

DRAINAGE REPORT
70 Walker St, Newton
Newton, Massachusetts

September 24, 2019

Prepared by:
Natalie Doyle

Reviewed by:
Marc Besio, PE, SIT

VTP Associates, Inc.
132 Adams Street
2nd Floor, Suite 3
Newton Massachusetts 02465
1-617-332-8271
Job #218237



IMPERVIOUS AREAS

Date: September 24, 2019
Address: 70 Walker St, Newton
Project: 218237

Impervious Areas	Existing	Proposed
Buildings	2,493.8 s.f.	5,903.5 s.f.
Porch	232.2 s.f.	284.0 s.f.
Driveway	3,122.5 s.f.	3,406.9 s.f.
Walkways, patios	160.6 s.f.	125.8 s.f.
Landing, stairs	0.0 s.f.	0.0 s.f.
A.C. Unit	0.0 s.f.	0.0 s.f.
Bulkhead	32.4 s.f.	53.7 s.f.
Retaining Walls	246.2 s.f.	144.7 s.f.
Total	6,287.7 s.f.	9,918.6 s.f.

Increase in Impervious Area: $9,918.6 - 6,287.7 = 3,630.9$ s.f.
Lot area: 20,151.0 s.f.
4% of lot area: 806.0 s.f.
400 s.f. Max.
3,630.9 s.f. > 400.0 s.f. Drainage Required

END GALLEY STORAGE:

Design Infiltration Rate: 7 min/inch = 0.71 ft/hr Rawls Ratio: 8.27 (Sand)

Infiltration Capacity

$$\begin{aligned} \text{Bottom Area} &= 8.0' \times 6.0' = 48.0 \text{ sq. ft.} \\ 48.0 \text{ sq. ft.} \times 0.71 \text{ ft/hr} &= 34.1 \text{ cfh} = 818.4 \text{ cf/day} = 0.0188 \text{ ac-ft} \end{aligned}$$

Galley Storage

$$\begin{aligned} \text{Total} &= 48.0 \text{ sq. ft.} \times 3.25' = 156.0 \text{ cf} \\ \text{Embedded Galley Volume} &= 4.00' \times 4.00' \times 3.25' = 52.0 \text{ cf} \\ \text{Stone Volume} &= 156.0 \text{ cf} - 52.0 \text{ cf} = 104.0 \text{ cf} \\ \text{Storage} &= \text{stone volume} \times \text{voids ratio} = 104.0 \times 0.35 = 36.4 \text{ cf} \\ \text{Galley Volume} &= 3.50' \times 3.50' \times 3.25' = 39.8 \text{ cf} \\ \text{Total Capacity} &= \text{Galley Volume} + \text{stone void volume} \\ &= 39.8 + 36.4 = 76.2 \text{ cf} = 0.0017 \text{ ac-ft} \end{aligned}$$

$$\begin{aligned} \text{Total stored/infiltrated} &= \text{infiltration capacity} + \text{total capacity} \\ 0.0188 \text{ ac-ft} + 0.0017 \text{ ac-ft} &= \mathbf{0.0205 \text{ ac-ft}} \end{aligned}$$

MIDDLE GALLEYS STORAGE:

Design Infiltration Rate: 7 min/inch = 0.71 ft/hr Rawls Ratio: 8.27 (Sandy)

Infiltration Capacity

$$\begin{aligned} \text{Bottom Area} &= 8.0' \times 4.0' = 32.0 \text{ sq. ft.} \\ 32.0 \text{ sq. ft.} \times 0.71 \text{ ft/hr} &= 22.7 \text{ cf/hr} = 544.8 \text{ cf/day} = 0.0125 \text{ ac-ft} \end{aligned}$$

Galley Storage

$$\begin{aligned} \text{Total} &= 32.0 \text{ sq. ft.} \times 3.25' = 104.0 \text{ cf} \\ \text{Embedded Galley Volume} &= 4.00' \times 4.00' \times 3.25' = 52.0 \text{ cf} \\ \text{Stone Volume} &= 104.0 \text{ cf} - 52.0 \text{ cf} = 52.0 \text{ cf} \\ \text{Storage} &= \text{stone volume} \times \text{voids ratio} = 52.0 \times 0.35 = 18.2 \text{ cf} \\ \text{Galley Volume} &= 3.50' \times 3.50' \times 3.25' = 39.8 \text{ cf} \\ \text{Total Capacity} &= \text{Galley Volume} + \text{stone void volume} \\ &= 39.8 + 18.2 = 58.0 \text{ cf} = 0.0016 \text{ ac-ft} \end{aligned}$$

$$\begin{aligned} \text{Total stored/infiltrated} &= \text{infiltration capacity} + \text{total capacity} \\ 0.0125 \text{ ac-ft} + 0.0016 \text{ ac-ft} &= \mathbf{0.0141 \text{ ac-ft}} \end{aligned}$$

REQUIRED SYSTEM STORAGE:

Storage required: 0.1490 ac-ft

Storage provided:

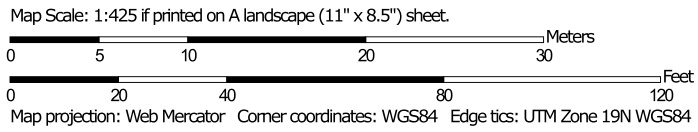
Unit Type	Qty.	Unit Capacity	Total
End:	4	0.0205 ac-ft	0.0820 ac-ft
Middle:	5	0.0141 ac-ft	0.0705 ac-ft
Low Profile End:	0	0.0056 ac-ft	0.0000 ac-ft
Low Profile Middle:	0	0.0038 ac-ft	0.0000 ac-ft
Total =	9 units		0.1525 ac-ft

> 0.1490 ac-ft
Therefore OK

Soil Map—Middlesex County, Massachusetts
(70 Walker Street)




Soil Map may not be valid at this scale.



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 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

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

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

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
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.5	100.0%
Totals for Area of Interest		0.5	100.0%

Middlesex County, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9

Elevation: 0 to 820 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days

Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent

Urban land: 40 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Kames, eskers, moraines, outwash terraces, outwash plains

Landform position (two-dimensional): Backslope, footslope, shoulder, summit

Landform position (three-dimensional): Side slope, crest, riser, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam

Bw1 - 10 to 22 inches: fine sandy loam

Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand

2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Runoff class: Very 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

Calcium carbonate, maximum in profile: 2 percent

Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

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

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

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

Windsor

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, dunes, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018