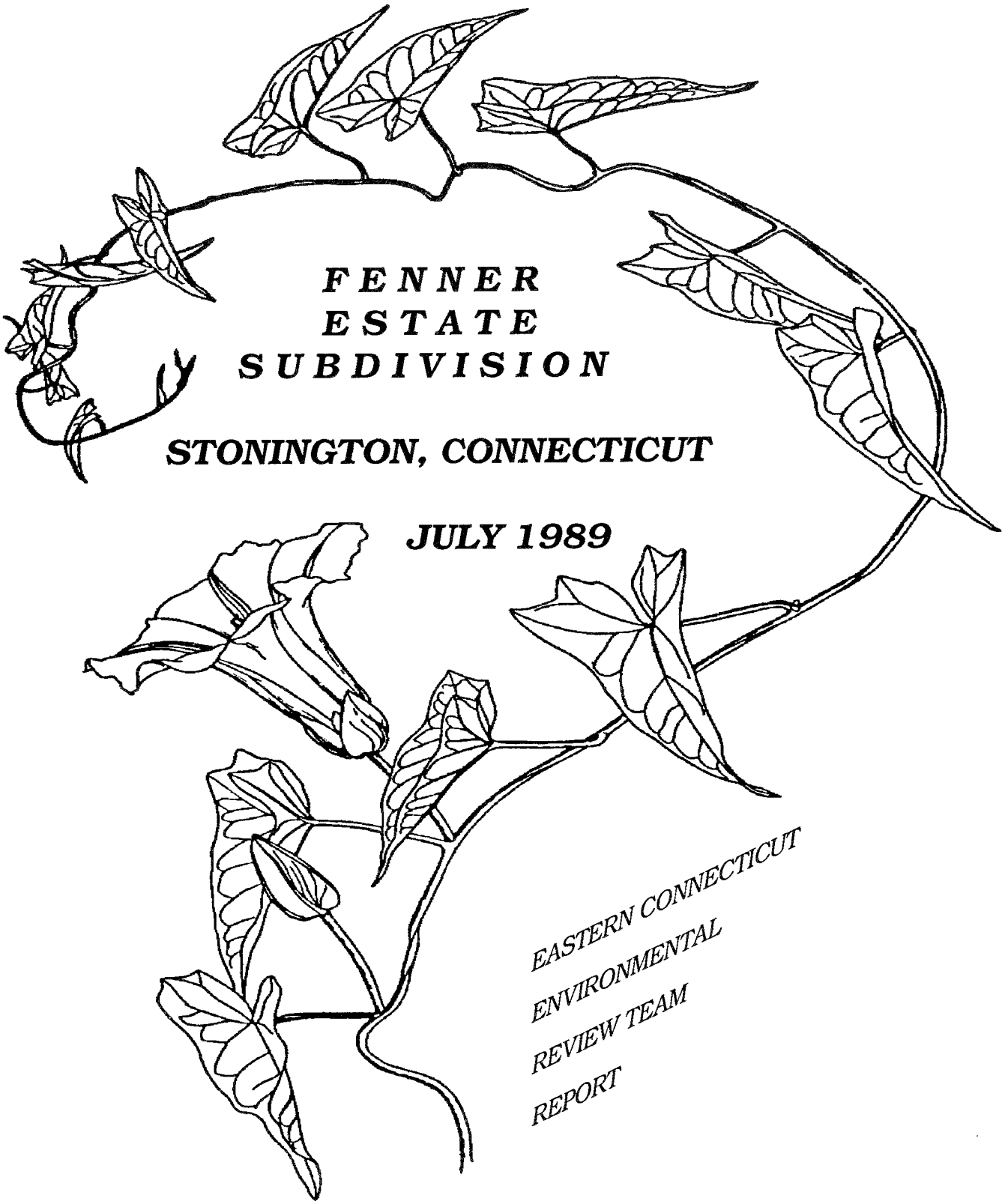


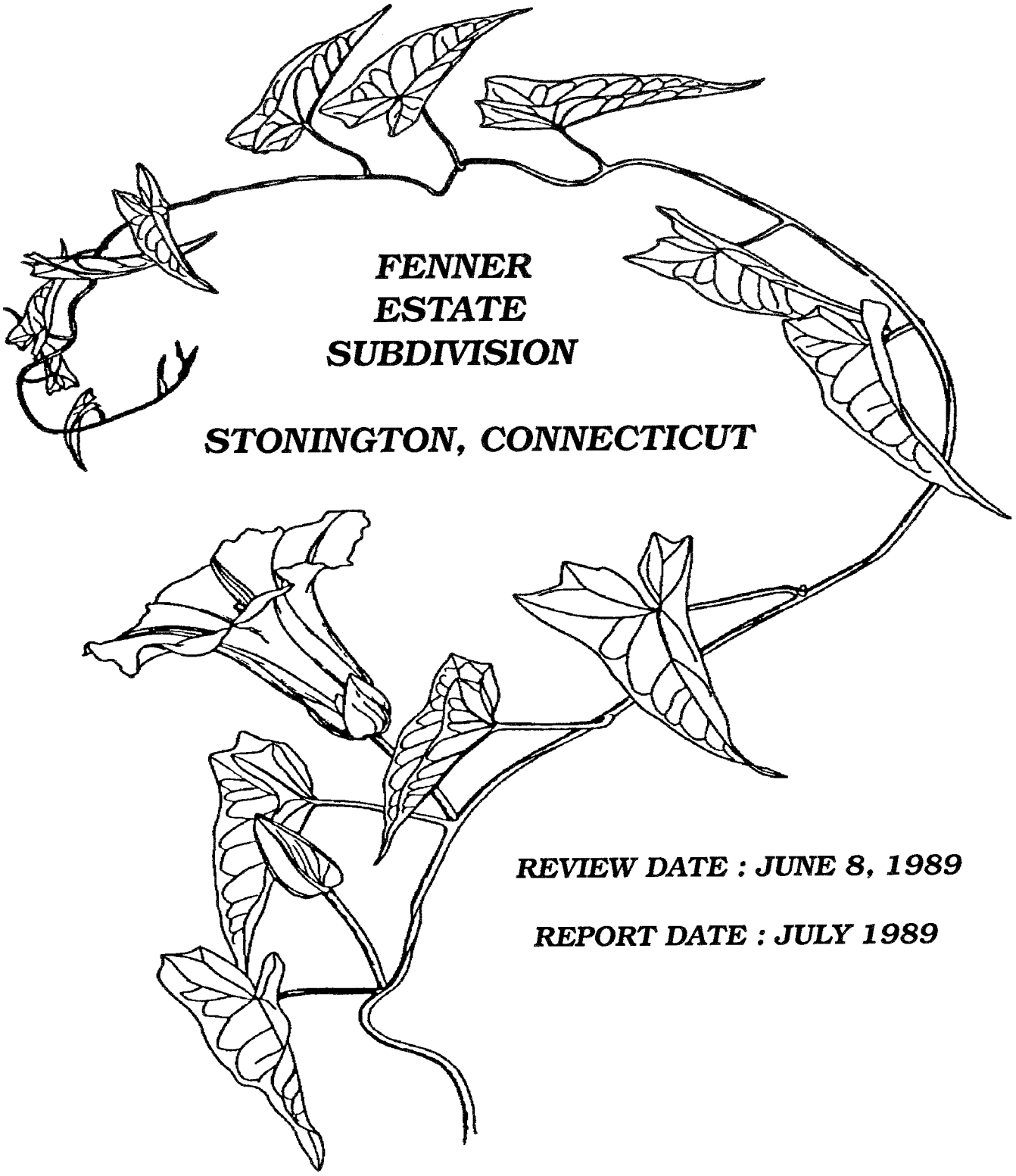
FENNER ESTATE SUBDIVISION

STONINGTON, CONNECTICUT

JULY 1989

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut Resource Conservation and Development Area, Inc.



FENNER ESTATE SUBDIVISION

STONINGTON, CONNECTICUT

REVIEW DATE : JUNE 8, 1989

REPORT DATE : JULY 1989

Eastern Connecticut Environmental Review Team
Eastern Connecticut Resource Conservation and Development Area, Inc,
P.O. Box 70, Route 154
Haddam, CT 06438
(203) 345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

FENNER ESTATE SUBDIVISION
STONINGTON, CONNECTICUT

This report is an outgrowth of a request from the Stonington Inland Wetlands Commission to the New London County Soil and Water Conservation District (SWCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Thursday, June 8, 1989. Team members participating on this review included:

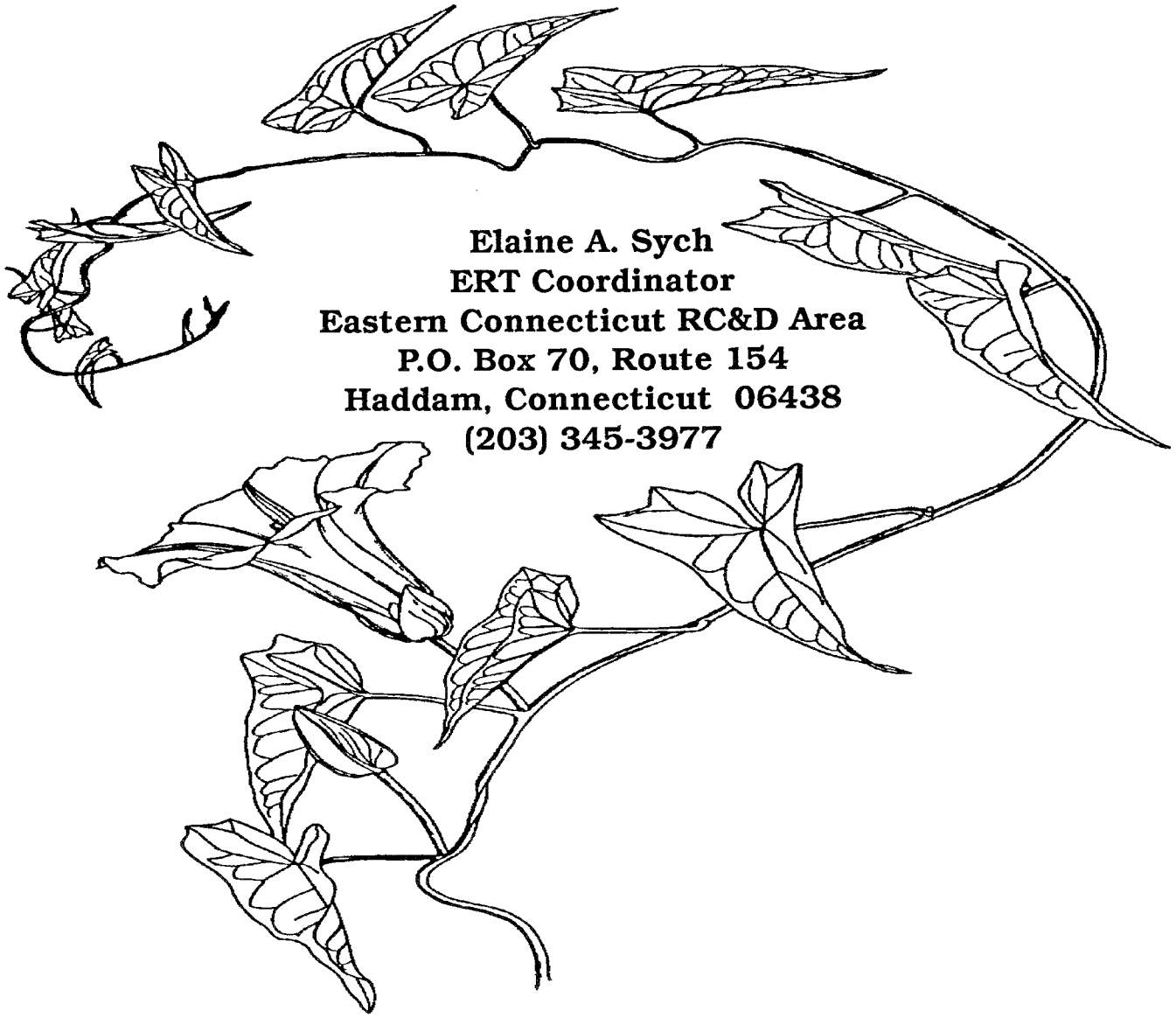
Sharon Ashworth	***Wildlife Assistant***	***DEP-Eastern District Headquarters***
Nick Bellantoni	***State Archaeologist***	***CT Museum of Natural History***
Patrice D'Ovidio	***Soil Conservationist***	***USDA-Soil Conservation Service***
Carla Harvey	***Environmental Analyst***	***DEP-Water Resources Unit***
Steve Hill	***Wildlife Biologist***	***DEP-Eastern District Headquarters***
Brian Murphy	***Fisheries Biologist***	***DEP-Eastern District Headquarters***
Elaine Sych	***ERT Coordinator***	***Eastern CT RC&D Area, Inc.***
Bill Warzecha	***Geologist/Sanitarian***	***DEP-Natural Resources Center***

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, and a soils map. During the field review the Team members were given subdivision plans and addtional information. The Team met with, and were accompanied by the project engineer and the applicant's legal counsel. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project — all final decisions rest with the Town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed development, and also suggests considerations that should be of concern to the developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in making your decisions on this proposed subdivision.

If you require additional information, please contact:



Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P.O. Box 70, Route 154
Haddam, Connecticut 06438
(203) 345-3977

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1. SETTING AND LAND USE

The site, ±119 acres in size, is located about 1,000 feet south of Interstate 95 at Interchange 91 in central Stonington. It is bounded on the east by Farmholme Road, on the south by Barnes Road, on the west by North Main Street and Pequot Trail (Route 234), and Old Pequot Trail and on the north by private, residential lots. Squire Drive and Heritage Drive, cul-de-sacs that serve a residential subdivision, terminate at the site's northern boundary. It is understood that these roads are presently not approved town roads.

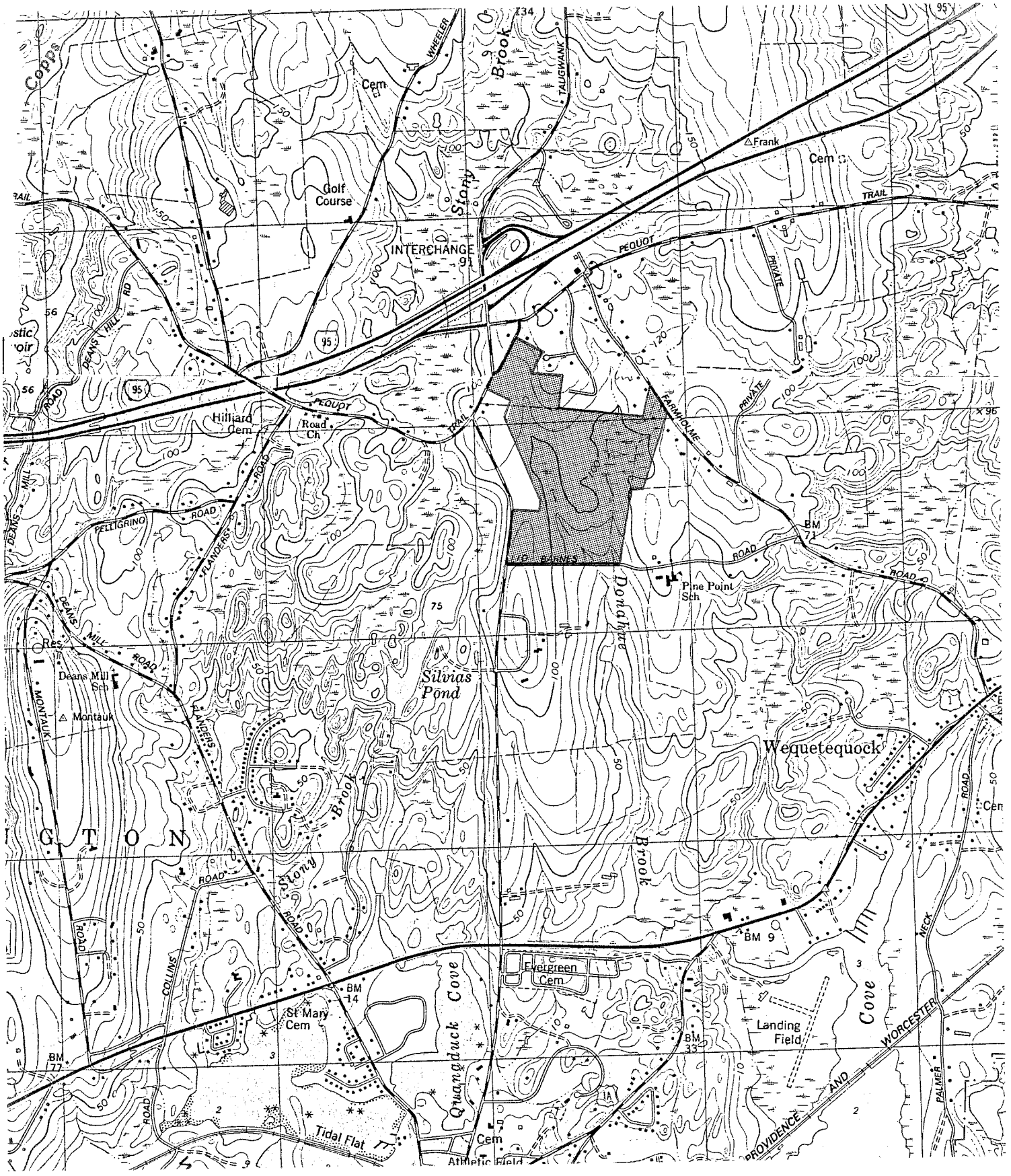
Donahue Brook, which originates in small ponds just north-northeast of the site, flows in a southerly direction to Wequetequock Cove.

Low density residential and agricultural land uses typify the area. The presence of numerous stonewalls transecting the site give testimony to its agricultural past. Additionally, review of a 1954 air photo comfirms agricultural use of the site and surrounding areas. Every effort should be made to preserve the stone walls on the site.

Town officials noted on the review day that the site is located in a RR-80 or 2 acre zone. The minimum lot size for residential purposes would be approximately 80,000 square feet or 2 acres. Plans distributed to Team members indicate the proposed lots will range in size from 2.1 acres to 19.5 acres and therefore appear to be in conformance with the RR-80 zone for lot size. Each lot, which would be served by individual on-site septic systems and wells, has road frontage along one of the roads mentioned earlier. As such, no interior road system will be constructed for the subdivision. Lots 1 and 3 (an interior lot) and 11 and 12 (interior lots) will be accessed by two common driveways via Pequot Trail and Barnes Road, respectively.

LOCATION MAP

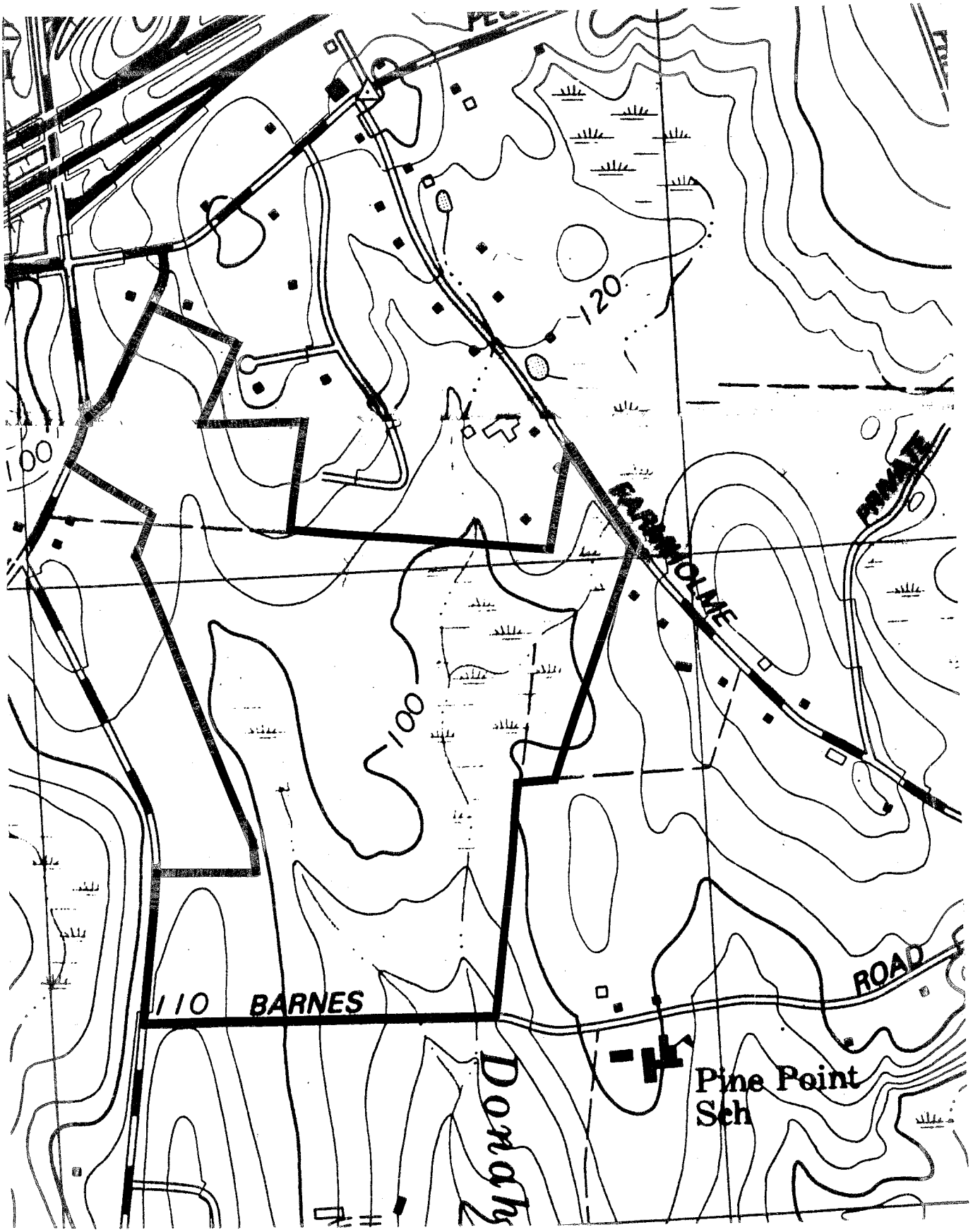
Scale 1" = 2000'



TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary



2. TOPOGRAPHY

The proposed subdivision site is situated between three streamlined hills. Donahue Brook, which flows in a southerly direction enroute to Wequetequock Cove, flows through two wetland areas on the site. Land surface on the site slopes gently to the wetlands from all directions. Steeply sloping areas were not visible during the field walk. Site elevations range from about 140 feet above mean sea level at the northern parts to 80 feet above mean sea level near the intersection of Donahue Brook and Barnes Road.

3. GEOLOGY

Bedrock was not observed at the ground surface during the field walk. It was possibly encountered at depths ranging between ±6 feet and ±9.5 feet (on lots 7, 10, and 12) during subsurface exploration for on-site sewage disposal.

Two subunits within the Mamacoke Formation have been identified on the site. The majority of the site is underlain by a hornblende-biotite gneiss. The northern limits are underlain by a biotite gneiss. The latter rock unit is more susceptible to the weathering than the hornblende-biotite gneiss. Because of the high percentage of the mineral biotite in the rock, it tends to weather to low ridges and swales. In general, gneisses are coarse grained metamorphic rocks, geologically altered by heat and pressure commonly with strong layering (foliation).

Based on deep test hole information supplied to Team members, the bedrock surface is shallowest on Lot 10 (Test Hole 3A) where it was possibly encountered at a depth of 6 feet. Bedrock is probably 10 feet thick or less throughout the parcel.

The bedrock underlying the site will be the likely source of domestic water to homes in the subdivision. Drilled wells that penetrate the underlying bedrock will hopefully intersect joints and fractures that are saturated with water. These openings generally occur in the first few hundred below the rock surface. Most homes in the area rely on the underlying bedrock aquifer for doemstic water. (See ***WATER SUPPLY*** Section)

Other than its affect on water quality and quantity to domestic wells drilled in the subdivision, the underlying bedrock should pose no major problems with regard to residential development of the site.

The subdivision site is covered entirely by a glacial sediment called till. It was deposited directly by an ice sheet whose front extended to Fisher's Island. The till consists of varying proportions of sand, silt, gravel, clay and boulders. Particles of different sizes are generally mixed together in a complex fashion.

The texture of the till on the site is sandy and gravelly and tightly compact. In general, it is grey in color. The compact zone is encountered below the weathered and rooted surficial soil zone (2-3 feet below ground surface). Above the compact soil zone the texture of soil is typically loose or only moderately compact. The discussion in the preceding sentences is based on interpretation of deep test hole data supplied by the applicant's engineer.

Because the compact soil zone is slowly permeable, there is a tendancy for seasonal high water tables to occur above the compact or "hardpan" layer during the wet time of year. Additionally, the compact soil zone is slowly permeable characterized by a slow percolation rate. As a result, if septic systems are not properly designed, constructed and maintained in areas characterized by a seasonally high water table condition, the chance for septic system failure will be high and the potential for ground and surface water contamination will be enhanced. (See ***SEWAGE DISPOSAL*** Section).

A bouldery area characterizes the central parts of the site. The removal of large stones and boulders for landscaping and septic system will be necessary in this area.

Regulated wetland soils, which are poorly drained, have been mapped on the site by a certified soil scientist and cover about 50% of the site. They generally parallel the watercourses on the site. A broad wetland occurs in the northeast corner. In order to gain access to lots or the buildable areas of Lots 1, 11 and 12, two driveway crossings of watercourses and/or their accompanying wetlands will be required.

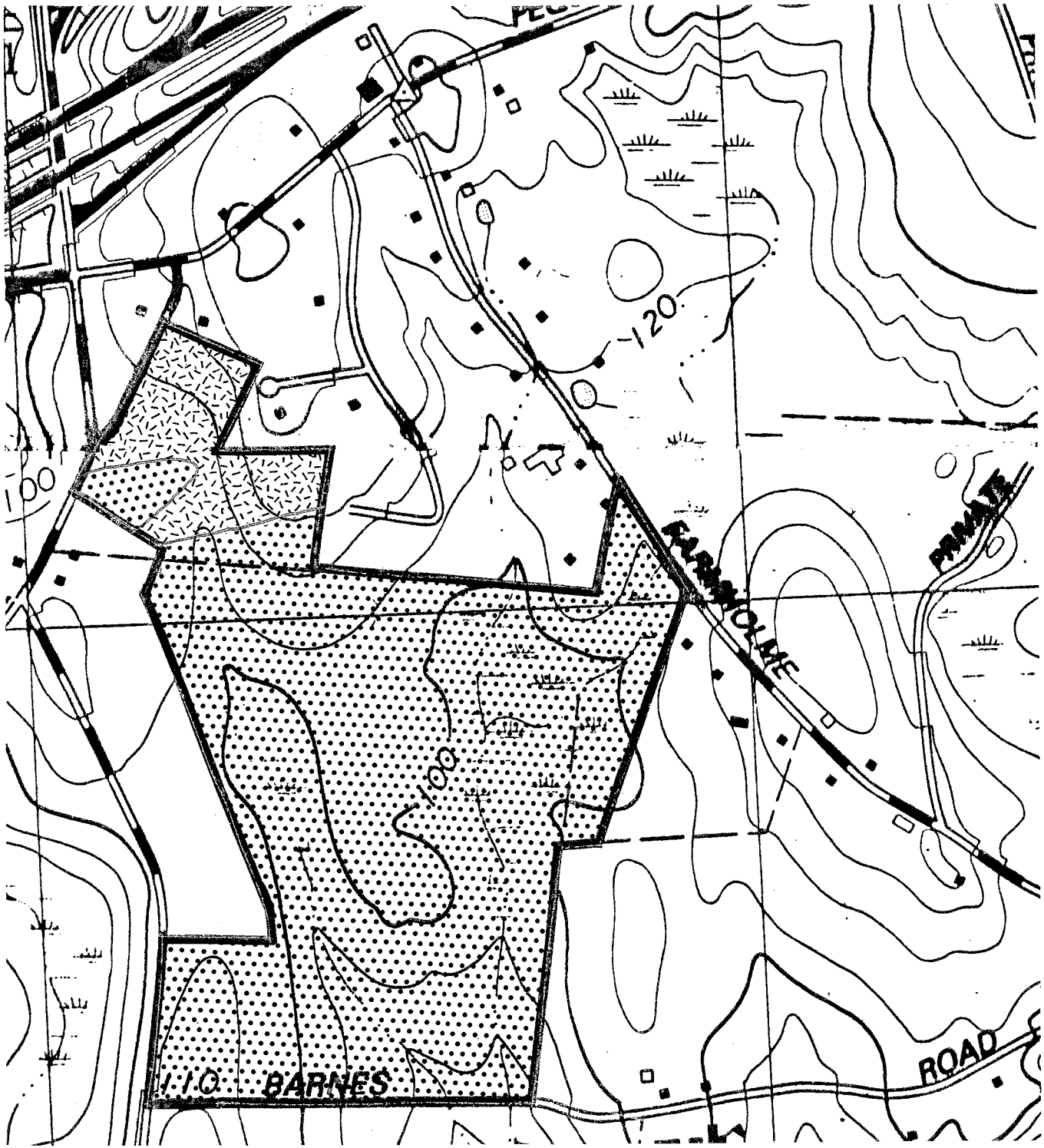
BEDROCK GEOLOGIC MAP

Scale 1" = 1000'

*Both rock units are subunits of the Mamacoke Formation

Hornblende-biotite gneiss

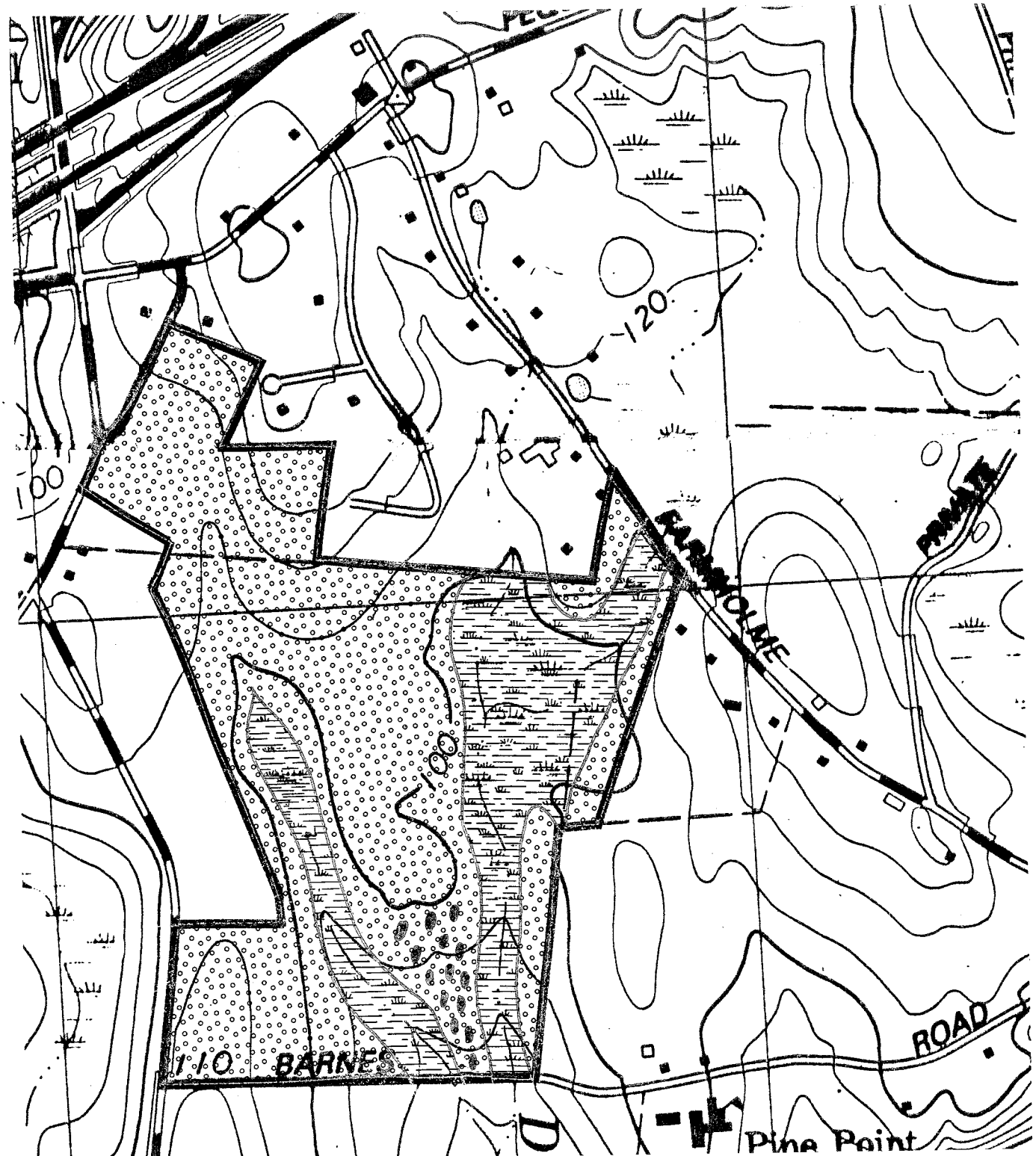
Biotite gneiss



SURFICIAL GEOLOGIC MAP

Scale 1" = 1000'

Till
Swamp Deposits
Bouldery



4. SOIL RESOURCES

It is important to size all pipes and plunge pools associated with the wetland crossings. If the design is substandard, the brook at the crossing could be dammed and excess water could cause the crossing to fail. Plunge pools, if inadequate, would result in excessive erosion and head and bank cutting. Construction at wetland crossings should take place during the driest time of the year so as not to send excessive sediment downstream. The storm drainage calculations used for design criteria were not submitted to the New London County Soil Conservation Service (SCS) office.

The general notes make reference to using the CT Guidelines, the plan narrative does not mention how this information will be applied to this site.

General note #7 states that the contractor shall notify of unsatisfactory erosion control. This practice would be considered a conflict of interest for the contractor. It is recommended that a town appointed official be responsible for sediment and erosion control inspection. The name and contact address of the developer and the excavation contractor should be furnished to this town official prior to the start of construction. A complete maintenance schedule for sediment and erosion control devices can be found in the CT Guidelines, Chapter 7.

Refer to Chapters 6 & 7 of the CT Guidelines for specific information on seedings and mulchings. The information taken from the Guidelines should pertain to this specific site. Seeding dates for New London County are April 15 - June 15 and August 15 - September 30. Seedings need to be protected with mulch as do those areas which, for other reasons, cannot be seeded immediately. Mulching and anchoring methods can be found in Chapter 7 of the CT Guidelines.

The SCS has found that the use of synthetic fabrics in roadbed construction has proven to be very effective when properly applied. The use of these fabrics is advocated, especially at wetland crossings. Follow manufacturers instruction for proper installation. Synthetic sediment fencing is generally considered a preferred material over hay bales because of its longevity, among other characteristics. Sediment control devices are particularly important at wetland crossings to protect downstream areas. Proposed disturbances of the wetland

areas should be delineated on the site plan and this disturbance should be kept to a minimum.

It should be noted that excluding wetland soils on this site, the majority of the soil mapping units are considered prime agricultural soils. Refer to the soil descriptions and the soil test pit data for specific information on soil characteristics. Evidence of a high water table is displayed by mottling. Engineered septic systems may be necessary at these sites to prevent downslope seepage of effluent. Foundation drains are also necessary. Wetness and slow percolation rates dominate these soil types.

Refer to the enclosed checklist for additional items which should be included in the site plan.

Erosion and Sediment Control Plan Worksheet

This is a guide for the development and review of erosion and sediment control plans. Local commissions should be consulted for regulatory requirements concerning erosion and sediment planning.

Checked (✓) items are those that have been provided on the current erosion and sediment control plan. Items identified with a star (*) should be incorporated into final plans.

Name of development Fenner Estate

Materials received Site plan

Total Area 119 acres Location Barnes Road, Stonington

Engineer Total Technology

Date Received June 8 Site Visit _____ Reviewed by SCS

Submitted by Stonington Town Hall

NARRATIVE SECTION DESCRIBING:

_____ The development
_____ Major land uses of adjoining areas
✓ The number of total acres and acres to be disturbed in the project
✓ The schedule of grading and construction activities including start and completion dates.
✓ Application sequence of all E&S control measures
_____ The design criteria for all proposed E&S control measures
_____ Construction details and installation procedures for all proposed E&S control measures
✓ The operations and maintenance program for all proposed E&S control measures
✓ The name of the person or organization that will be responsible for the installation and maintenance of the E&S control measures
✓ Organization or person responsible for maintenance of permanent measures when project is completed. Measures include: _____

-CONTINUED-

Erosion and Sediment Control Plan Worksheet

A SITE PLAN AT A SUFFICIENT SCALE SHOWING:

Natural Features

_____ Existing topography
_____ Existing vegetation
_____ Soils information, including test pit data if available
_____ Identification of wetlands, watercourses, major drainageways and water bodies on the site
_____ Name of soil scientist who performed wetlands delineations and flag numbers
_____ Rock outcrop areas
_____ Seeps, springs
_____ Major aquifers
_____ Floodplains (100 yr.) and floodways
_____ Channel encroachment line (DEP permit required)
_____ Coastal zone boundary
_____ Public water supply watershed boundaries
_____ Possible Army Corps Sec. 404 or Sec. 10 Permit Areas (Contact Corps @ 1-800-343-4789).

Project Features

_____ The location of the proposed development
_____ A plan legend
_____ Adjacent properties
_____ Property lines
_____ Lot lines and setback lines
_____ Lot and/or building numbers
_____ Planned and existing roads
_____ Proposed structures
_____ Location of existing and planned utilities
_____ Location of wells and septic systems
_____ Proposed Topography
_____ North arrow

Clearing, Grading, Vegetative Stabilization

_√_ The sequence of grading, construction, and sediment and erosion control activities
_____ The location of and construction details for all proposed E&S control measures
_____ Recommended measures include _____

_____

_____

_√_ Limits of disturbed areas
_√_ Extent of areas to be graded
_√_ Disposal procedure for cleared material
_√_ Location of stockpiled topsoil and subsoil

-CONTINUED-

Erosion and Sediment Control Plan Worksheet

✓	Temporary erosion control in method for protection of disturbed areas when time of year or
✓	Weather prohibit establishment of permanent vegtative cover
	Seedbed preparation (including topsoiling specifications)
	Fertilizer and lime application rates
	Mulch application rate
✓	Mulch anchoring measures

Drainage System

✓	Existing and planned drainage pattern
✓	Drainage areas used in design of stormwater management system
	Size and location of culverts and storm sewers
✓	Drainage calculations for review by town engineer
	Stormwater management measures and construction details
✓	Groundwater control measures (footing drains, curtain drains)
	Planned water diversions and dams (DEP permit may be required)

House Site Developments

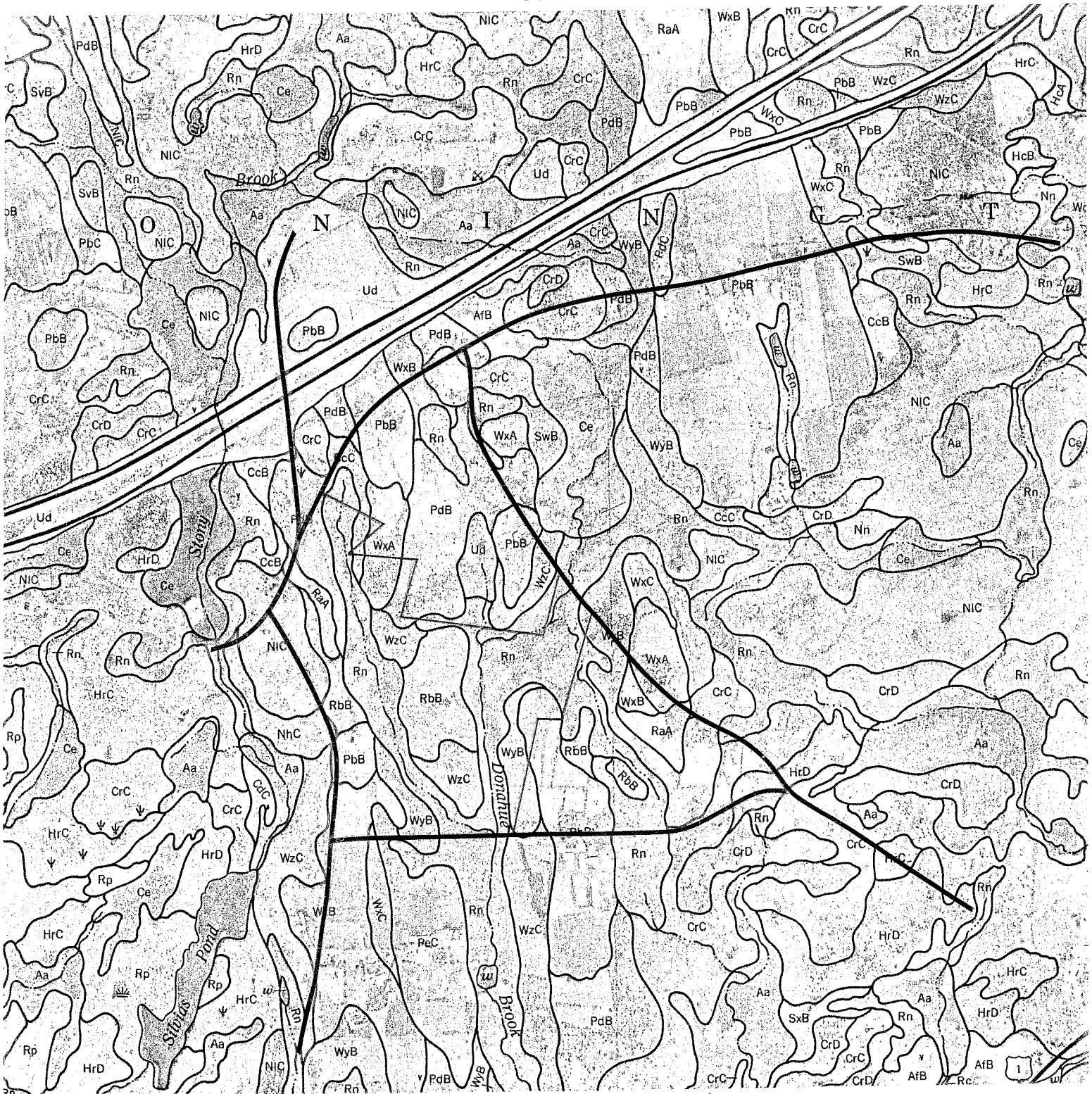
✓	Sediment and erosion control measures for individual lot development

Additional Comments

SOILS

Scale 1" = 1320'

New London County USDA-SCS
562 New London Turnpike
Norwich, CT 06360
887-4163



5. SOILS DESCRIPTIONS

*** PbB - Paxton and Montauk fine sandy loams, 3 - 8 percent slopes**

These gently sloping, well drained soils are on drumloidal, glacial till, upland landforms. Permeability of the Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. Permeability of the Montauk soil is moderate or moderately rapid in the surface layer and subsoil and slow or moderately slow in the substratum. The available water capacity for these soils is moderate. Runoff is medium. These soils warm up and dry out rapidly in the spring. Unless limed, these soils are strongly acid or medium acid. These soils are well suited to cultivated crops. The hazard of erosion is moderate. These soils are suited to trees. The major limiting factor for community development is the very slow, slow, or moderately slow permeability in the substratum.

These soils are in capability subclass IIe.

***PdB - Paxton and Montauk very stony fine sandy loams, 3 - 8 percent slopes**

These gently sloping, well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. Permeability of the Montauk soil is moderate or moderately rapid in the surface layer and subsoil and slow or moderately slow in the substratum. The available water capacity of these soils is moderate. Runoff is medium. These soils warm up and dry out rapidly in the spring. Unless limed, they are strongly acid or medium acid. These soils are not suited to cultivated crops. The hazard of erosion is moderate. These soils are suited to trees. The major limiting factor for community development is very slow, slow, and moderately slow permeability in the substratum.

These soils are in capability subclass VIs.

*** RaA - Rainbow silt loam, 0 - 3 percent slopes**

This nearly level, moderately well drained soil is on drumloidal, glacial till, upland landforms. The Rainbow soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is slow. Rainbow soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid. This soil is well suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and slow to very slow permeability in the substratum.

This soil is in capability subclass IIw.

*** RbB - Rainbow very stony silt loam,0 - 8 percent slopes**

This nearly level to gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 - 8 percent of the surface. The Rainbow soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is slow to medium. Rainbow soil warms up and dries out slowly in the spring. It is strongly acid or medium acid. This soil is not suited to cultivated crops. The hazard of erosion is moderate. This soil is suited to trees. The major limiting factors for community development are a seasonal high water table and slow to very slow permeability in the substratum.

This soil is in capacity subclass VIs.

Rn - Ridgebury, Leicester, and Whitman extremely stony fine sandy loams

These nearly level, poorly drained and very poorly drained soils are in drainageways and depressions of glacial till upland hills, ridges, plains, and drumloidal landforms. Stones and boulders cover 8 - 25 percent of the surface. The Ridgebury and Leicester soils have a seasonal high water table at a depth of about 6 inches. The Whitman soil has a high water table at or near the surface for most of the year. Permeability of Ridgebury and Whitman soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The Ridgebury and Whitman soils are strongly acid through slightly acid. Permeability of Leicester soil is moderate or moderately rapid, it is very strongly acid through medium acid. Runoff for the Ridgebury and Leicester soil is very slow or slow. Whitman soil runoff is very slow, or the soil is ponded. The available water capacity for these soils is moderate. These soils are not suited to cultivated crops. The erosion hazard is slight. These soils are suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. The major limiting factors for community development are the high water table and the slow or very slow permeability in the substratum.

These soils are in capability subclass VIIs.

*** WxA - Woodbridge fine sandy loam, 0 - 3 percent slopes**

This nearly level, moderately well drained soil is on drumloidal, glacial till, upland landforms. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water

capacity is moderate. Runoff is slow. This Woodbridge soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is well suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and the slow or very slow permeability in the substratum.
This soil is in capability subclass IIw.

*** WxB - Woodbridge fine sandy loam, 3 - 8 percent slopes**

This gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. It has moderate permeability in the surface layer and subsoil and slow or very slow permeability in the substratum. The available water capacity is moderate. Runoff is medium. This soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is well suited to cultivated crops. Artificial drainage helps to dry the soil earlier in the spring. The hazard of erosion is moderate. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and slow or very slow permeability in the substratum.

This soil is in capability subclass IIw.

WzC - Woodbridge very stony fine sandy loam, 0 - 8 percent slopes

This nearly level to gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 - 8 percent of the surface. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is medium. This Woodbridge soil warms up and dries out slowly in the spring. It is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is not suited to cultivated crops. The hazard of erosion is moderate. This soil is suited to trees. The major limiting factors for community development are the seasonal high water table and the slow or very slow permeability in the substratum.

This soil is in capability subclass VIs.

WzC - Woodbridge and Rainbow extremely stony soils, 3 - 15 percent slopes

These gently sloping and sloping, moderately well drained soils are on drumloidal, glacial till, upland landforms. Stones and boulders cover 8 - 25 percent of the surface. The Woodbridge and Rainbow soils have a seasonal high water table at a depth of about 18 inches. Permeability of these soils is moderate in the surface layer and subsoil and slow or very slow in the substratum. Runoff of these soils is medium or rapid. These soils warm up and dry out slowly in the spring. The available water capacity of Woodbridge soils is moderate. The Woodbridge soils are strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. The Rainbow soils are strongly acid or medium acid. The available water capacity is high in Rainbow soils. These soils are not suited to cultivated crops. The hazard of erosion is moderate. These soils are suited to trees. The major limiting factors for community development are the seasonal high water table and the slow or very slow permeability in the substratum.

These soils are in capability subclass VIIs.

*** Prime agricultural soils**

6. HYDROLOGY

Except for the southwest corner, the site is located in the Donahue Brook drainage area. The western parts of the site drain into Silvias Pond southwest of the site. This outlet stream for Silvias Pond is Story Brook. However, at its point of outflow into Wequetequock Cove, Donahue Brook drains an area of 1.62 square miles or about 1037 acres. The site, therefore, represents about 10% of the drainage area.

Since the density of homes proposed is low and no interior road system proposed, the increase in post development runoff should not be significant. The broad, flat wetlands on the site will also provide natural storage capabilities for handling post-development runoff increases from the subdivision. Careful examination of the culverts passing under Barnes Road is warranted. Team members were informed that flooding occasionally occurs in this area. Every effort should be made not to aggravate this condition.

The Flood Insurance Rate Map for Stonington indicates that the site lies in a Zone C. This refers to areas of minimal flooding.

The proposed subdivision calls for two wetland driveway crossings between Lots 1 and 4, and 11 and 12. An existing farm or woods road will be improved to serve buildable areas on Lots 1 and 3. The proposed wetland crossing in this area will utilize a formerly disturbed area. This should help to minimize impacts to wetlands in this area. Because of the construction method proposed (geotextile and crushed stone), potential wetland impacts should be further reduced with minor changes.

Present plans indicate that ±237' of regulated wetlands will need to be crossed in order to access Lots 11 and 12, which would be served by a common driveway. Approximately 500 cubic yards of material will be placed over wetlands in this area. The construction method for crossing the wetlands in this area will be similar to the crossing mentioned above except that bank run gravel fill will be placed over the geotextile material/wetland soils and compacted. A 15' wide driveway consisting of 1'" crushed stone will be placed in the bank run gravel fill. It would probably be wise to determine the texture and structural stability of the wetland soils by boring a few holes in this area. If the wetland material contains a high percentage of organic material, it may be displaced by the weight of the driveway fill material so that it may subsequently render the driveway impassable. The applicant has proposed the installation of double (30" x 19") horizontal elliptical reinforced concrete pipes to convey surface flows under the proposed driveway so that flows are not obstructed and existing conditions maintained. (Also see ***WETLAND RESOURCES*** section)

In order to protect water resources on and off site, a detailed erosion and sediment control plan should be designed and enforced for the project. The methods used to control erosion and sedimentation shall be in accordance with the Guidelines for Soil Erosion and Sediment Control - Connecticut (1985).

WATERSHED BOUNDARY MAP

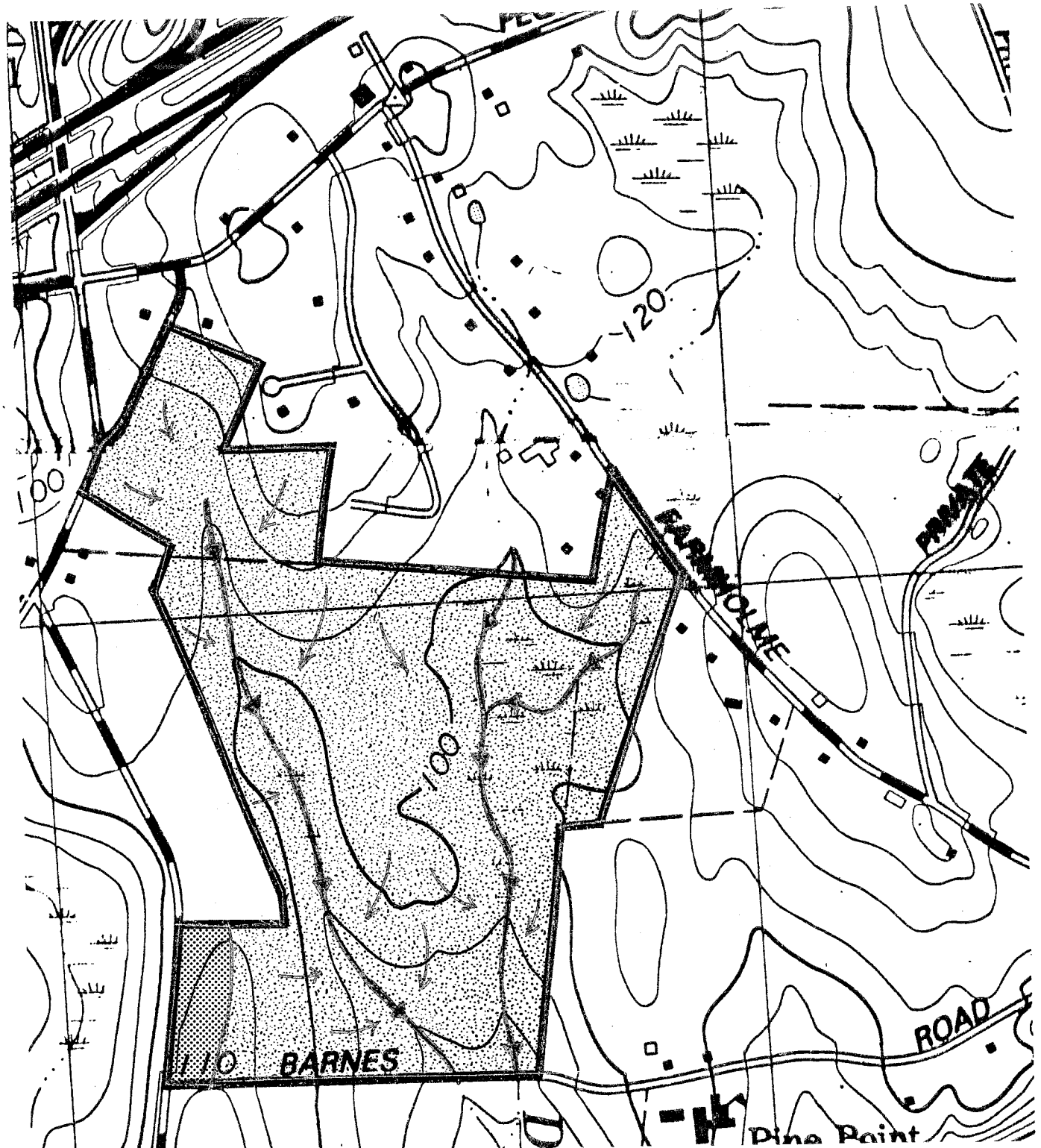
Scale 1" = 1000'

Portion of site that drains to Donahue Brook

Portion of site that drains to Story Brook

Direction of surface flow

Watercourses showing direction of flow



7. WETLAND REVIEW

General Site Features

Wetlands comprise approximately 59.45 acres (±50 percent of the site), of which 45.81 acres are to be donated to the Mashantucket Land Trust, Inc. as open space. The wetlands exist in conjunction with two southerlv flowing brooks on the property: Donahue Brook to the east and another unnamed brook to the west.

The USDA Soil Survey of New London County, CT has mapped the wetlands on this site as the poorly drained and very poorly drained Ridgebury, Leicester, Whitman series (Rn) on 0 to 3 percent slopes. These nearly level soils develop in drainageways and depressions on glacial till upland hills. ridges, plains and drumloidal landforms. Stones and boulders cover 8 to 25 percent of the surface. Mapped areas are long and narrow or irregular in shape.

Wetland Resources

The wetlands consist primarily of red maple dominated deciduous swamps. The canopy of the forest has openings that have allowed for the growth of moderately dense understory vegetation. The combination of upland and wetland areas along with the brooks facilitates the utilization of this site by a variety of animals (i.e. small mammals, various amphibian and reptile species,nesting birds and larger mammals such as deer.) The vertical stratification in the wetlands (vegetative growth on all layers; canopy, understory, shrub story and ground) adds to the habitat value of the wetland system by increasing shelter, feeding and nesting opportunities.

Additionally, the wetlands serve to collect and slow the velocity of runoff before it exits the property via the two brooks. As the water is slowed by both the flat slopes and the vegetative cover, sediments are allowed to settle out before entering watercourses and other waterbodies downstream.

Project Impacts to Regulated Areas

This project calls for two wetland intrusions: a combined driveway crossing to access Lots 2 and 3; and a second combined driveway crossing to access Lots 11 and 12. The first crossing involves the western brook and its associated wetlands. This narrow corridor is the location of an existing stone crossing. The proposed crossing will involve the placement of a layer of spunbound geotextile fabric over the existing "stone bridge". Overlying the spunbound fabric will be a layer of crushed stones which will be the driveway surface. Current flow patterns will be maintained as the stone crossing under the driveway will remain intact and not be replaced bv a culvert. No pavement is proposed to be placed over the crossing. The activities proposed for the first crossing appear to be acceptable in that the impact to the wetlands is minimal and should not result in an overall reduction in the ability of this wetland system to carry out the functions that it currently performs.

The second wetland crossing involves the installation of ±500 cubic yards of fill to access Lots 11 and 12 from Barnes Road. This crossing is to be located at the narrowest section of wetlands, approximately half way between the two brooks that exit the site. All trees and vegetation within the area of disturbance will be cleared. Spunbound geotextile fabric is to be installed on the existing ground surface and covered with gravel fill. Crushed stone will then be installed on the travelled portion of the driveway. Currently, the westerly brook flows under Barnes Road through an existing 12" CMP designed to accommodate a flow of 6 cfs. The brook, however, carries 34 cfs to the headwall. As a result of the undersized culvert, 29 cfs flows easterly in a drainageway parallel to Barnes Road. Two existing culverts pick up some of the overflow and convey it downstream. However, during periods of heavy rainfall, Barnes Road becomes flooded. Since there will be a small increase in post-development runoff (35 cfs to 39 cfs for a 10 year storm event) the applicant is proposing the installation of two elliptical culverts at the location of the proposed driveway crossing (not shown on the plans, but discussed during the site visit). It is felt that a crossing at this location and the installation of two elliptical culverts under the driveway would be acceptable, provided that all the proposed sediment and erosion controls are installed properly and maintained and if the contractors adhere to the construction sequence.

The site plans also show conceptual locations for houses, septic systems and wells. The layout provides for a 100 foot buffer around all regulated area. Upon receiving separate applications for lot development, it is recommended that the 100 foot buffer be maintained.

General Comments and Recommendations

Section 22a - 41(b) c.f thie Connecticut General Statutes mandates that:

> "In the case of an application which received a public hearing, a permit shall not be issued unless the commission finds that a feasible and prudent alternative does not exist."

Several alternatives to the proposed driveway crossings were discussed with the applicant at the site:

1. Accessing Lots 1 and 2 by extending an existing cul-de-sac (Squire Drive) located in the subdivision to the north. Mr. Wenke (Project Engineer) indicated that this alternative was explored. He related that the road was unaccepted by the town and could not be used to connect the two subdivisions.

2. Access to Lots 11 and 12 could be provided via the first crossing on the northwest portion of the site. This would involve the construction of a road almost the entire length of the site, through the land dedicated as open space, simply to access two lots. This is not a feasible alternative as it would entail much more clearing and paving than the current layout proposes.

Based upon the field observations and the restrictions imposed relative to alternative access, the activities proposed within regulated areas appear to be acceptable in that they should not significantly alter the character of the larger wetland and watercourse system. Further, because there is little or no downstream development, the post-development increases in runoff should have a negligible impact.

According the Mr. Wenke, the placement of two elliptical culverts under the driveway will not alleviate the present flooding problem, but will maintain existing conditions. Perhaps the existing undersized culvert under Barnes Road could be replaced to accommodate post-development flows instead of or in addition to the installation of the two elliptical culverts.

8. WATER SUPPLY

Based on the hydrogeologic setting and water supply in the vicinity of the site, the proposed subdivision will likely be served by individual wells that tap the underlying bedrock. Wells drilled in bedrock generally supply small (3-5 gallons per minute) but reliable yields of groundwater. Because the yield of a given well depends upon the number and size of water-bearing fractures that it intersects and because the distribution of the fractures is highly irregular, there is no practical way of predicting the yield of a well in a specific location, before drilling the well. Experience has shown, however, that most water-bearing fractures occur in the top few hundred feet of the bedrock surface.

The team's geologist reviewed well completion reports for residences and/or businesses on Barnes Road, Squire Drive, Farmholme Road and Heritage Drive. These wells presumably tap the same type of rock that underlies the proposed subdivision site. Yields and depth of the wells surveyed are shown in the following table.

TABLE 1 - Well Completion Reports

Well Location	Total Depth (ft)	Well Yield (gal./min.)
Farmholme Road	225	15
Farmholme Road	225	1
Farmholme Road	228	3
Farmholme Road	92	8
Farmholme Road	400	.5
Farmholme Road	200	15
Farmholme Road	300	5
Farmholme Road	420	1.5
Farmholme Road	100	25
Farmholme Road	225	15
Farmholme Road	265	8
Farmholme Road	425	2
Farmholme Road	225	6
Heritage Drive	75	50
Heritage Drive	80	12
Heritage Drive	125	6
Heritage Drive	105	12
Heritage Drive	242	5
Squire Drive	500	no yield
Barnes Road	200	10
Barnes Road	500	1
Barnes Road	165	20
Barnes Road	360	2

Because of the low density of houses proposed and because lot sizes will be greater than 2 acres, there should be minor changes in the amounts of recharge to the bedrock aquifer. Additionally since no interior road system is proposed, there will be relative small amounts of impervious surface created by the subdivision to prohibit infiltration to the bedrock aquifer. In most cases, ground recharge should equal or exceed the ground water demands for each lot in the subdivision. It should be kept in mind that this assumes the underlying bedrock is fractured and

capable of transmitting usable amounts of water to a well. As mentioned earlier, this cannot be determined exactly without first drilling the well(s).

It should be pointed out that induced recharge by properly renovated septic system effluent (about 95%) plays an important role in the ground water budget. This stresses the need for properly designed and installed septic systems on each lot. Also, the present lot layout and proposed well location allows at least 200 feet between domestic wells. ***(NOTE: A well location for Lot 8 has not been shown on the subdivision plan.)*** This will provide about 1 acre or 595 gallons of direct discharge to each well. Assuming the bedrock aquifer is capable of transmitting water, this will help to minimize the chances for mutual interference between pumping wells.

Each well should ideally be located on a relatively high portion of the lot, properly separated from the sewage disposal system or any other potential pollutant (e.g., fuel oil storage tank, etc.) and in a direction opposite the expected direction of groundwater movement. They should all be cased with steel pipe into the underlying bedrock. In order to provide adequate protection of the quality of bedrock water, all wells will need to be properly installed in accordance with all applicable State Public Health Code and Connecticut Well Drilling Board regulations. The town sanitarian will need to inspect and approve every well location.

The natural quality of groundwater should be satisfactory. Groundwater in the area is classified by the Department of Environmental (DEP) as GA, which means that it is presumed suitable for private drinking water supplies without treatment.

Since leakage from underground fuel storage tanks is a frequent cause of ground water contamination in the State, every effort should be made to prohibit residential underground fuel storage tanks on the site.

9. SEWAGE DISPOSAL

Soil and percolation tests have been conducted on each lot by the applicant's engineer, except Lot 2 which has no percolation test data. Based on deep test hole data and percolation tests conducted on the proposed lots, subsurface sewage disposal systems appear to be feasible on each lot, but all lots except Lot 1 will require specially designed (engineered) septic systems. Subsurface conditions on Lot 1 appear to allow a conventional (non-engineered) septic system.

With regard to subsurface sewage disposal on the site, the presence of a seasonally high water table is a major concern. The main concern for areas characterized by elevated water tables is to determine whether or not the naturally occurring soil in the vicinity of the leaching system can adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effects on ground or surface waters. In general, suitable, well-drained fill material is used to elevate the bottom of the system above the high water table so that it does not hydraulically interfere with the proper functioning of the septic system.

Depending upon soil conditions and topographic conditions, curtain drains (groundwater control drains) may also be used to protect the leaching systems from a seasonally high ground water table. The curtain drain must be properly designed and constructed in compliance with the State Public Health Code. The outlet point for the curtain drain(s) should be in a location that does not pose a threat to water supply wells or create a nuisance condition such as the flooding of neighboring properties.

Subsurface data made available to Team members at the present time indicates all lots can support on-site septic systems. The subdivision plans should not be approved until it is shown that each lot can support a septic system in compliance with the State Public Health Code and Technical Standards as determined by Stonington Health Department. The applicant's engineering firm must demonstrate that each of the proposed lots in the subdivision meets the minimum soil standards set forth in Section 19-13 BlQ3e(a)(3) of the State's Public Health Code.

The process should be a coordinated effort between the design engineer and the Stonington certified sanitarian. Because most of the lots will be deemed of "special concern" by the State Public Health Code, plans for the design of the subsurface sewage disposal facilities (along with the placement of each on-site water supply well) must be prepared by a professional engineer and submitted to the Health Department for review and approval by their certified sanitarian.

The final configuration of lots should not be approved until the Health Department is assured of the feasibility of each lot meeting all of the State Health Code Requirements.

In addition to being a hindrance for the installation of on-site sewage disposal systems, seasonally high water tables indicate a potential for wet basements. Every effort should be made to protect basements from getting wet. This can be accomplished by installing building/footing drains around the perimeter of each house (where grades permit outletting pipe to daylight) or raising the foundation above the high water table. Where feasible, building footing drains may be used in conjunction with curtain drains.

10. WILDLIFE RESOURCES

Wildlife Habitat Descriptions

Open Field: Open land habitat is very beneficial to wildlife. Vegetation, in this case hay, provides food and cover for a great array of wildlife ranging from mice and shrews to deer. Another important feature of the fields is the edge created where field meets forest. This valuable zone for food and cover consists of cherry trees, shrubs and grasses.

Wildlife utilizing open field habitat include deer, woodchuck, fox, raccoon, skunk, mourning dove, bluebirds, eastern kingbirds, mockingbirds, flycatchers, blue and golden-winged warblers, robins, kestrels, red-tailed hawks, eastern screech owls and cottontail rabbits.

Upland hardwood forest: This habitat consists of a variety of hardwood species including red maple, white oak, ash and hickory. Understory vegetation includes several species of ferns, highbush blueberry, mountain laurel and hardwood regeneration.

Wildlife frequenting such habitat types (dependent upon age mix of stand) include deer, fox, raccoon, gray squirrel, woodpeckers (hairy and downy), ovenbirds, black-throated blue and green warblers, barred owls, broadwing hawks and various non-game species such as shrews, voles and snakes.

Wetland/Riparian Zone: This habitat type consist of two converging brooks and a red-maple wetland area. The predominant tree species is red-maple. Associated vegetation includes sweet pepperbush and swamp azalea.

Wildlife that might use such an area includes deer, fox, raccoon, skunk, muskrat, red-winged blackbirds, kingbirds, prothonatory warblers, titmice, woodpeckers and numerous amphibians and reptiles including salamanders, newts and spotted and painted turtles.

Effects of Proposed Development on Wildlife

In a small, but heavily developed and highly populated state like Connecticut, available habitat continues to decline on a daily basis. It is critical to maintain and enhance existing wildlife habitat.

Development of this area will decrease the amount of upland habitat simply because the land will be occupied by physical buildings and roads. Human activity in the area will increase, even after construction is completed. Some species of wildlife will not tolerate increased human activity and may emigrate from the area. Because of the large lot size and the extent of the area given to the land trust, emigration may only be temporary and occur during construction. Other species, tolerant of human activity, might be attracted to the area and may become a nuisance to area residents.

The edge habitat created between lawn and forest is not as valuable as the edge between hayfield and forest due to the lack of cover and reduction in food sources.

Factors Mitigating Impact of Development

A large, continuous open space area consisting of wetland and upland forest habitat will be deeded to a land trust and will allow for most wildlife species to remain in the area. The proposed wetland crossings are narrow and will not have a severe impact on the quality of the wetland.

There are several management guidelines which should be considered during the planning of lot development in order to minimize adverse impacts on wildlife:

1. Make use of natural landscaping techniques (avoid and /or minimize lawns and chemical applications) to lessen acreage of lost habitat and possible wetland contamination. Implementation of backyard wildlife habitat management practices should be encouraged. Plant trees and shrubs which are useful to wildlife and landscaping. Large expanses of lawn with no trees or shrubs present should be discouraged.

Planting shrubs that are less palatable to deer may lessen problems with nuisance deer. Shrubs less palatable to deer include evergreen hybrid rhododendrons, American holly, Scotch pine, White and Norway spruce, Japanese cedar, Flowering dogwood, Mountain laurel, Common lilac and White pine. Taxus spp. (yews) experience a greater degree of damage as they are a preferred winter food of deer (Conover, 1988).

2. Maintain a 100 foot wide buffer zone of natural vegetation around wetland/riparian areas to help filter and trap silt and sediments. These vegetated zones provide excellent wildlife cover and travel corridors.

3. Stone walls, shrubs and trees should be maintained along field borders.

4. During land clearing care should be taken to maintain certain forestland

wildlife requirements:

a. Encourage mast producing trees (oak, hickory, beech).

b. Leave snag/den trees as they are used by many birds and mammals for nesting, roosting and feeding.

c. Exceptionally tall trees are used by raptors as perching and nesting sites and should be encouraged.

d. Trees with vines (fruit producers) should be encouraged.

e. Brush debris could be windrowed to provide cover for small mammals, birds and amphibians and reptiles.

f. Removal of dead and down woody material should be discouraged where possible. The existence of many wildlife species (salamanders, snakes, mice, shrews and insects) depends on the presence of dead trees (Hassinger, 1986).

References

Conover, Michael R. and Gary S. Kania 1988. Browsing preference of White-tailed deer for different ornamental species. Wildlife Society Bulletin vol. 16, pp. 175-179.

Hassinger, J. 1986. Dead wood for wildlife. Pennsylvania Woodlands. Penn. State Univ., Col. of Agric., Coop. Exten. Serv. 7: 1-6.

11. FISH RESOURCES

This section of the report will address all major impacts to aquatic resources and delineate mitigation measures required to minimize impacts.

Donahue Brook

The headwaters of Donahue Brook originate within the property. Initially intermittent in nature, the two branches join to form a perennial stream south of Barnes Road. The stream's riparian (streamside zone) on the proposed development site is primarily comprised of wetland habitat. One of the primary functions of the upper sections of this brook and associated wetlands is to provide clean and unpolluted waters to downstream areas of the watershed.

Surface waters of Donahue Brook are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

Donahue Brook empties into the estuarine environment of Wequetequock Cove, which is part of the Little Narragansett Bay. The cove supports diverse groups of finfish and shellfish that are of recreational and commercial importance. Wetlands associated with Wequetequock Cove have been designated as "Wetlands of Special Concern" in Connecticut.

Fish Population

No fisheries resources exist on the proposed development site. Viable fish population habitat was observed in stream stretches downstream of the Barnes Road crossing. Since the brook has not been sampled, the exact freshwater fish species composition in downstream areas is unknown at this time. Freshwater fish species expected to inhabit downstream sections are: native (wild) brook trout, longnose dace, blacknose dace, American eel, fallfish, and white sucker.

Impacts

The following impacts of the proposed subdivision on Donahue Brook and associated wetlands can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of Donahue Brook through increased runoff from unvegetated areas : During construction, topsoil within the proposed building lots will be exposed and susceptible to runoff events. Erosion and sedimentation due to construction has been regarded as a major cause of stream degradation in eastern Connecticut. Excessive sediment deposition could damage downstream areas of the Donahue Brook ecosystem in the following ways:

**** Reduce the amount of usable fish habitat used for spawning purposes - preferred substrate that becomes compacted with silt is no longer available for spawning. Fish will be forced to disperse to other areas not affected by siltation.***

**** Reduce fish egg survival - water free of sediment particles is required for egg respiration (biological process of extracting oxygen from water) and successful hatching. Silt deposits will smother eggs.***

**** Reduce aquatic insect production - sediment-free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are the primary food source of young and adult fishes. Reduced insect levels will adversely affect fish growth and survival.***

**** Contribute to the depletion of oxygen - organic matter associated with soil particles is decomposed by micro-organisms contributing to the depletion of oxygen in waters overlying sediments.***

**** Adversely affect "gill" function and impair feeding activities - studies have documented that high sediment concentrations and turbidity will disturb fish respiration and gill function.***

2. Degradation of wetland habitat : Some minor degradation of wetlands can be expected due to the construction of the two road crossings within wetland

habitat. These wetlands serve to protect the water quality of Donahue Brook. Wetlands are beneficial in many ways. They serve to: (1) control flood waters by acting as a water storage basin, (2) trap sediment from natural and man-made sources of erosion, and (3) help filter-out pollutants from runoff before they enter watercourses.

Recommendations

The following recommendations should be considered by the Town of Stonington to mitigate impacts to Donahue Brook and wetlands.

1. It is highly recommended that at the minimum, a 100 foot open space buffer zone be maintained along all wetland boundaries of Donahue Brook : This buffer can be an effective mitigation measure at this development location. No construction and alteration of existing habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985). Impacts such as soil erosion, can be more effectively minimized if these areas are left in their natural condition. These buffers will absorb surface runoff and other pollutants before they can enter aquatic ecosystems.

2. Install and maintain proper erosion and sedimentation controls during site construction activities : Silt fences and haybales should be placed within excavated trenches to ensure that all runoff is properly contained. A town official should be responsible for inspecting this development on a daily basis to ensure that contractors have complied with all stipulated mitigation devices. Past stream siltation disturbances in Connecticut associated with residential housing developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis. Proper installation and maintenance of these devices is critical to environmental well being.

3. All work near streams and/or wetlands for the purpose of road construction should take place during low flow periods : This strategy will help minimize the impact to aquatic resources. Reduced streamflows and rainfall

during the summer and early fall provide the least hazardous conditions in which to work near sensitive aquatic environments.

References

ODFW (Oregon Department of Fish and Wildlife) 1985. The Effects of Stream Alterations on Salmon and Trout Habitat in Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon. 70 pp.

USFWS (United States Fish and Wildlife Service) 1984. Habitat Suitability Information: Rainbow Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS-82(10.124). 64pp.

USFWS (United States Fish and Wildlife Service) 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. United States Fish and Wildlife Service, Biological Report FWS/OBS 82/(10.60). 65pp.

12. ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps show no prehistoric sites located in the project area. However, similar topographic features, such as relatively flat slopes associated with wetlands, in Stonington have yielded prehistoric artifacts from early Native American camp and village sites. It is recommended that higher elevations surrounding the wetlands have an archaeological reconnaissance survey conducted prior to construction activities to locate and identify all cultural resources that might exist in the project area. The following map indicates such areas.

An on-site review of the proposed subdivision indicates numerous properties of historic or architectural interest in the immediate area. Information on these properties are available at the UConn Special Collections Library, or the Office of State Archaeology, both at the Storrs Campus. These historic properties are shown on the map. In general, the existing fieldstone walls bordered by mature tree

species establish a network of potential scenic roads which effectively surround the project area. All new construction must be compatible in scale, mass, and materials with the surrounding extant architecure. Likewise, it is imperative that mature tree species be retained wheresoever feasible in order to provide a visual buffer between new housing units and the nearby historic properties.

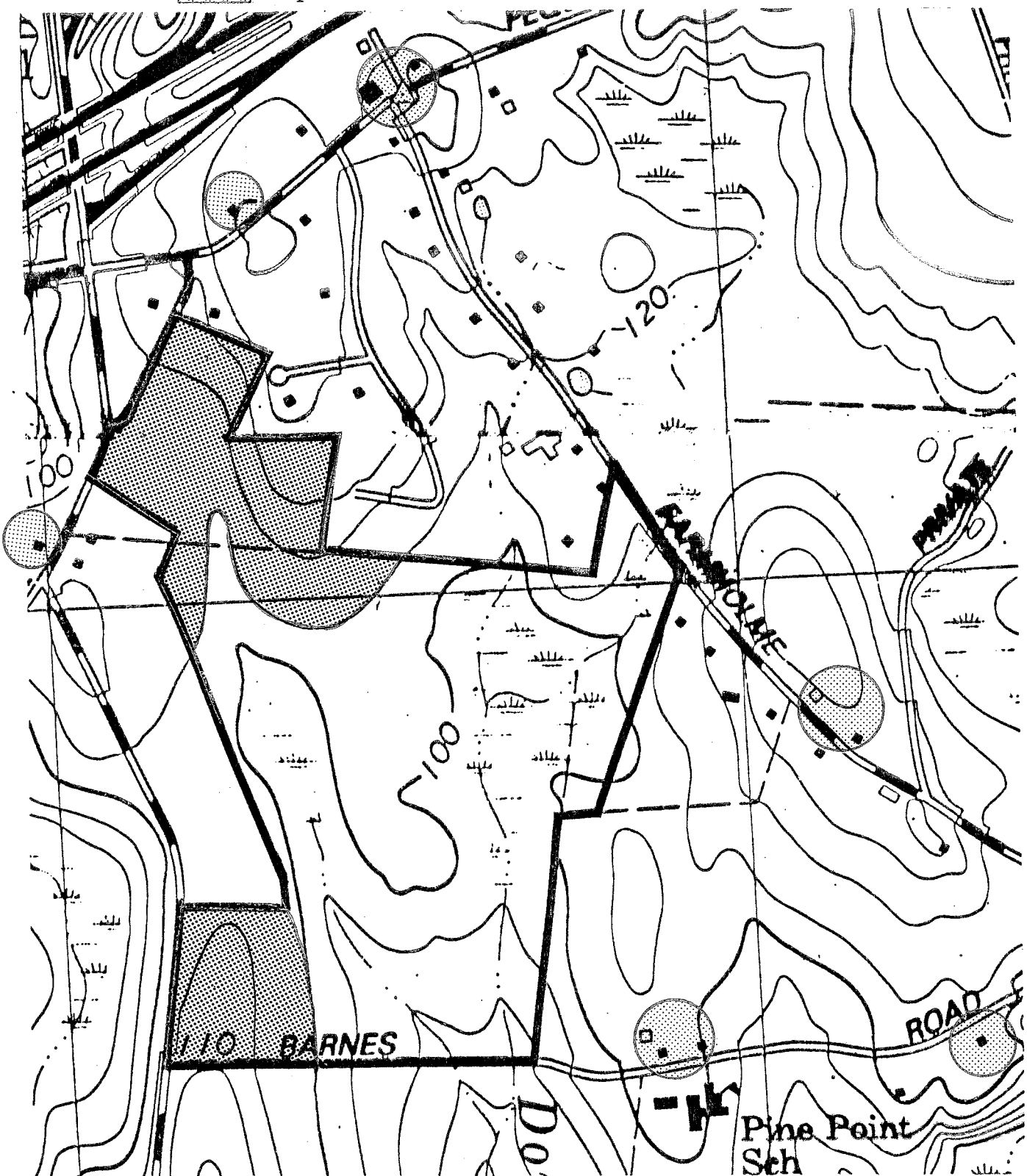
In summary, the project area has no listed archaeological sites, however, there is a high probability for prehistoric cultural resources based on environmental features similar to where other sites have been located in Stonington. An archaeological survey is recommended for areas delinated as having high potential. In addition, a series of historic properties surround the project area and all new construction should consider the visual effect of the area including architecture and mature tree buffers.

CULTURAL RESOURCES MAP

Scale 1" = 1000'

Areas recommended for an archaeological reconnaissance survey

Properties of historic or architectural interest



ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at ***no cost*** to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Soil and Water Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: **203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.**