

GROTON PLAN OF CONSERVATION AND DEVELOPMENT/ MUNICIPAL COASTAL PROGRAM UPDATE

NATURAL RESOURCES

November 2012

Prepared for:
Town of Groton
Planning Commission

Prepared by:



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NATURAL RESOURCES

Understanding the extent and quality of natural resources in a community is a key component of comprehensive planning. Natural resources not only provide vital ecologic functions, such as providing habitat, enhancing flood control and maintaining water quality; but also influence quality of life for residents and businesses. This memorandum inventories natural resources and their quality in Groton in order to help identify resources in need of protection, and determine policies for guiding growth in an environmentally sensitive manner.

GEOLOGY

The Town of Groton is a coastal community located on the Connecticut shoreline. Elevations range from sea level along the Thames River and Fishers Island Sound to just over 300 feet in the northern portion of the Town. Groton's geologic landscape is characterized by its irregular coastline and the steeper slopes and rock outcroppings of its northern uplands. To geologists, Groton is part of the "Eastern Coastal Slope," an area of Southern New England once covered by loose sediments. Millions of years of erosion exposed the underlying bedrock of the Coastal Slope. This helps explain the rocky shoreline found in much of Connecticut, and Groton, and the ragged coastline. In addition, the protection afforded Connecticut's coastline by Long Island, a glacial terminal moraine, has preserved the jagged character of the Connecticut coastline. In contrast, nearby Rhode Island and Long Island have sandy barrier beaches created from years of storm activity picking up and depositing debris.

BEDROCK GEOLOGY

The bedrock geology of Groton, illustrated in the *Bedrock Geology* map, consists primarily of the Mamacoke and Plainfield formations as well as New London, Hope Valley Alaskite and Potter Hill Granite Gneiss. All of these mineral resources are believed to have originated from organic sediments and volcanic material and make up part of the Avalonian Terrane.

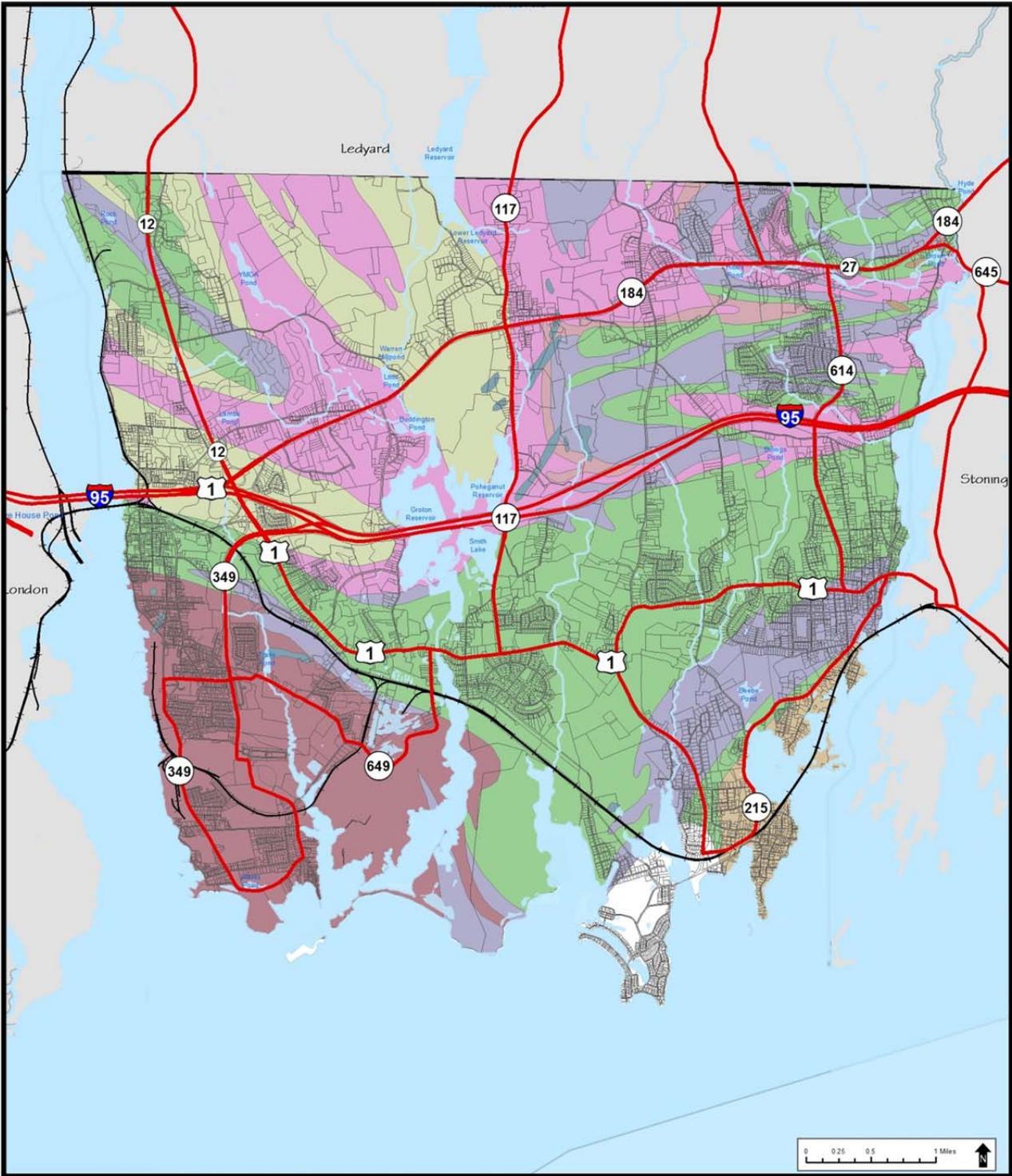
The Town of Groton lies above four bedrock types which trend northwest to southeast across the area. These are the Potter Hill Granite Gneiss, the Plainfield Formation and the quartzite member of the Plainfield Formation, Rope Ferry Gneiss, and small intrusions of Westerly Granite. Each of these formations consists primarily of gneiss, a relatively hard metamorphic rock except for the hard, igneous granite intrusions.

SURFICIAL GEOLOGY

The surficial geology of Groton is a product of glaciation. The advance and retreat of glaciers eroded many of the river and stream valleys we know today, and deposited glacial till on the underlying bedrock. Some of the glacial till has eroded since the glacial period to expose bedrock in ledge outcroppings in upland areas and hilltops.

The Town's surficial geologic formations include glacial till, stratified drift, and coastal formations. The distribution of the Town's surficial geology is illustrated in the *Surficial Geology* map. The majority of the Town is underlain by glacial till. Till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. The exception is a vast area from Poheganut Reservoir and Smith Lake, extending south along the Poquonock River (also spelled "Poquonnock") and west through the airport which is underlain by stratified drift. Other minor stratified drift deposits are found along watercourses.

The amount of stratified drift present is important as areas of stratified materials are generally coincident with floodplains. These materials were deposited at lower elevations by glacial streams, and these valleys were later inherited by the larger of our present day streams and rivers. However, the smaller glacial till watercourses can also contribute to flooding.





Groton, Connecticut
Plan of Conservation and Development

Bedrock Geology

Geologic Formations

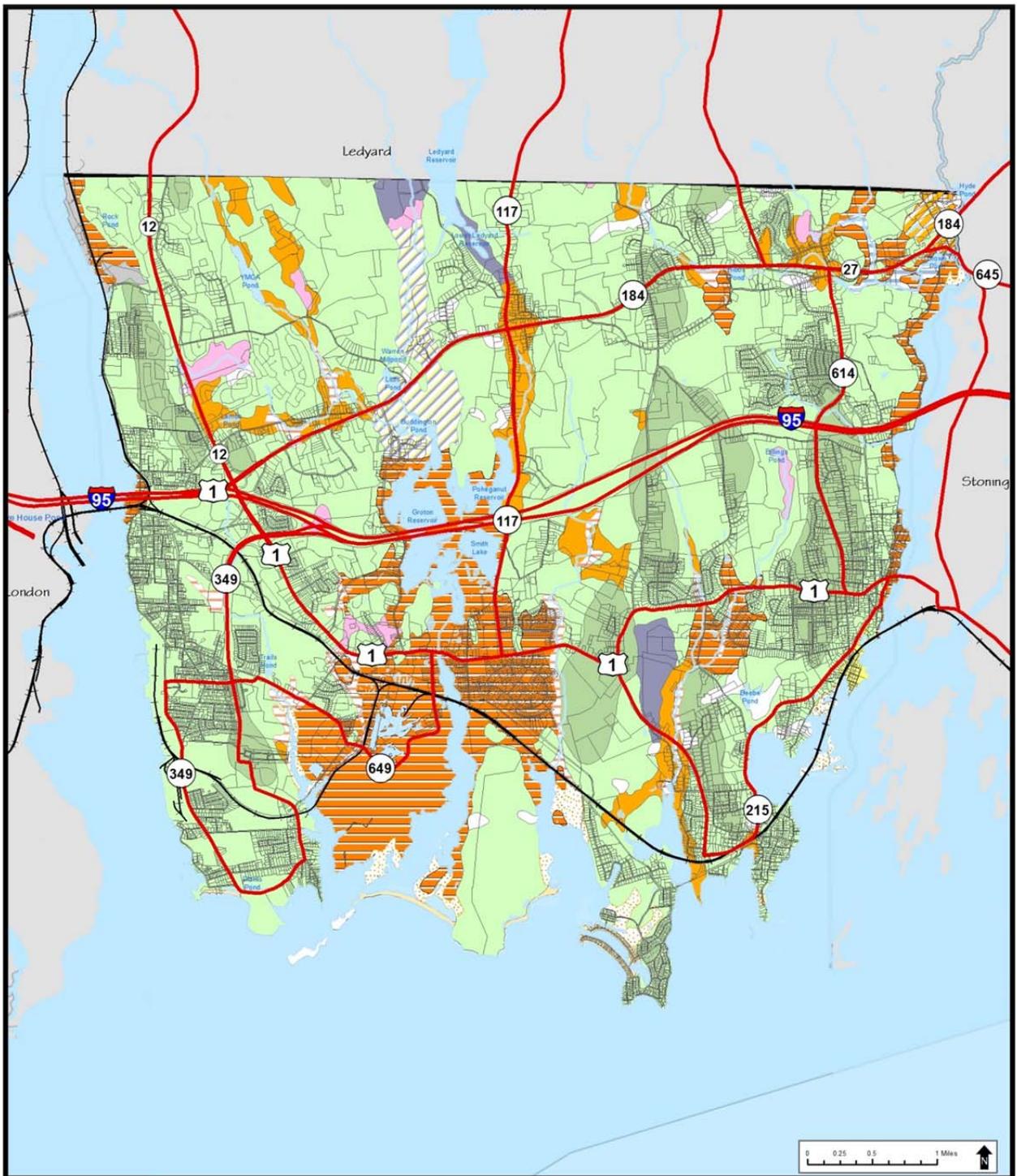
 Hope Valley Alaskite Gneiss	 Potter Hill Granite Gneiss
 Mamacoke Formation	 Quartzite unit in Plainfield Formation
 Narragansett Pier Granite	 Rope Ferry Gneiss
 New London Gneiss	 Westerly Granite
 Plainfield Formation	

Source:
* Street Centerline: Town of Groton Geographic Information System Data
* Survey and Geologic Data: Connecticut Department of Environmental Protection Map # Geographic Information Center (2012)

The map was developed for use as a planning document. Distortions may not be exact.

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Surficial Geology

Surficial Materials

ALLUVI/FINES	SAND
ALLUV/SAND	SAND+GRAVEL
ALLUV/SAND+GRAVEL	SAND+GRAVEL/FINES
ARTIFICIAL FILL	SAND+GRAVEL/SAND
BEACH	SAND+GRAVEL/SAND/FINES
GRAVEL	SWAMP
GRAVEL/SAND	THICK TILL
SALT MARSH	TILL

Sources:
 * Street Centerline: Town of Groton Geographic Information Systems Dept.
 * Topographic and Geologic Data: Connecticut Department of Environmental Protection Map & Geographic Information Center (2012)
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SOILS

Certain soil types are valuable for their intrinsic characteristics and the ecological services they provide. Other soils impose limitations on potential development. For these reasons, soil types are an important consideration during the comprehensive planning process.

HYDROLOGIC SOIL GROUPINGS

Hydrologic soil groups are classifications of soil types based on their run-off and water transmission characteristics. There are four hydrologic soil groups:

Group A – Soils that have low runoff potential when thoroughly wet, and water is transmitted freely through the soil.

Group B – Soils in this group have moderately low runoff potential when thoroughly wet, and water transmission through the soil is unimpeded.

Group C – Soils in this group have moderately high runoff potential when thoroughly wet and water transmission through the soil is somewhat restricted.

Group D – Soils in this group have high runoff potential when thoroughly wet and water movement is restricted or very restricted.

(USDA - NRCS, May 2007)

Hydrologic Group D soils are shown in the *Hydrologic Soil Group D* map. These soils represent areas sensitive to development because of their potential for runoff.

WETLAND SOILS

Wetlands have many defining characteristics: periods of standing water, saturated soil conditions, and specific organisms and vegetation that are adapted to or tolerant of saturated soils. In Connecticut, wetlands are defined by soil types, specifically soils that are classified as Poorly Drained, Very Poorly Drained, and/or Alluvial/Floodplain by the Natural Resources Conservation Service (NRCS) of the U.S. Geological Survey.

Wetlands provide highly productive natural ecosystems; habitat for a variety of plant and animal species, including threatened and endangered species; flood protection in their ability to store and slowly release flood waters; and serve to improve water quality through sediment and nutrient removal processes.

About 11% of Groton's land area, or approximately 2,190 acres, consists of wetland-designated soils. These areas are shown in the *Wetland Soils* map.

STEEP SLOPE SOILS

Steep slopes are important to identify primarily due to their effect on development. While the stability of a slope depends on a variety of factors from underlying geology to vegetation cover, as a general rule slopes greater than 15% pose challenges to development due to difficulty building foundations and siting septic systems. In addition, these areas pose additional hazards in increased erosion and surface runoff. Groton's areas of steep slopes, slopes greater than 15%, are shown in the *Steep Slope Soils* map.

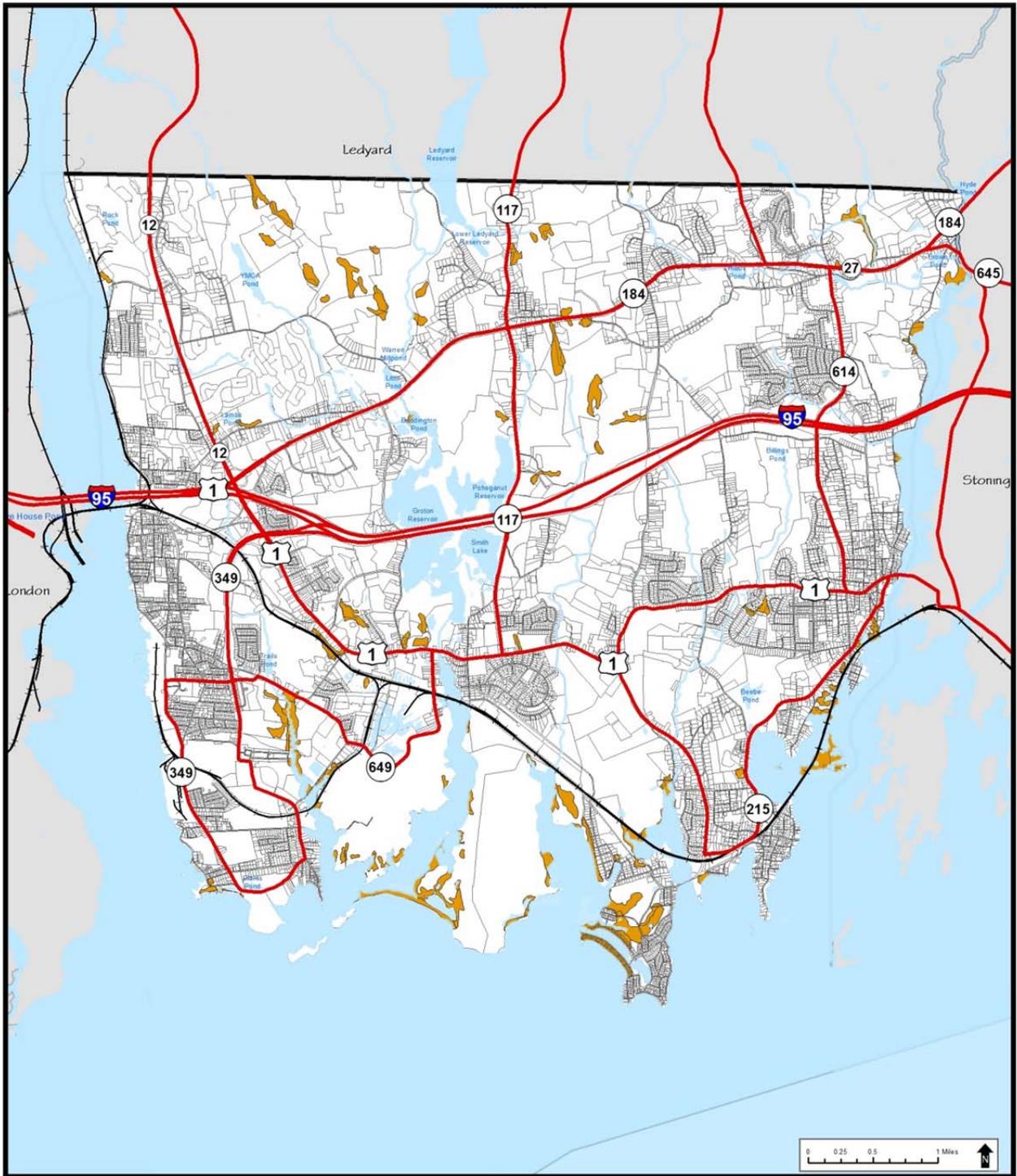
FARMLAND SOILS

Prime farmland is defined by the NRCS as available land with both the physical and chemical properties conducive to producing crops and pasture. These lands are capable of producing sustained yields of economically important agricultural products. Farmlands of statewide importance are additional areas with near prime farmland soils that produce or are capable of producing high yields of crops.

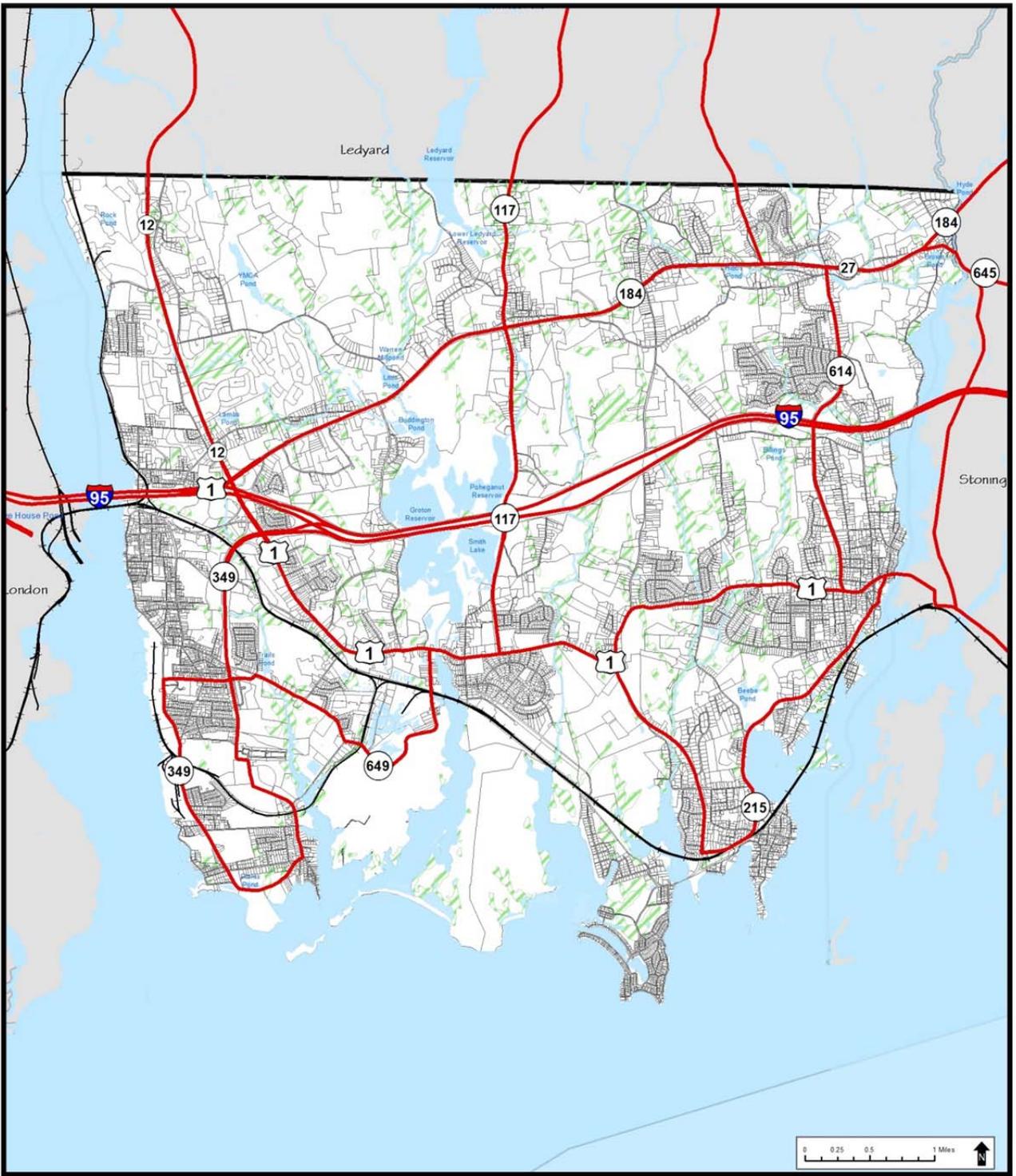
As the State continues to lose farmland soils and farms to development, it is important to consider farmland preservation strategies in the comprehensive planning process. About 22% of Groton's land area, or approximately 4,474 acres, consists of prime farmland soils or farmland soils of statewide importance. These areas are shown in the *Farmland Soils* map. As is evident from the map, many areas with important farmland soils have been developed over the years.

SOILS WITH SHALLOW DEPTH TO BEDROCK

Bedrock depth varies throughout Groton depending on elevation and slope. Understanding what areas have shallow soil depths is important for planning future development, especially for on-site septic system capabilities. Shallow soils, soils with less than 60 inches above bedrock, account for approximately 3,489 acres or about 17% of Groton's land area. These areas are illustrated in the *Shallow Depth to Bedrock Soils* map.



 <p>Groton, Connecticut <i>Plan of Conservation and Development</i></p>	<p style="text-align: center;"><u>Legend</u></p> <p> Hydrologic Group D Soils</p>	<p>Sources: * Street Centerline: Town of Groton Geographic Information System Data. * Elevation and Geologic Data: Connecticut Department of Environmental Protection Map # Geographic Information Center 2011-2. The map was developed for use as a planning document. Distortions may not be exact.</p> <p style="text-align: right;">October 2012</p> <p style="text-align: right; font-size: x-small;">Engineering, Landscape Architecture and Environmental Science</p> <p style="text-align: right;"> MILONE & MACBROOM®</p>
<p>Hydrologically Sensitive Soils</p>		



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Wetland Soils

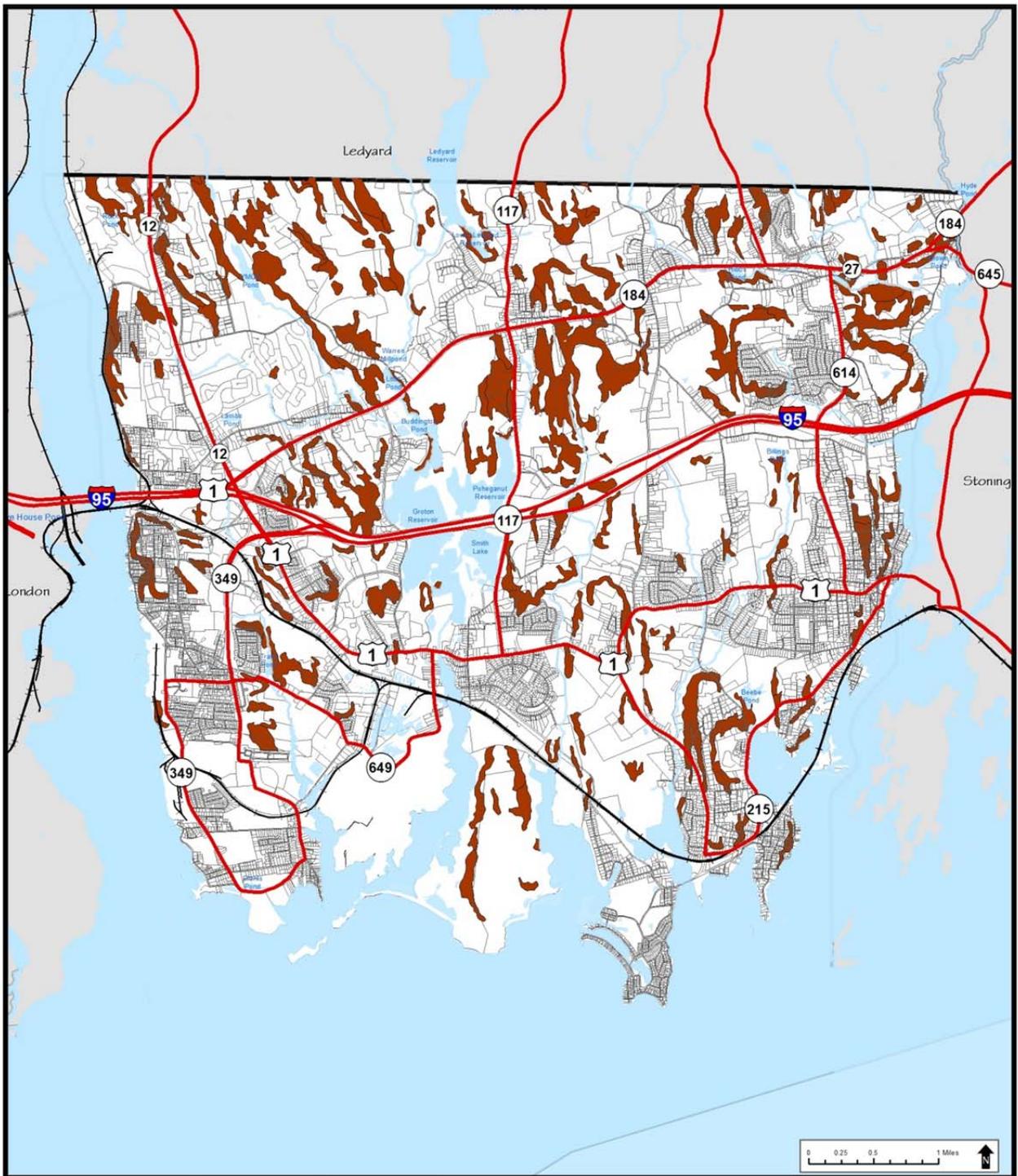
Legend

Wetland Soils

Sources:
 * Street Centlines: Town of Groton Geographic Information Systems Dept.
 * Wetland and Wetland Data: Connecticut Department Of Environmental Protection Map & Geographic Information Center (2012)
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	<p>Groton, Connecticut <i>Plan of Conservation and Development</i></p>	<p><u>Legend</u></p>	<p><small>Sources: * Street Centerlines: Town of Groton Geographic Information System Data * Reservoir and Geologic Data: Connecticut Department of Environmental Protection Map 9 Geographic Information Center (2012) The map was developed for use as a planning document. Distances may not be exact.</small></p>
	<p>Steep Slope Soils</p>	<p> Slopes > 15%</p>	<p>October 2012</p>
			<p><small>Engineers, Landscape Architecture and Environmental Science</small> </p>





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Farmland Soils

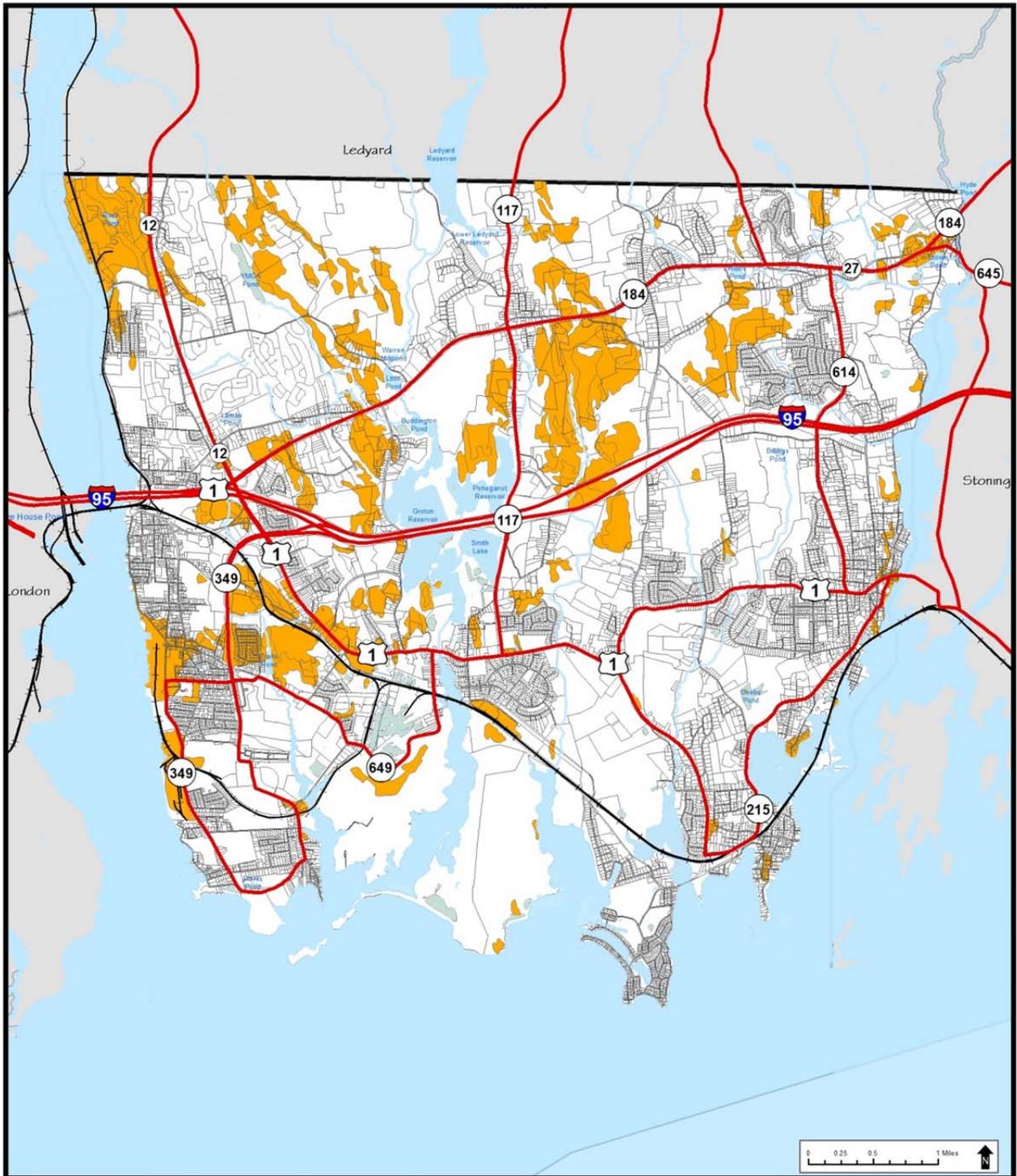
Legend

- Prime Farmland
- Additional Farmland of Statewide Importance

Sources:
 * Street Centerlines: Town of Groton Geographic Information Systems Dept.
 * Statewide and Geologic Data: Connecticut Department Of Environmental Protection Map & Geographic Information Center (2012)
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 <p>Groton, Connecticut <i>Plan of Conservation and Development</i></p> <p style="text-align: center;">Shallow Depth to Bedrock Soils</p>	<p style="text-align: center;"><u>Legend</u></p> <p> Shallow Soils (Max. Depth $< 60''$)</p>	<p>Source:</p> <ul style="list-style-type: none"> • Street Centlines: Town of Groton Geographic Information Systems Dept. • Elevation and Geologic Data: Connecticut Department of Environmental Protection Map & Geographic Information Center (2012) <p>The map was developed for use as a planning document. Distances may not be exact.</p> <p style="text-align: right;">October 2012</p> <p style="text-align: right; font-size: x-small;">Engineering, Landscape Architecture, and Environmental Science</p> <p style="text-align: right;">MILONE & MACBROOM</p>
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WATER RESOURCES

Water resources include watercourses, waterbodies, watersheds and coastal resources. The various reservoirs of the Groton Public Utility Co., YMCA Pond, and Beebe Pond are all major waterbodies within Groton. The Thames and Mystic Rivers on the Town's western and eastern boundaries are major watercourses fed by a network of tributaries.

SUBREGIONAL WATERSHEDS

A watershed is defined as all the land and waterways that drain into the same body of water. All of Groton's land area drains to one of six subregional watersheds: Great Brook, Haleys Brook, Mystic River, Southeast Shoreline, Thames River, and Whitford Brook. All of the drainage basins directly or indirectly drain to Long Island Sound. These watersheds are delineated in the map entitled *Watershed & Public Water Supply*.

Streams in the extreme western part of Town drain to the Thames River. Streams in the north-central region of Groton drain to Great Brook, which discharges to the Poquonock River. Streams in the northeast part of Town drain to Red Brook, Haleys Brook, and Blindloss Brook, flowing eastward towards the Mystic River. Streams in the central and southern portion of Groton drain southward to Birch Plain Creek, eventually discharging to the Sound in Baker Cove; Fort Hill Brook, eventually discharging to the Sound in Mumford Cove; and Eccleston Brook or Fishtown Brook, eventually discharging to the Sound in Palmer Cove.

Watersheds define the natural drainage systems in Groton. Managing watershed in a sustainable manner is critical to ensuring the community maintains a reliable drinking water supply, and the ability to support a variety of plant and wildlife and to attenuate flood conditions.

RESERVOIRS

The Groton Public Utilities Water Division serves a population of approximately 45,000 primarily throughout the Town of Groton, and parts of neighboring Ledyard, Montville and the Mohegan Tribal Authority. The Water Division relies on five interconnected reservoirs and three wells to supply the system. The five reservoirs are fed by a 15.6 square mile watershed shown on the *Watershed & Public Water Supply* map as the "public water supply watershed." Four of the reservoirs: Morgan, Ledyard, Poheganut and Smith Lake flow into Poquonock, the Water Division's terminal reservoir. The Groton public Utilities Water Division is in compliance with all water quality standards as of 2011.

WATER QUALITY

The quality of surface waters often serves as an indicator of the burdens of development and human activity on water resources. Poorer quality waters often suffer from water quality events, such as spills, or more generally contaminated runoff.

According to the latest Connecticut Department of Energy and Environmental Protection (CT DEEP), all surface waters physically located in Groton and its immediate coastal boundary are meeting goals for current and future uses. Both the Thames and Mystic Rivers are also meeting water quality goals. At the time the 2002 Groton Plan of Conservation and Development was prepared, the Thames River was not meeting water quality criteria. The most recent water quality classifications are shown in the *Surface Water Qualities* map.

COASTAL RESOURCES

The shorefront of the Town of Groton contains developed shorefront along the Thames River; areas of rocky shorefront at Bushy Point, Bluff Point, and Groton Long Point; coastal bluffs and escarpments at Bluff Point; modified bluffs and escarpments at Groton Long Point, Noank, and West Mystic; and beaches and dunes at Bluff Point Beach, Bluff Point, and Groton Long Point. Portions of Baker Cove, the Poquonock River, Mumford Cove, Palmer Cove, Beebe Cove, and Mystic Harbor are estuarine embayments.

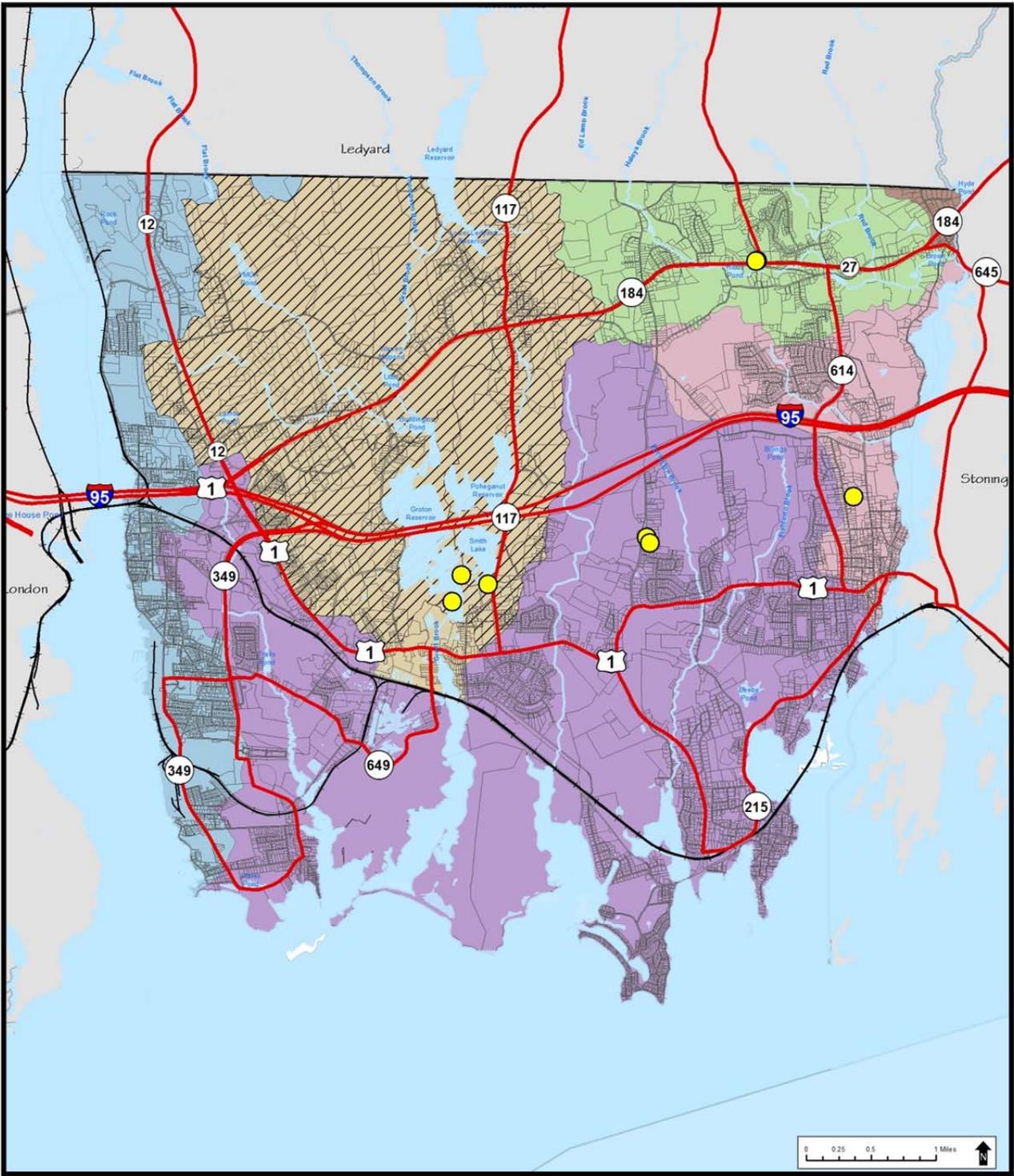
Given the amount of marine industry based in Groton, the location and health of marine resources are critical to the community. The *Shellfish Resources* map shows the location of various shellfish and eelgrass beds. Eelgrass grows in shallow bays and coves and provides important habitat for numerous species of fish and other wildlife. Eelgrass had largely been destroyed in Long Island Sound by a fungal disease in the 1930s and as a result of nitrification of the waters. Restoration efforts have helped Eelgrass reestablish in Eastern Long Island Sound, including off the coast of Groton and in Mystic Harbor. The abundance of eelgrass beds indicates good water quality, acceptable levels of nutrients and good habitat for aquatic life.

Sea-level rise and coastal adaptation will be addressed in detail in the Coastal Management Plan, rather than this memo.

FLOOD ZONES

Flood zones are areas that the Federal Emergency Management Agency (FEMA) has identified according to varying levels of flood risk. These include floodplains, broad areas of river or stream valleys that are formed through a series of flood events and shoreline areas subject to coastal flooding events.

A 100-year flood zone is an area that has a one percent probability of experiencing flooding in any given year, or is likely to experience flooding once every one-hundred years. A coastal flood zone is a coastal area with a one percent annual chance of experiencing flooding and the hazards associated with storm waves. These are considered high risk areas, according to FEMA. Existing flood zones are delineated on the *FEMA Flood Zones* map. Preliminary 2012 Flood Maps are expected to be adopted in spring 2013. Those maps are available in the Groton Office of Planning and Development Services, and should be incorporated in the Plan of Conservation and Development upon adoption.





Groton, Connecticut
Plan of Conservation and Development

Watersheds & Public Water Supply

Subregional Drainage Basins

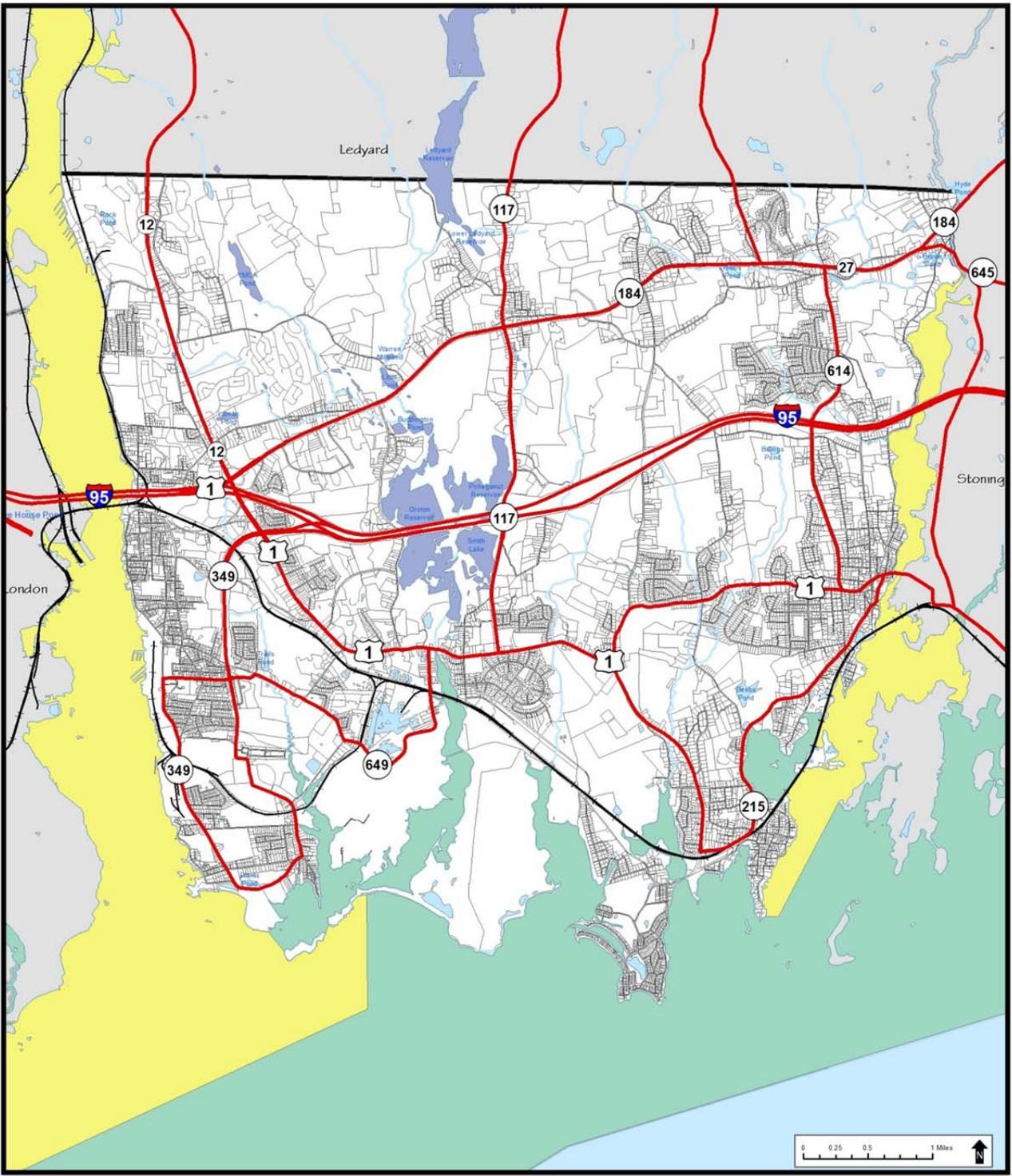
 Great Brook	 Haleys Brook	 Community Wells
 Mystic River	 Southeast Shoreline	 Public Water Supply Watershed
 Thames River	 Whitford Brook	

Sources:
 * Street Centlines: Town of Groton Geographic Information Systems Dept.
 * Elevation and Geologic Data: Connecticut Department Of Environmental Protection Map & Geographic Information Center (2012)
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Surface Water Quality

Water Quality Classification

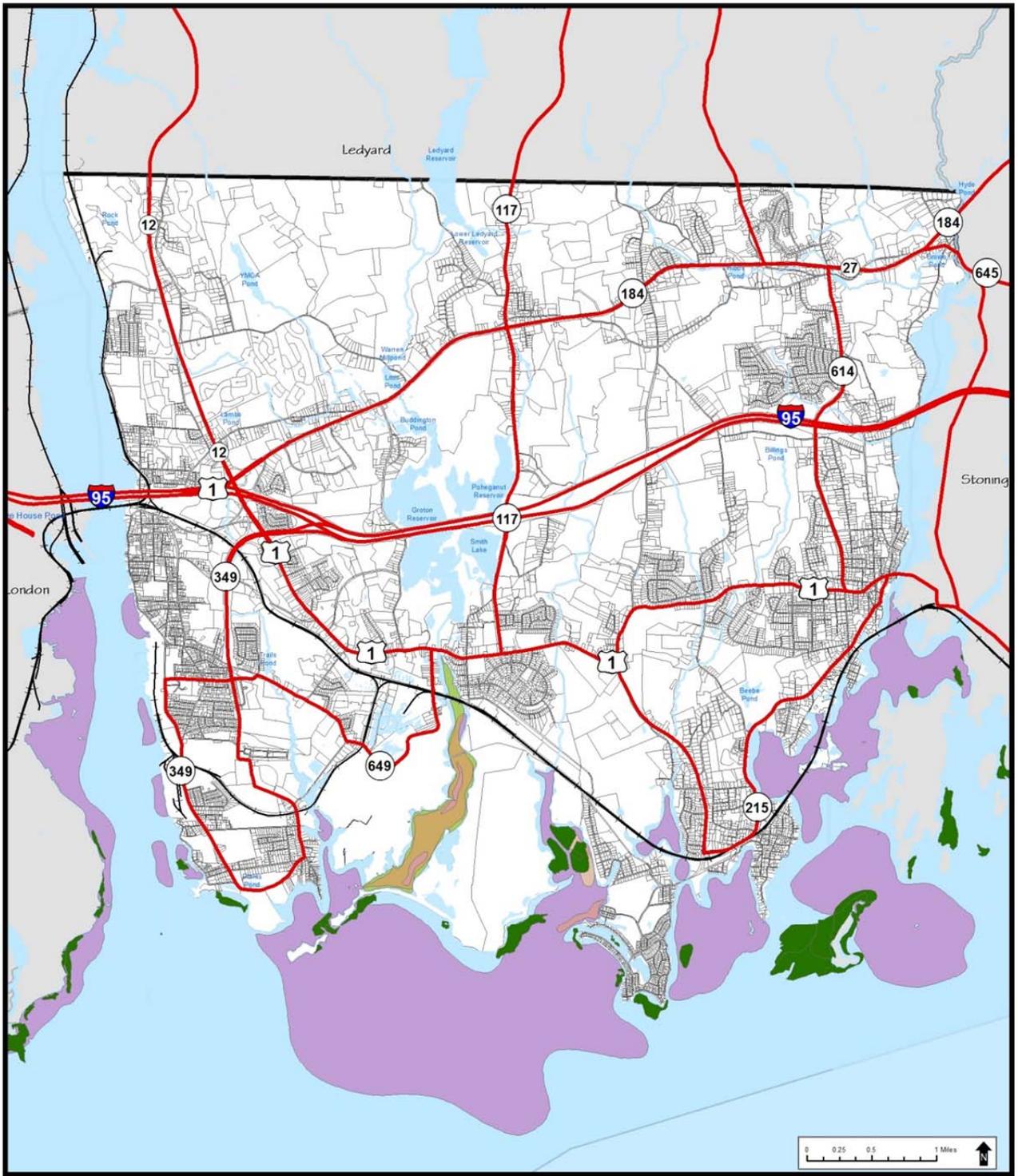
- Support Potential Drinking Water, Fish/Wildlife, Recreation
- Support Existing Drinking Water, Fish/Wildlife, Recreation
- Salt Water Support Fish/Wildlife, Recreation
- Salt Water Support Fish/Wildlife, Recreation, Agriculture, Industry

Division:
 * Street Centerline: Town of Groton Geographic Information System Data
 * Reservoir and Water Quality Data: Connecticut Department of Environmental Protection-Map & Geographic Information Center (2012)
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Shellfish Resources

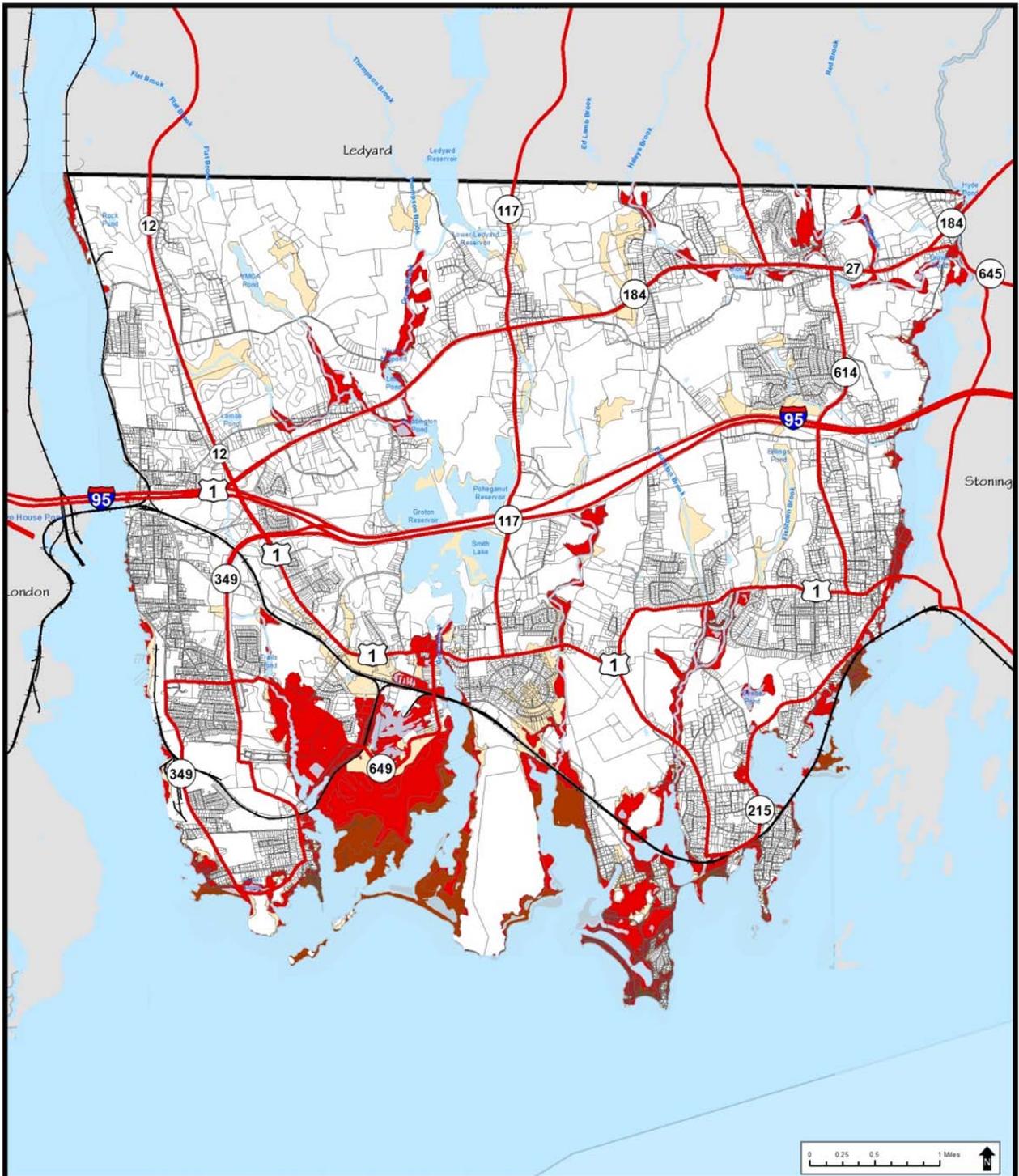
Shellfish and Eelgrass Beds

 Eelgrass	 Oyster
 Shellfish	 Oyster / Hard Clam
 Hard Clam	 Oyster / Hard Clam / Soft Clam
 Hard Clam / Soft Clam	 Soft Clam

Sources:
 * Street Centerlines: Town of Groton Geographic Information Systems Dept.
 * Seawall and Geologic Data: Connecticut Department of Environmental Protection Map & Geographic Information Center (2012)
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FEMA Flood Zones

Flood Zones

- 100-Year Flood Zone
- 500-Year Flood Zone
- Coastal Flood Zone

Sources:
 * Direct Centerline: Town of Groton Geographic Information Systems Dept.
 * Submap and FEMA Data: Connecticut Department of Environmental Protection Map & Geographic Information Center (2012)
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SIGNIFICANT HABITATS AND STATE LISTED SPECIES

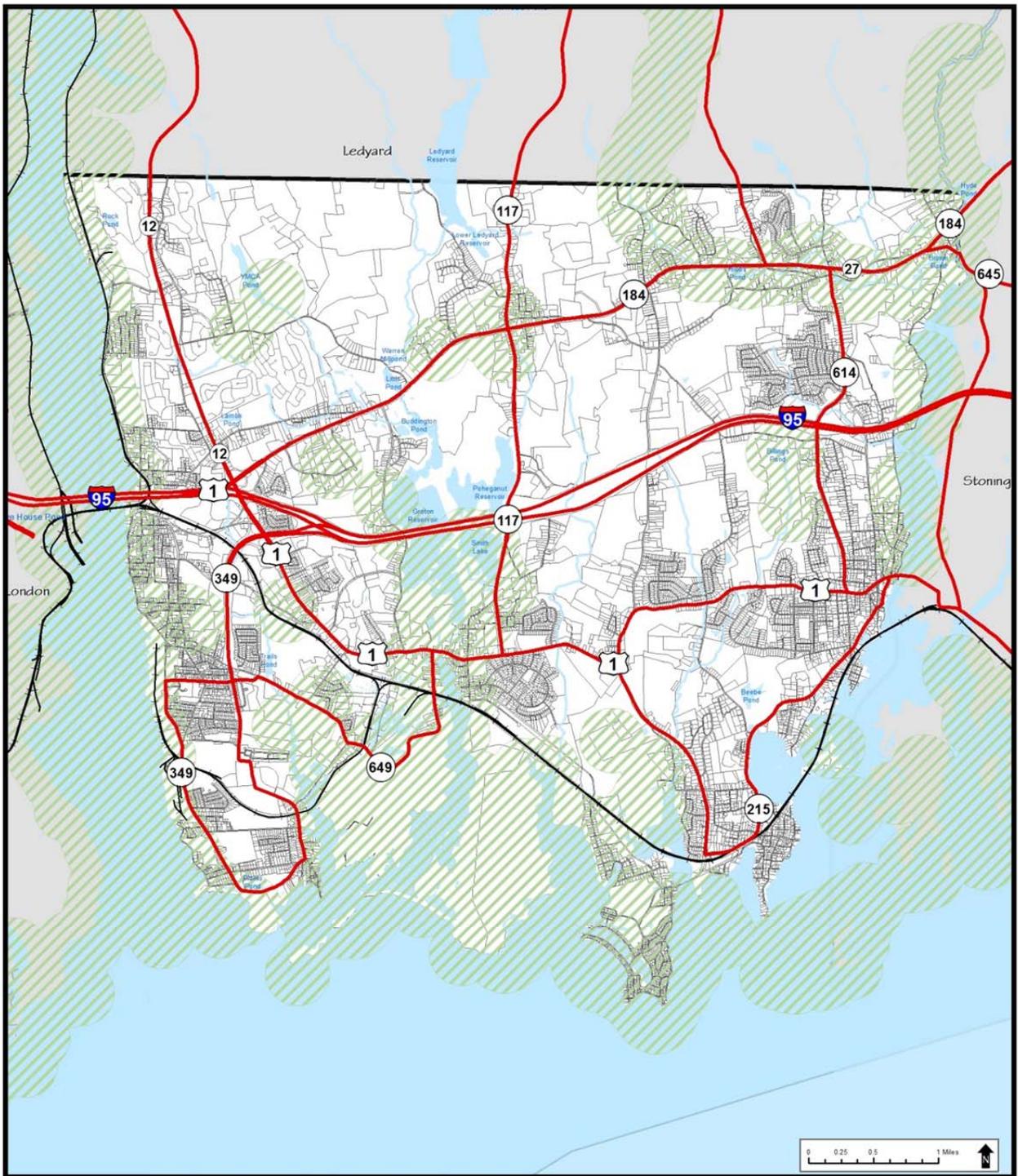
The variety of topography, forested lands, and coastal resources provide exceptional habitats for a variety of plants and animals. The CT DEEP has inventoried sites across the state that contain habitats of endangered, threatened and special concern species in the Connecticut Natural Diversity Database. The database represents years of biological surveys and identify areas that are unique and receive special protection status. The *Significant Habitat & State Listed Species* map highlights these areas. As is demonstrated in the map, Groton's high quality marine resources provide unique habitats.

CONCLUSION

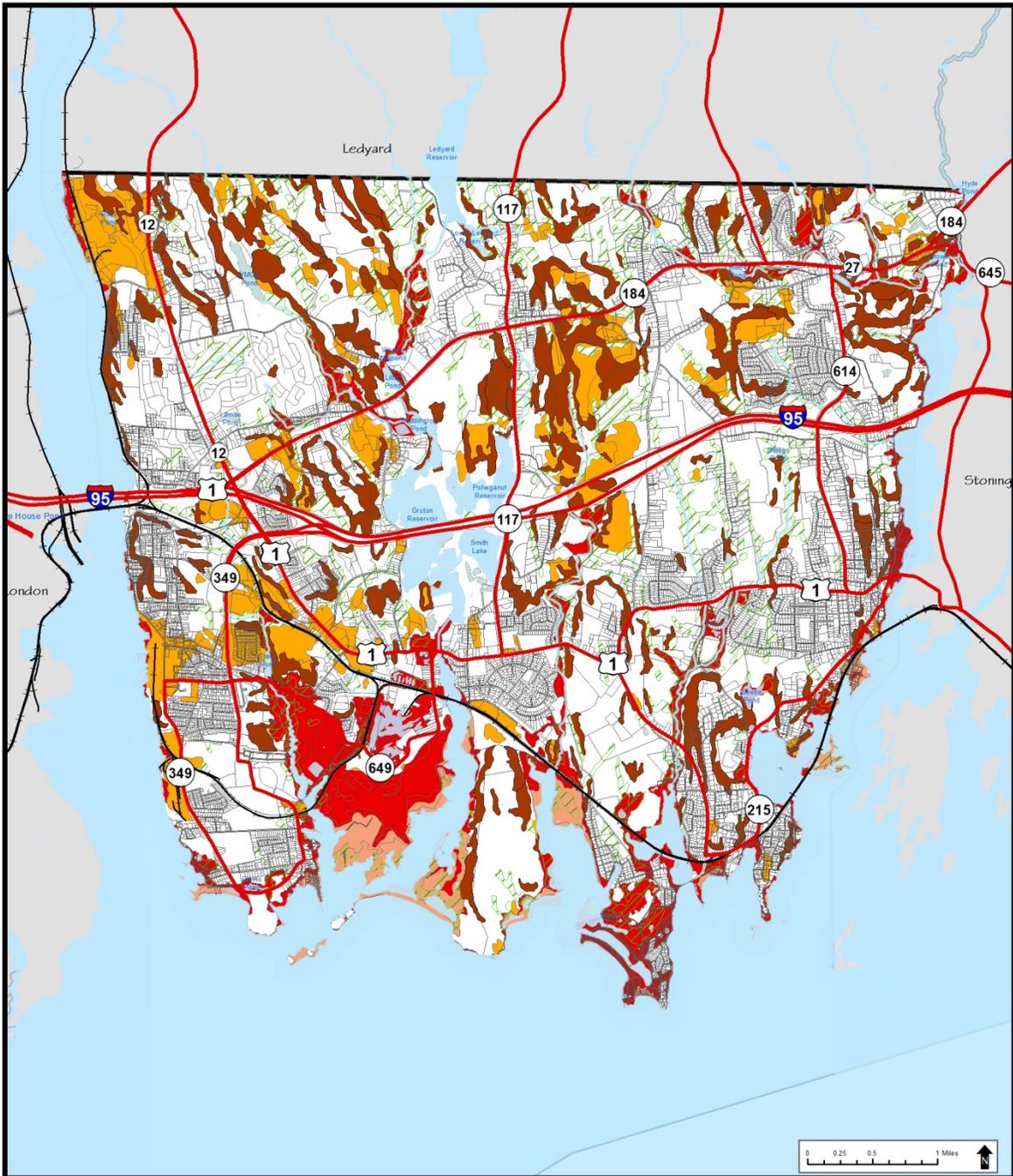
The natural resources inventory presented here represents the natural attributes of the Town of Groton that may offer opportunities for or constraints on development. Given the scale of the maps presented in this memo, it is important to recognize that this analysis is not intended to determine the suitability of particular parcels or sites for development. Rather, this analysis points to large areas of the community with multiple physically constraining features that may be appropriate for targets of conservation efforts.

Properties that are particularly sensitive to development are shown on the map, *Areas Physically Sensitive to Development*. These areas include those with shallow, wetland and/or steep slope soils, as well as 100-year flood zones. Additional constraints are presented by habitats identified in the Natural Diversity Database, public water supply watershed lands. Appropriate development techniques and siting can be used to mitigate these additional constraints.

The information in this memo must be considered as the planning process evolves into setting goals and policies for guiding future development and conservation efforts.



 <p>Groton, Connecticut <i>Plan of Conservation and Development</i></p>	<p style="text-align: center;"><u>Legend</u></p> <p> Natural Diversity Database Site</p>	<p>Sources: * Street Centerline: Town of Groton Geographic Information Systems Dept. * Boundary and Geologic Data: Connecticut Department of Environmental Protection Map & Geographic Information Center (2012) This map was developed for use as a planning document. Distances may not be exact.</p> <p style="text-align: right;">October 2012</p> <p style="text-align: right; font-size: x-small;">Engineering, Landscape Architecture and Environmental Science</p> <p style="text-align: right;"></p>
<p>Significant Habitat ‡ State Listed Species</p>		





Groton, Connecticut
Plan of Conservation and Development

Areas Physically
Sensitive to Development

Physical Constraints

- Wetland Soils
- Slopes > 15%
- 100-Year Flood Zone
- Coastal Flood Zone
- Shallow Soils (Max. Depth <60")

Sources:
 * Street Centerlines: Town of Groton Geographic Information System Data
 * Wetland and Geologic Data: Connecticut Department of Economic Protection, Maps & Geographic Information Center (2012)
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