DK Engineering LLC

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REPORT TO ACCOMPANY APPLICATION FOR SPECIAL PERMIT FOR EARTH MOVEMENT

Ministers Estates ~ 39 Sunset Rock Road, Andover, Massachusetts

Introduction

Description: The site is located at 39 Sunset Rock Road between Spring Grove Road and the entrance to Pike School in Andover, Massachusetts and consists of approximately 4.9± acres. The project involves subdividing one (1) lot into five (5) lots, one (1) parcel and a minor road (Ministers Lane). Topography generally slopes from the high point along the northeasterly boundary of the property at elevation 238± to the low point along the southwesterly at elevation 202±, a vertical difference of 36 feet. The existing vegetation mainly consists of grass areas with a tree line area along the perimeter of the property. The soils as mapped by the Natural Resource Conservation Service (NRCS) are mainly Canton and Woodbridge Series.

9. Site Information

a. *Site soil type and boundaries based on U.S.D.A. Natural Resource Conservation Service Standards:*

The soils within the project consist of the Canton and Woodbridge series. Refer to the Soils Map at the end of this report and the Existing Conditions Plan (Definitive Subdivision Plan Set, Sheets 3 of 7).

b. *Areas of Steep Slopes, i.e. greater than 15%:*

There are areas within the site that exceed fifteen (15) percent slope. These areas total approximately 1 acre None of these areas exceed twenty-five (25) percent.

c. *Predominant site vegetation, including existing cleared areas:*

The predominant site vegetation is mainly woods. Treed areas include various species including pine, oak and maple.

d. *Locations of ledge/rock outcroppings:*

No areas of ledge/rock outcropping were observed on the site.

e. *Locations of standing water, wetlands, and perennial or intermittent streams:*

There are no wetland areas that exist on the property.

f. *Proposed locations of earth material stockpiles:*

The location of the earth material stockpile will be between lots 1 and 2 as shown on the Grading & Erosion Control Plan (sheet 4 of 7). Note that there are no wetlands within 100 feet of the earth material stockpile.

g. Maximum depth and width of proposed cuts:

The depth of cuts varies with the greatest depth being approximately 8.9 feet. Refer to the Earthwork Exhibit in this report.

h. Volume of earth materials to be removed from the site:

The excess material will be used on site to the maximum extent possible, however, some of the excess will have to be exported. That quantity will have to be determined but will be not greater than the total excess.

i. Type(s) of earth materials to be removed:

The primary earth material to be removed from the site will be mainly the Canton series (loamy sand). To a much lesser extend, some of the Woodbridge series soil would also be exported. This series consists of moderately well drained loamy soils formed in lodgment till. They are very deep to bedrock and moderately deep to a densic contact. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent.

j. Proposed soil and slope stabilization program:

a) Install erosion control measures (Compost Filter Socks or equal) at the downgradient portion of the property to prevent sediment from leaving the site.

b) Install sediment control measures around all catch basins and Erosion Control Silt Sacks in the basins.

c) Grade site to bring the roadway to subgrade, install utilities, place binder course of pavement, and loam and seed side slopes.

d) Construct houses, loam, and seed all disturbed areas.

k. Destination(s) of materials to be removed:

Any export from the site is expected to be transported to an area to be determined.

l. Estimated number of truckloads of materials:

Assuming an export of 2,367 c.y. and an average of eighteen (18) cubic yards per truck, the estimated number of truckloads of materials is approximately 132.

m. Proposed schedule of removal operations:

Although the schedule of operations is unknow at this time, typically the operation time is between 7:00 am and 5:00 pm.

n. Volume of earth materials to be re-graded on the site:

The site cut volume, including foundations and basements, is approximately 6,292 cubic yards and the site fill volume is approximately 3,925 cubic yards. No assumption has been made for shrinkage or expansion in the calculations, so the net excess is approximately 2,367 cubic yards.

o. *Proposed soil and slope stabilization program:*

All disturbed areas remaining idle for more than fourteen (14) days shall be stabilized. Disturbed portions of the site where construction activities have permanently ceased shall be hydroseeded within three weeks of completion. All disturbed areas shall be loamed and seeded within six (6) months from the start of that lot construction.

p. *Certified statement by the engineer that the date submitted to the Board is accurate:*

I certify that to the best of my knowledge, the information presented in this report is accurate.

Prepared by: Daniel Koravos, P.E.
Date: April 14, 2025

Norse Environmental Services
Test Pit Data

December 12, 2022

See Following Page

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

A. Facility Information

1. Owner Information:
   Ministers Lane LLC - Greg Alexandris

   Street Address:
   39 Sunset Rock Road Map/Lot: Map 79 Parcel 18

   Town:

Andover	MA	01810
City/Town	State	Zip Code

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐

2. Published Soil Survey available? Yes ☒ No ☐ If yes: Web Soil Survey (Year Published) 1:1740 (Publication Scale) 421B, 421D, 310B (Soil Map Unit)

   Canton & Woodbridge (Soil Name) slope, stoniness, wetness, slow permeability (Soil limitations)

3. Surficial Geological Report available? Yes ☐ No ☒ If yes: _____ (Year Published) _____ (Publication Scale) _____ (Map Unit)

   _____ (Geologic Material) _____ (Landform)

4. Flood Rate Insurance Map:

   Above the 500-year flood boundary? Yes ☒ No ☐ Within the 100-year flood boundary? Yes ☐ No ☒

   Within the 500-year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map _____ (Map Unit) _____ (Name)

   Wetlands Conservancy Program Map _____ (Map Unit) _____ (Name)

6. Current Water Resource Conditions (USGS) 3/2025 (Month/Year) Range: Above Normal ☐ Normal ☐ Below Normal ☒

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

C. On-Site Review

Deep Observation Hole Number: TP-A–TP-L | 3/7/25 (Date) | 9:00 a.m. (Time) | Cloudy – 42° (Weather)

1. Location

   Ground Elevation at Surface of Hole: See plan

   Location (Identify on Plan) See plan

2. Land Use: 4.6 acre single family wooded lot (e.g. woodland, agricultural field, vacant lot, etc.) | Few (Surface Stones) | Varies (Slope (%))

   Maple, Oak & Pine (Vegetation) | Drumlin (Landform) | Varies along slope (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100 ft. feet | Drainage Way >100 ft. feet | Possible Wet Area >100 ft feet

   Property Line >100 ft. feet | Drinking Water Well >100 ft. feet | Other _____

4. Parent Material: Glacial Till | Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐ - Varies throughout the Test Pits – See next page

   If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____

   Estimated Depth to High Groundwater: _____ inches | _____ elevation

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-A

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14”	Ap	10YR 2/2				FSL			Granular	Friable	
14-30”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
30-60”	C	2.5Y 6/6	68”	7.5YR 6/8	10%	LS & G	10%	20%	Massive	Friable	Boulders

Additional Notes: ESHWT 68” / No Observed Water.

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-B

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-76”	C	2.5Y 6/6	48”	7.5YR 6/8	10%	LS & G	10%	5%	Massive	Friable	

Additional Notes: ESHWT 48” / Observed Water 73”.

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-C

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-93”	C	2.5Y 6/6	48”	7.5YR 6/6	10%	LS & G	5%	10%	Massive	Friable	

Additional Notes: ESHWT 48” / No Observed Water,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-D

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-90”	C	2.5Y 6/6	48”	7.5YR 6/8	20%	LS & G	10%	10%	Massive	Friable	

Additional Notes: ESHWT 48” / No Observed Water,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-E

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-38”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
38-83”	C	2.5Y 6/6	48”	7.5YR 6/6	20%	LS & G	5%	10%	Massive	Friable	

Additional Notes: ESHWT 48” / Observed Water 65”,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-F

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14”	Ap	10YR 2/2				FSL			Granular	Friable	
14-30”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
30-88”	C	2.5Y 6/6	50”	7.5YR 6/6	20%	LS & G	10%	5%	Massive	Friable	

Additional Notes: ESHWT 50” / Observed Water 51”,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-G

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-30”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
30-57”	C	2.5Y 6/6	48”	7.5YR6/8	10%	LS & G	15%	10%	Massive	Friable	

Additional Notes: ESHWT 48” / No Observed Water,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-H

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-95”	C	2.5Y 6/6	52”	7.5YR 5/6	20%	LS & G	10%	10%	Massive	Friable	

Additional Notes: ESHWT 52” / No Observed Water,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-I

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-72”	C	2.5Y 6/6	48”	7.5YR 6/8	15%	LS & G	10%	10%	Massive	Friable	

Additional Notes: ESHWT 48” / No Observed Water,

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-J

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-90”	C	2.5Y 6/6	48”	7.5YR 6/8	20%	LS & G	10%	20%	Massive	Friable	

Additional Notes: ESHWT 48” / No Observed Water.

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-K

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-100”	C	2.5Y 6/6	54”	7.5YR 5/6	15%	LS & G	20%	10%	Massive	Friable	

Additional Notes: ESHWT 54” / No Observed Water.

Soil Suitability Assessment

Site: 39 Sunset Rock Road
City/Town: Andover, MA
Soil Evaluator/Soil Scientist: Maureen Herald – Norse Environmental Services, Inc.

Deep Observation Hole Number: TP-L

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12”	Ap	10YR 2/2				FSL			Granular	Friable	
12-24”	Bw	10YR 3/6				FSL			Weak Blocky	Friable	
24-84”	C	2.5Y 6/6	48”	7.5YR 6/8	10%	LS & G	10%	20%	Massive	Friable	Boulders

Additional Notes: ESHWT 48” / No Observed Water,

D. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise, and experience described in 310 CMR 15.017.

Maureen Herald
Signature of Soil Evaluator

4-11-25
Date

Maureen Herald
Typed or Printed Name of Soil Evaluator

SE13578
Soil Evaluator Number

NRCS – National Cooperative Soils Survey

See Following Pages

Hydrologic Soil Group—Essex County, Massachusetts, Northern Part
(39 Sunset Rock Road)

Map Scale: 1:1,930 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 18, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	0.6	9.4%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	B	1.7	25.3%
421D	Canton fine sandy loam, 15 to 25 percent slopes, very stony	A	4.4	65.3%
Totals for Area of Interest			**6.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Map Unit Description

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 in this report, 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, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components 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. Some minor components, however, have properties and behavior 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*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given 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.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Essex County, Massachusetts, Northern Part

310B—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2ql
Elevation: 0 to 1,470 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: All areas are prime farmland

Map Unit Composition

Woodbridge, fine sandy loam, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Fine Sandy Loam

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 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): 2w
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 8 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421B—Canton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w81l
Elevation: 0 to 1,180 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 statewide importance

Map Unit Composition

Canton, very stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
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: 0 to 8 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

Scituate, very stony

Percent of map unit: 9 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, very stony

Percent of map unit: 5 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Gloucester, very stony

Percent of map unit: 4 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent

Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421D—Canton fine sandy loam, 15 to 25 percent slopes, very stony

Map Unit Setting

National map unit symbol: vj5c
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Drainage class: Well drained
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 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate
Percent of map unit: 10 percent
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 18, Sep 9, 2022

Earthwork Cut/Fill Exhibit

See Following Pages