of impervious cover than the increase on site all of the disturbed areas will be loamed and seeded along with new landscaping which will help retain stormwater on the non-impervious areas of the site.

# PRE-DEVELOPMENT MODEL OUTPUT

for

**CC Railroad Street Newmarket, LLC**

**Site Plan**




Subcat Reach Pond Link

**Routing Diagram for 02 230750_PRE_01**
Prepared by Horizons Engineering, Printed 10/20/2023
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## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 29,539 | 61 | >75% Grass cover, Good, HSG B (S1, S2) |
| 5,852 | 96 | Gravel surface, HSG B (S1) |
| 14,870 | 98 | Paved parking, HSG B (S1, S2) |
| 6,563 | 98 | Roofs, HSG B (S1, S2) |
| 20,980 | 55 | Woods, Good, HSG B (S1, S2) |
| **77,804** | **72** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0 | HSG A | |
| 77,804 | HSG B | S1, S2 |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **77,804** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Su Nu |
|---|---|---|---|---|---|---|---|
| 0 | 29,539 | 0 | 0 | 0 | 29,539 | >75% Grass cover, Good | |
| 0 | 5,852 | 0 | 0 | 0 | 5,852 | Gravel surface | |
| 0 | 14,870 | 0 | 0 | 0 | 14,870 | Paved parking | |
| 0 | 6,563 | 0 | 0 | 0 | 6,563 | Roofs | |
| 0 | 20,980 | 0 | 0 | 0 | 20,980 | Woods, Good | |
| **0** | **77,804** | **0** | **0** | **0** | **77,804** | **TOTAL AREA** | |

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentS1: Subcatchment1** Runoff Area=36,517 sf 28.52% Impervious Runoff Depth=5.62"
Flow Length=408' Tc=12.5 min CN=75 Runoff=4.42 cfs 17,110 cf

**SubcatchmentS2: Subcatchment2** Runoff Area=41,287 sf 26.69% Impervious Runoff Depth=4.90"
Flow Length=497' Slope=0.0100 '/' Tc=23.0 min CN=69 Runoff=3.46 cfs 16,854 cf

**Reach SP#1: Study Point #1** Inflow=4.42 cfs 17,110 cf
Outflow=4.42 cfs 17,110 cf

**Reach SP#2: Study Point #2** Inflow=3.46 cfs 16,854 cf
Outflow=3.46 cfs 16,854 cf

**Total Runoff Area = 77,804 sf Runoff Volume = 33,964 cf Average Runoff Depth = 5.24"**
**72.45% Pervious = 56,371 sf 27.55% Impervious = 21,433 sf**

## Summary for Subcatchment S1: Subcatchment 1

Runoff = 4.42 cfs @ 12.17 hrs, Volume= 17,110 cf, Depth= 5.62"
Routed to Reach SP#1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.64"

| Area (sf) | CN | Description |
|---|---|---|
| 5,903 | 98 | Paved parking, HSG B |
| 4,512 | 98 | Roofs, HSG B |
| 8,824 | 61 | >75% Grass cover, Good, HSG B |
| 11,426 | 55 | Woods, Good, HSG B |
| 5,852 | 96 | Gravel surface, HSG B |
| 36,517 | 75 | Weighted Average |
| 26,102 | | 71.48% Pervious Area |
| 10,415 | | 28.52% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.7 | 100 | 0.0300 | 0.19 | | **Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 2.93" |
| 1.6 | 194 | 0.0100 | 2.03 | | **Shallow Concentrated Flow, Segment 2** Paved Kv= 20.3 fps |
| 1.3 | 53 | 0.0100 | 0.70 | | **Shallow Concentrated Flow, Segment 3** Short Grass Pasture Kv= 7.0 fps |
| 0.9 | 61 | 0.0500 | 1.12 | | **Shallow Concentrated Flow, Segment 5** Woodland Kv= 5.0 fps |
| 12.5 | 408 | Total | | | |

## Summary for Subcatchment S2: Subcatchment 2

Runoff = 3.46 cfs @ 12.32 hrs, Volume= 16,854 cf, Depth= 4.90"
Routed to Reach SP#2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.64"

| Area (sf) | CN | Description |
|---|---|---|
| 8,967 | 98 | Paved parking, HSG B |
| 2,051 | 98 | Roofs, HSG B |
| 20,715 | 61 | >75% Grass cover, Good, HSG B |
| 9,554 | 55 | Woods, Good, HSG B |
| 41,287 | 69 | Weighted Average |
| 30,269 | | 73.31% Pervious Area |
| 11,018 | | 26.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 13.5 | 100 | 0.0100 | 0.12 | | **Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 2.93" |
| 9.5 | 397 | 0.0100 | 0.70 | | **Shallow Concentrated Flow, Segment 2** Short Grass Pasture Kv= 7.0 fps |
| 23.0 | 497 | Total | | | |

## Summary for Reach SP#1: Study Point #1

Inflow Area = 36,517 sf, 28.52% Impervious, Inflow Depth = 5.62" for 100 Year event
Inflow = 4.42 cfs @ 12.17 hrs, Volume= 17,110 cf
Outflow = 4.42 cfs @ 12.17 hrs, Volume= 17,110 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Reach SP#2: Study Point #2

Inflow Area = 41,287 sf, 26.69% Impervious, Inflow Depth = 4.90" for 100 Year event
Inflow = 3.46 cfs @ 12.32 hrs, Volume= 16,854 cf
Outflow = 3.46 cfs @ 12.32 hrs, Volume= 16,854 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 300R

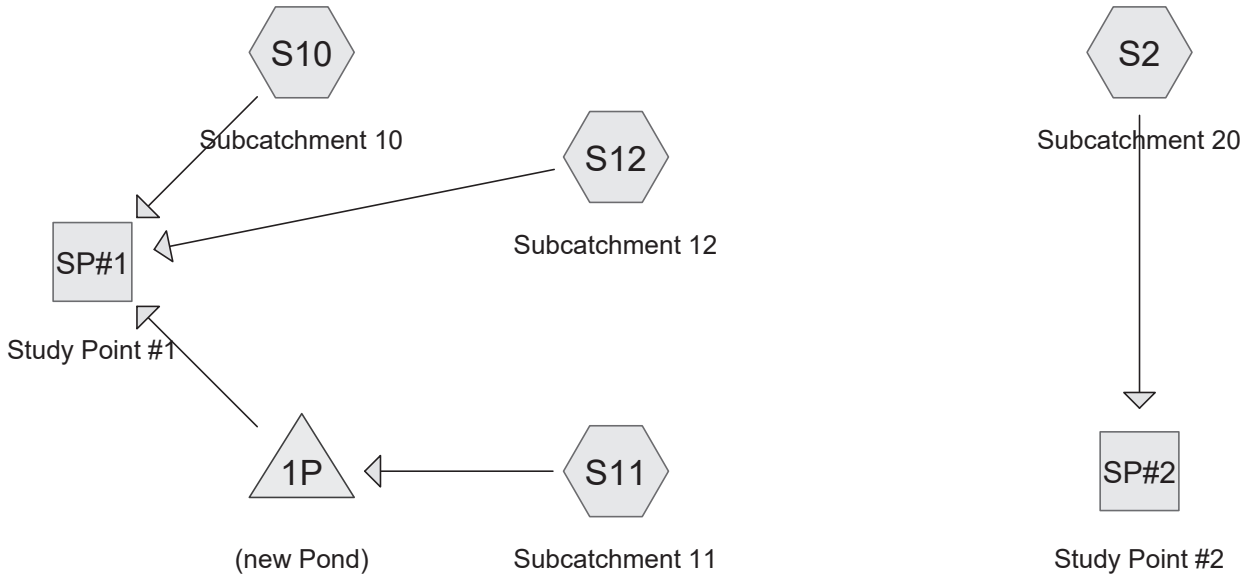
Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

# POST-DEVELOPMENT MODEL OUTPUT

for

**CC Railroad Street Newmarket, LLC**

**Site Plan**




Subcat Reach Pond Link

**Routing Diagram for 03 230750_POST_01**
Prepared by Horizons Engineering, Printed 10/20/2023
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## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 33,872 | 61 | >75% Grass cover, Good, HSG B (S10, S12, S2) |
| 28,839 | 98 | Paved parking, HSG B (S10, S11, S12, S2) |
| 10,947 | 98 | Roofs, HSG B (S11, S2) |
| 4,174 | 55 | Woods, Good, HSG B (S10, S2) |
| **77,832** | **80** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0 | HSG A | |
| 77,832 | HSG B | S10, S11, S12, S2 |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **77,832** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Su Nu |
|---|---|---|---|---|---|---|---|
| 0 | 33,872 | 0 | 0 | 0 | 33,872 | >75% Grass cover, Good | |
| 0 | 28,839 | 0 | 0 | 0 | 28,839 | Paved parking | |
| 0 | 10,947 | 0 | 0 | 0 | 10,947 | Roofs | |
| 0 | 4,174 | 0 | 0 | 0 | 4,174 | Woods, Good | |
| **0** | **77,832** | **0** | **0** | **0** | **77,832** | **TOTAL AREA** | |

## Pipe Listing (all nodes)

| Line# | Node Number | In-Invert (feet) | Out-Invert (feet) | Length (feet) | Slope (ft/ft) | n | Width (inches) | Diam/Height (inches) | Inside-Fill (inches) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1P | 35.70 | 33.00 | 50.0 | 0.0540 | 0.012 | 0.0 | 12.0 | 0.0 |

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentS10: Subcatchment10** Runoff Area=11,920 sf 32.01% Impervious Runoff Depth=0.89"
Flow Length=100' Slope=0.0300 '/' Tc=8.7 min CN=72 Runoff=0.23 cfs 887 cf

**SubcatchmentS11: Subcatchment11** Runoff Area=24,036 sf 100.00% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=98 Runoff=1.64 cfs 5,824 cf

**SubcatchmentS12: Subcatchment12** Runoff Area=7,332 sf 44.33% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=77 Runoff=0.22 cfs 714 cf

**SubcatchmentS2: Subcatchment20** Runoff Area=34,544 sf 25.14% Impervious Runoff Depth=0.79"
Flow Length=497' Slope=0.0100 '/' Tc=23.0 min CN=70 Runoff=0.41 cfs 2,284 cf

**Reach SP#1: Study Point #1** Inflow=0.45 cfs 1,601 cf
Outflow=0.45 cfs 1,601 cf

**Reach SP#2: Study Point #2** Inflow=0.41 cfs 2,284 cf
Outflow=0.41 cfs 2,284 cf

**Pond 1P: (new Pond)** Peak Elev=34.28' Storage=1,404 cf Inflow=1.64 cfs 5,824 cf
Discarded=0.32 cfs 5,824 cf Primary=0.00 cfs 0 cf Outflow=0.32 cfs 5,824 cf

**Total Runoff Area = 77,832 sf Runoff Volume = 9,709 cf Average Runoff Depth = 1.50"**
**48.88% Pervious = 38,046 sf 51.12% Impervious = 39,786 sf**

## Summary for Subcatchment S10: Subcatchment 10

Runoff = 0.23 cfs @ 12.14 hrs, Volume= 887 cf, Depth= 0.89"
Routed to Reach SP#1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 3,815 | 98 | Paved parking, HSG B |
| 0 | 98 | Roofs, HSG B |
| 7,205 | 61 | >75% Grass cover, Good, HSG B |
| 900 | 55 | Woods, Good, HSG B |
| 0 | 96 | Gravel surface, HSG B |
| 11,920 | 72 | Weighted Average |
| 8,105 | | 67.99% Pervious Area |
| 3,815 | | 32.01% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.7 | 100 | 0.0300 | 0.19 | | **Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 2.93" |

## Summary for Subcatchment S11: Subcatchment 11

Runoff = 1.64 cfs @ 12.09 hrs, Volume= 5,824 cf, Depth= 2.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 18,163 | 98 | Paved parking, HSG B |
| 5,873 | 98 | Roofs, HSG B |
| 0 | 61 | >75% Grass cover, Good, HSG B |
| 0 | 55 | Woods, Good, HSG B |
| 0 | 96 | Gravel surface, HSG B |
| 24,036 | 98 | Weighted Average |
| 24,036 | | 100.00% Impervious Area |

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

## Summary for Subcatchment S12: Subcatchment 12

Runoff = 0.22 cfs @ 12.10 hrs, Volume= 714 cf, Depth= 1.17"
Routed to Reach SP#1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 3,250 | 98 | Paved parking, HSG B |
| 0 | 98 | Roofs, HSG B |
| 4,082 | 61 | >75% Grass cover, Good, HSG B |
| 0 | 55 | Woods, Good, HSG B |
| 0 | 96 | Gravel surface, HSG B |
| 7,332 | 77 | Weighted Average |
| 4,082 | | 55.67% Pervious Area |
| 3,250 | | 44.33% Impervious Area |

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

## Summary for Subcatchment S2: Subcatchment 20

Runoff = 0.41 cfs @ 12.37 hrs, Volume= 2,284 cf, Depth= 0.79"
Routed to Reach SP#2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.14"

| Area (sf) | CN | Description |
|---|---|---|
| 3,611 | 98 | Paved parking, HSG B |
| 5,074 | 98 | Roofs, HSG B |
| 22,585 | 61 | >75% Grass cover, Good, HSG B |
| 3,274 | 55 | Woods, Good, HSG B |
| 34,544 | 70 | Weighted Average |
| 25,859 | | 74.86% Pervious Area |
| 8,685 | | 25.14% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 13.5 | 100 | 0.0100 | 0.12 | | **Sheet Flow, Segment 1**<br>Grass: Short n= 0.150 P2= 2.93" |
| 9.5 | 397 | 0.0100 | 0.70 | | **Shallow Concentrated Flow, Segment 2**<br>Short Grass Pasture Kv= 7.0 fps |
| 23.0 | 497 | Total | | | |

## Summary for Reach SP#1: Study Point #1

Inflow Area = 43,288 sf, 71.85% Impervious, Inflow Depth = 0.44" for 2 Year event
Inflow = 0.45 cfs @ 12.12 hrs, Volume= 1,601 cf
Outflow = 0.45 cfs @ 12.12 hrs, Volume= 1,601 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Reach SP#2: Study Point #2

Inflow Area = 34,544 sf, 25.14% Impervious, Inflow Depth = 0.79" for 2 Year event
Inflow = 0.41 cfs @ 12.37 hrs, Volume= 2,284 cf
Outflow = 0.41 cfs @ 12.37 hrs, Volume= 2,284 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 300R

Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Pond 1P: (new Pond)

Inflow Area = 24,036 sf,100.00% Impervious, Inflow Depth = 2.91" for 2 Year event
Inflow = 1.64 cfs @ 12.09 hrs, Volume= 5,824 cf
Outflow = 0.32 cfs @ 11.75 hrs, Volume= 5,824 cf, Atten= 80%, Lag= 0.0 min
Discarded = 0.32 cfs @ 11.75 hrs, Volume= 5,824 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach SP#1 : Study Point #1

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Peak Elev= 34.28' @ 12.52 hrs Surf.Area= 4,000 sf Storage= 1,404 cf

Plug-Flow detention time= 23.3 min calculated for 5,814 cf (100% of inflow)
Center-of-Mass det. time= 23.3 min ( 780.1 - 756.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 33.40' | 4,480 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc)<br>11,200 cf Overall x 40.0% Voids |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 33.40 | 4,000 | 0 | 0 |
| 36.20 | 4,000 | 11,200 | 11,200 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 35.70' | **12.0" Round Culvert**<br>L= 50.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 35.70' / 33.00' S= 0.0540 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.79 sf |
| #2 | Discarded | 33.40' | **3.500 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.32 cfs @ 11.75 hrs HW=33.44' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.32 cfs)

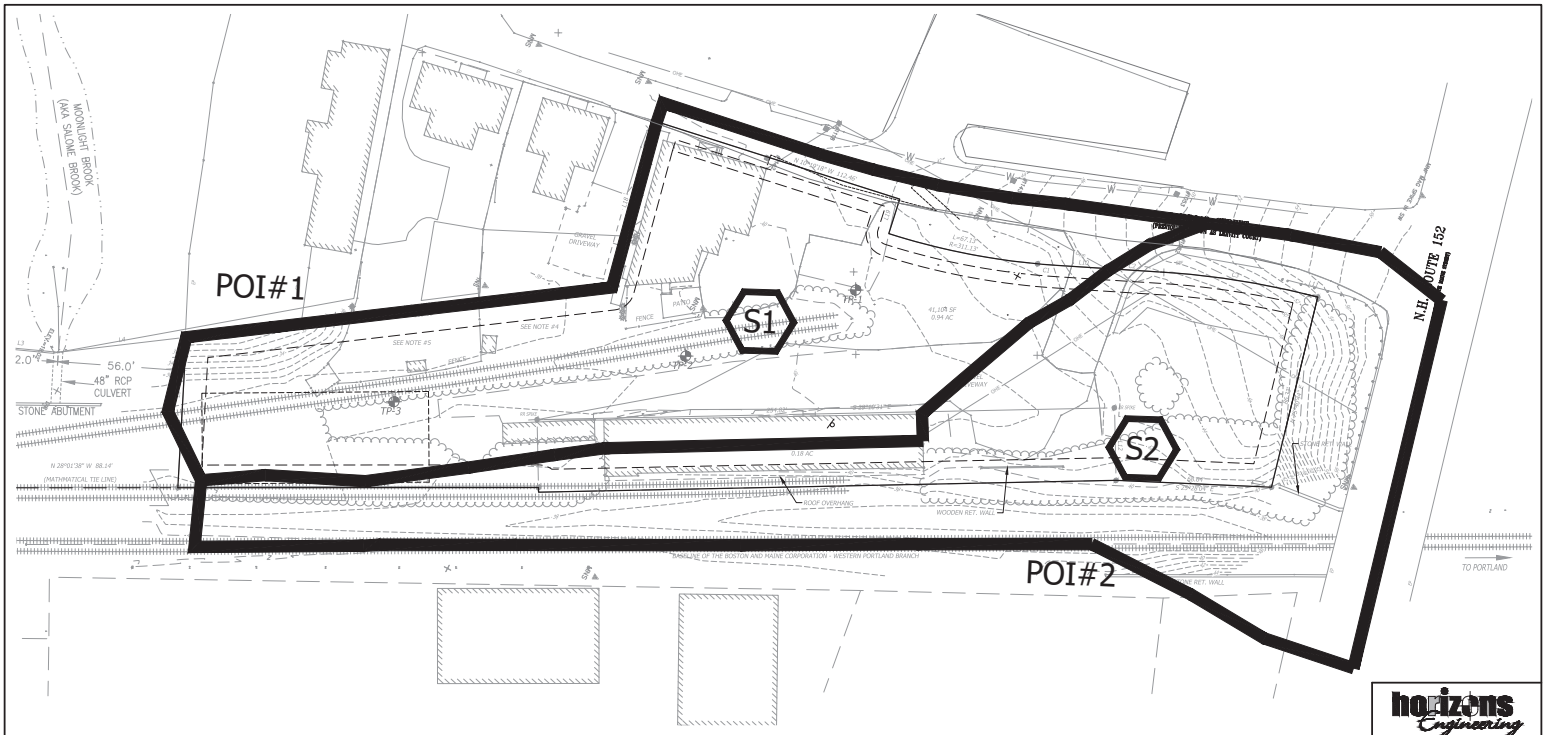
**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=33.40' (Free Discharge)
↑—**1=Culvert** ( Controls 0.00 cfs)

# STORMWATER MANAGEMENT PLANS

for

**CC Railroad Street Newmarket, LLC**

**Site Plan**




LEGEND

S1 — SUBCATCHMENT ID

SUBCATCHMENT BOUNDARY

TIME OF CONCENTRATION (TC)

FOR REVIEW
NOT FOR CONSTRUCTION

DATE OF PRINT
OCTOBER 24 2023
HORIZONS ENGINEERING

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CONDOR CAPITAL

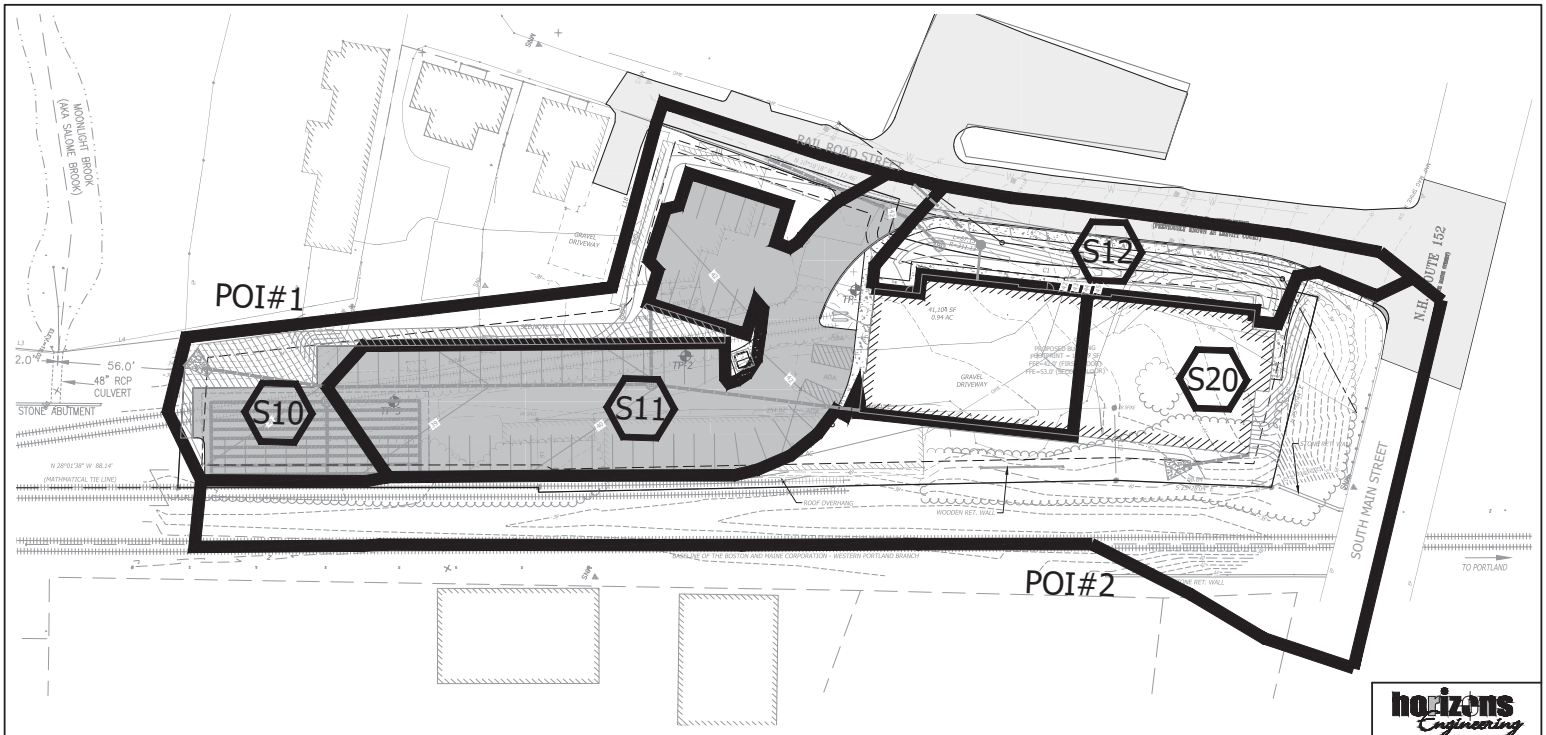
3 RAIL ROAD STREET
NEWMARKET, NH 03857

PRE-DEVELOPMENT
DRAINAGE PLAN

| NO. | DATE | REVISION DESCRIPTION | ENG | DWG |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| DATE: 10.17.23 | PROJECT #: 230750 |
|---|---|
| ENGIN'D BY: TAL | DRAWN BY: TAL |
| CHECK'D BY: MJS | ARCHIVE #: H:___ |

D101




LEGEND

S10 — SUBCATCHMENT ID

SUBCATCHMENT BOUNDARY

TIME OF CONCENTRATION (TC)

FOR REVIEW
NOT FOR CONSTRUCTION

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CONDOR CAPITAL

3 RAIL ROAD STREET
NEWMARKET, NH 03857

POST-DEVELOPMENT
DRAINAGE PLAN

| NO. | DATE | REVISION DESCRIPTION | ENG | DWG |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| DATE: 10.17.23 | PROJECT #: 230750 |
| ENGIN'D BY: TAL | DRAWN BY: TAL |
| CHECK'D BY: MJS | ARCHIVE #: H:___ |

D102

# SOILS REPORTS

for

**CC Railroad Street Newmarket, LLC**

**Site Plan**

3641A White Mountain Highway, North Conway, NH 03860 • Ph 603-447-2254 • Fax 603-444-1343 • www.horizonsengineering.com

**TEST PITS - 10/16/2023**
**Job #: 230750 – CC Capital – Newmarket, NH**
**Observer: Elias Buzzell**

**Test Pit Report:**
Test pits completed on 10/16/23. Site conditions were a mix of moderate rain and sun throughout the day. Test pits located on the site of a defunct train station, significant human transported material found throughout the test pits. A layer of coal dust and coal fragments was identified in every pit. Parent material on site appears to be dense clays which limit opportunities for infiltration. Infiltration tests were successful on test pit numbers 1 & 3, test pit 2 did not successfully infiltrate. Compacted gravel layer restricts infiltration on pit 3 and will need to be removed or bypassed to manage stormwater from the proposed parking structure.

**Test Pit #1**

| | | |
|---|---|---|
| 0-6" | 10YR 3/3 | Dark Brown, Fine Sandy Loam, Granular, Loose, Clear Smooth Boundary, 20% Gravel |
| 6-18" | 10YR 5/6 | Yellowish Brown, Fine Sandy Loam, Granular, Very Friable, Abrupt Wavy Boundary, 20% Gravel |
| 18-30" | 10YR 3/1 | Very Dark Gray, Coal Fragments & Coal Dust, Blocky, Friable, Firm in Place, Clear Wavy Boundary, 20% Gravel, Red Mottles |
| 30-43" | 2.5YR 4/2 | Dark Grayish Brown, Clay, Massive, Firm, Firm in Place, Gradual Smooth Boundary, Red Mottles |
| 43-54" | 5Y 3/1 | Very Dark Gray, Clay, Massive, Friable, Firm in Place, Red Mottles |

ESHWT: 22"
ROOTS: 21"
OBSERVED H20: N/O
RESTRICTIVE LAYER: 29”
TERMINATION: 54"
REFUSAL: N/O

**Note:**

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**Test Pit #2**

| | | |
|---|---|---|
| 0-4" | 10YR 2/1 | Black, Fine Sandy Loam, Granular,<br>Friable, Abrupt Smooth Boundary, 70% Gravel |
| 4-7" | 10YR 4/3 | Olive Brown, Fine Sandy Loam, Massive, Friable<br>Firm in Place, Abrupt Smooth Boundary, 70% Gravel, Red Mottles |
| 7-12" | 10YR 2/1 | Black, Coal Fragments & Coal Dust, Massive, Friable,<br>Firm in Place, Clear Smooth Boundary, 50% Gravel, Red Mottles |
| 12-47" | 5YR 4/2 | Olive Gray, Clay, Massive, Firm<br>Firm in Place, Red Mottles |

ESHWT: 5" – Perched Water Table, Surface nearly impermeable.
ROOTS: 3"
OBSERVED H20: N/O
RESTRICTIVE LAYER: 12”
TERMINATION: 47"
REFUSAL: N/O

**Note:**
Impermeable surface to Clay layer.

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**Test Pit #3**

| | | |
|---|---|---|
| 0-7" | 10YR 3/1 | Very Dark Gray, Sand & Gravel, Massive, Friable, Firm in Place, Abrupt Smooth Boundary, 70% Gravel |
| 7-11" | 10YR 2/1 | Black, Fine Sandy Loam, Massive, Friable, Firm in Place, Abrupt Wavy Boundary, 50% Gravel |
| 11-16" | 10YR 3/4 | Dark Yellowish Brown, Fine Sandy Loam, Massive, Friable, Firm in Place, Abrupt Wavy Boundary, 50% Gravel |
| 16-26" | 10YR 2/1 | Black, Fine Sandy Loam & Coal Dust, Blocky, Friable, Firm in Place, Clear Wavy Boundary, 10% Gravel |
| 26-35" | 5Y 4/2 | Olive Gray, Fine Sandy Loam, Single Grain, Very Friable, Gradual Smooth Boundary |
| 35-65" | 2.5Y 4/3 | Olive Brown, Fine Sand, Single Grain, Loose, |

ESHWT: N/O to Depth, Perched Water Table @ 15”
ROOTS: 4”
OBSERVED H20: N/O
RESTRICTIVE LAYER: N/O
TERMINATION: 65”
REFUSAL: N/O

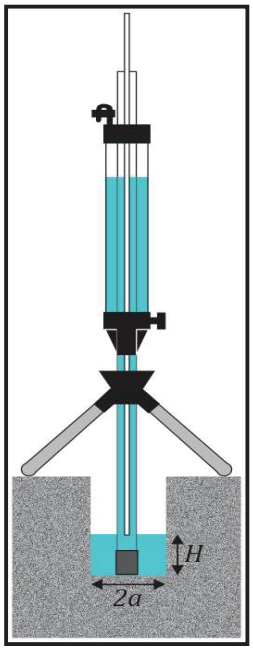
**Note:**
No original ground located, pit is 100% human transported material.

| | |
|---|---|
| HEI Project Name: | **CC Capital - Newmarket** |
| HEI Project Number: | **230750** |
| Test Location: | **Test Pit 1** |
| Test Date: | **10/16/2023** |
| Performed by: | **Elias Buzzell** |

## Guleph Permeameter Single Head Test Results

| | | |
|---|---|---|
| **Depth of Practice:** | **14"** | |
| **Reservoir Cross-sectional area in $cm^2$** | | |
| **(enter "35.22" for Combined and "2.16" for Inner reservoir):** | **35.22** | |
| **Enter water Head Height ("H" in cm):** | **5** | |
| **Enter the Borehole Radius ("a" in cm):** | **3** | *Standard (3)* |
| **Soil Texture Category** | **3** | |

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc




| | |
|---|---|
| Res Type | 35.22 |
| H | 5 |
| a | 3 |
| H/a | 1.666667 |
| a* | 0.12 |
| C0.01 | 0.809485 |
| C0.04 | 0.842059 |
| C0.12 | 0.803154 |
| C0.36 | 0.803154 |
| C | 0.803154 |
| R | 2.500 |
| Q | 1.4675 |
| pi | 3.1415 |

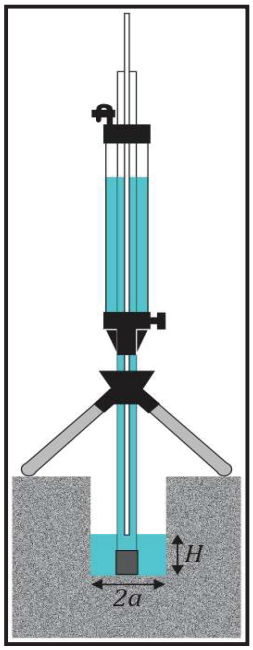
| | | |
|---|---|---|
| **RATE OF CHANGE:** | **2.5000** | |
| **$\alpha^*$=** | **0.12** | ***$cm^{-1}$*** |
| **C =** | **0.803154257** | |
| **Q =** | **1.4675** | |
| **$K_{fs}$ =** | **0.0027** | ***cm/sec*** |
| | **0.1601** | ***cm/min*** |
| | **0.0000** | ***m/sec*** |
| | **0.0631** | ***inch/min*** |
| | **3.7830** | ***inch/hr*** |
| **$\Phi_m$ =** | **0.0222** | ***$cm^2$/min*** |

| | |
|---|---|
| HEI Project Name: | **CC Capital - Newmarket** |
| HEI Project Number: | **230750** |
| Test Location: | **Test Pit 3** |
| Test Date: | **10/16/2023** |
| Performed by: | **Elias Buzzell** |

## Guleph Permeameter Single Head Test Results

| | | |
|---|---|---|
| **Depth of Practice:** | **46"** | |
| **Reservoir Cross-sectional area in $cm^2$** | | |
| **(enter "35.22" for Combined and "2.16" for Inner reservoir):** | **35.22** | |
| **Enter water Head Height ("H" in cm):** | **5** | |
| **Enter the Borehole Radius ("a" in cm):** | **3** | *Standard (3)* |
| **Soil Texture Category** | **4** | |

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc




| | |
|---|---|
| Res Type | 35.22 |
| H | 5 |
| a | 3 |
| H/a | 1.666667 |
| a* | 0.36 |
| C0.01 | 0.809485 |
| C0.04 | 0.842059 |
| C0.12 | 0.803154 |
| C0.36 | 0.803154 |
| C | 0.803154 |
| R | 3.000 |
| Q | 1.761 |
| pi | 3.1415 |

| | | |
|---|---|---|
| | **3.0000** | |
| **α*=** | **0.36** | ***$cm^{-1}$*** |
| **C =** | **0.803154257** | |
| **Q =** | **1.761** | |
| **$K_{fs}$ =** | **0.0053** | ***cm/sec*** |
| | **0.3178** | ***cm/min*** |
| | **0.0001** | ***m/sec*** |
| | **0.1251** | ***inch/min*** |
| | **7.5065** | ***inch/hr*** |
| **$\Phi_m$ =** | **0.0147** | ***$cm^2$/min*** |

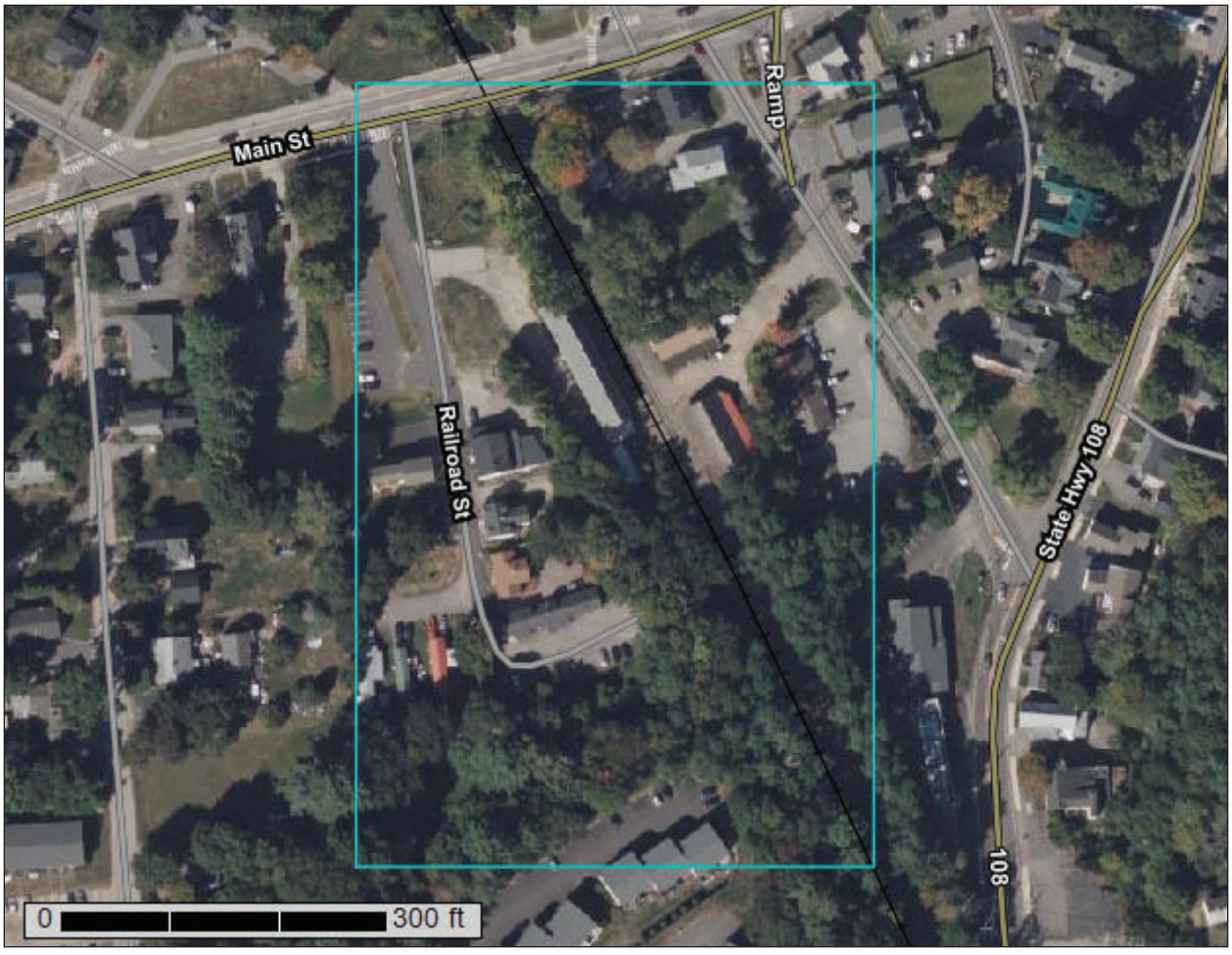
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

# Custom Soil Resource Report for Rockingham County, New Hampshire




October 20, 2023

# Preface

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

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

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

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

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

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

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# Contents

# How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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


Map Scale: 1:1,280 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 26, Aug 22, 2023

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

Date(s) aerial images were photographed: Jun 19, 2020—Sep 20, 2020

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

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 140C | Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky | 0.6 | 7.4% |
| 305 | Lim-Pootatuck complex | 0.2 | 2.3% |
| 699 | Urban land | 5.1 | 64.4% |
| 799 | Urban land-Canton complex, 3 to 15 percent slopes | 2.0 | 25.9% |
| **Totals for Area of Interest** | | **7.9** | **100.0%** |

# Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

# Rockingham County, New Hampshire

## 140C—Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky

### Map Unit Setting

*National map unit symbol:* 2w82s
*Elevation:* 0 to 980 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Chatfield, very stony, and similar soils:* 35 percent
*Canton, very stony, and similar soils:* 25 percent
*Hollis, very stony, and similar soils:* 25 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Chatfield, Very Stony

#### Setting

*Landform:* Hills, ridges
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Side slope, crest, nose slope
*Down-slope shape:* Convex
*Across-slope shape:* Linear, convex
*Parent material:* Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

#### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material
*A - 1 to 2 inches:* fine sandy loam
*Bw - 2 to 30 inches:* gravelly fine sandy loam
*2R - 30 to 40 inches:* bedrock

#### Properties and qualities

*Slope:* 8 to 15 percent
*Surface area covered with cobbles, stones or boulders:* 1.6 percent
*Depth to restrictive feature:* 20 to 41 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* High
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 to 0.00 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 4.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 6s
*Hydrologic Soil Group:* B
*Ecological site:* F144AY034CT - Well Drained Till Uplands

*Hydric soil rating:* No

### Description of Hollis, Very Stony

#### Setting

*Landform:* Hills, ridges
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Side slope, crest, nose slope
*Down-slope shape:* Convex
*Across-slope shape:* Linear, convex
*Parent material:* Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

#### Typical profile

*Oi - 0 to 2 inches:* slightly decomposed plant material
*A - 2 to 7 inches:* gravelly fine sandy loam
*Bw - 7 to 16 inches:* gravelly fine sandy loam
*2R - 16 to 26 inches:* bedrock

#### Properties and qualities

*Slope:* 8 to 15 percent
*Surface area covered with cobbles, stones or boulders:* 1.6 percent
*Depth to restrictive feature:* 8 to 23 inches to lithic bedrock
*Drainage class:* Somewhat excessively drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 to 0.00 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:* Very low (about 2.7 inches)

#### Interpretive groups

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

### Description of Canton, Very Stony

#### Setting

*Landform:* Ridges, hills, moraines
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Side slope, crest, nose slope
*Down-slope shape:* Convex, linear
*Across-slope shape:* Convex
*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

#### Typical profile

*Oi - 0 to 2 inches:* slightly decomposed plant material
*A - 2 to 5 inches:* fine sandy loam
*Bw1 - 5 to 16 inches:* fine sandy loam
*Bw2 - 16 to 22 inches:* gravelly fine sandy loam
*2C - 22 to 67 inches:* gravelly loamy sand

**Properties and qualities**

*Slope:* 8 to 15 percent
*Surface area covered with cobbles, stones or boulders:* 1.6 percent
*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 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 3.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 6s
*Hydrologic Soil Group:* B
*Ecological site:* F144AY034CT - Well Drained Till Uplands
*Hydric soil rating:* No

**Minor Components**

**Newfields, very stony**

*Percent of map unit:* 5 percent
*Landform:* Hills, ground moraines, moraines
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Hydric soil rating:* No

**Freetown**

*Percent of map unit:* 5 percent
*Landform:* Swamps, kettles, bogs, depressions, marshes
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Scarboro, very stony**

*Percent of map unit:* 3 percent
*Landform:* Outwash deltas, drainageways, outwash terraces, depressions
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Concave
*Across-slope shape:* Concave, linear
*Hydric soil rating:* Yes

**Rock outcrop**

*Percent of map unit:* 2 percent
*Landform:* Hills, ridges
*Hydric soil rating:* Unranked

## 305—Lim-Pootatuck complex

### Map Unit Setting

*National map unit symbol:* 9cmx
*Elevation:* 0 to 740 feet
*Mean annual precipitation:* 46 to 49 inches
*Mean annual air temperature:* 48 degrees F
*Frost-free period:* 155 to 160 days
*Farmland classification:* Farmland of local importance

### Map Unit Composition

*Lim and similar soils:* 45 percent
*Pootatuck and similar soils:* 40 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Lim

#### Setting

*Landform:* Flood plains
*Parent material:* Alluvium

#### Typical profile

*H1 - 0 to 8 inches:* very fine sandy loam
*H2 - 8 to 38 inches:* very fine sandy loam
*H3 - 38 to 44 inches:* fine sandy loam
*H4 - 44 to 60 inches:* fine sand

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Poorly drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 2.00 in/hr)
*Depth to water table:* About 0 to 18 inches
*Frequency of flooding:* NoneFrequent
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 10.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 4w
*Hydrologic Soil Group:* B/D
*Ecological site:* F144AY015NY - Wet Silty Low Floodplain
*Hydric soil rating:* Yes

**Description of Pootatuck**

**Setting**

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

**Typical profile**

*H1 - 0 to 4 inches:* very fine sandy loam
*H2 - 4 to 26 inches:* very fine sandy loam
*H3 - 26 to 60 inches:* loamy fine sand

**Properties and qualities**

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 6.00 in/hr)
*Depth to water table:* About 18 to 30 inches
*Frequency of flooding:* NoneFrequent
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Low (about 5.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* B
*Ecological site:* F144AY015NY - Wet Silty Low Floodplain
*Hydric soil rating:* No

**Minor Components**

**Not named wet**

*Percent of map unit:* 15 percent
*Landform:* Flood plains
*Hydric soil rating:* Yes

## 699—Urban land

**Map Unit Composition**

*Urban land:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Minor Components**

**Not named**

*Percent of map unit:* 15 percent
*Hydric soil rating:* No

## 799—Urban land-Canton complex, 3 to 15 percent slopes

### Map Unit Setting

*National map unit symbol:* 9cq0
*Elevation:* 0 to 1,000 feet
*Mean annual precipitation:* 42 to 46 inches
*Mean annual air temperature:* 45 to 48 degrees F
*Frost-free period:* 120 to 160 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Urban land:* 55 percent
*Canton and similar soils:* 20 percent
*Minor components:* 25 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Canton

#### Setting

*Parent material:* Till

#### Typical profile

*H1 - 0 to 5 inches:* gravelly fine sandy loam
*H2 - 5 to 21 inches:* gravelly fine sandy loam
*H3 - 21 to 60 inches:* loamy sand

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Low (about 5.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* A
*Ecological site:* F144AY034CT - Well Drained Till Uplands
*Hydric soil rating:* No

### Minor Components

#### Udorthents

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

#### Boxford and eldridge

*Percent of map unit:* 4 percent

*Hydric soil rating:* No

**Squamscott and scitico**

*Percent of map unit:* 4 percent
*Landform:* Marine terraces
*Hydric soil rating:* Yes

**Scituate and newfields**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Chatfield**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Walpole**

*Percent of map unit:* 4 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

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