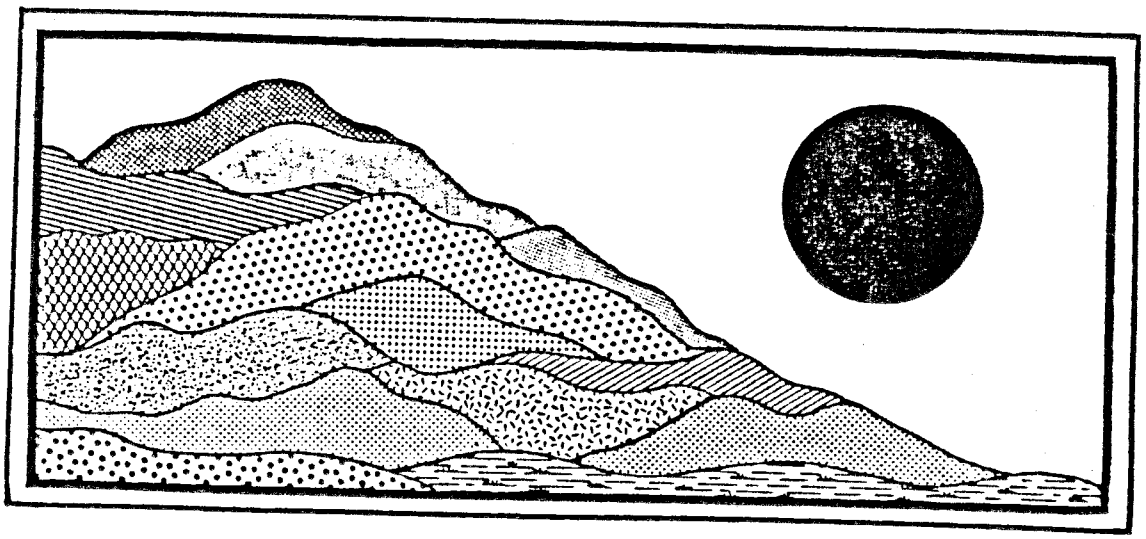
Pendleton Brook Estates

North Stonington, Connecticut

May 1988



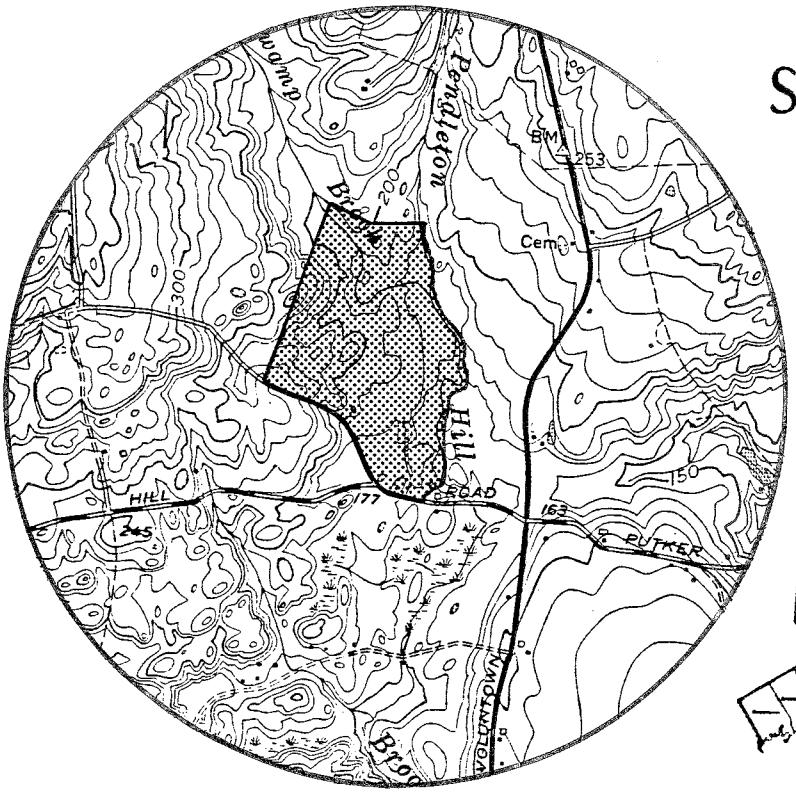
ENVIRONMENTAL REVIEW TEAM REPORT

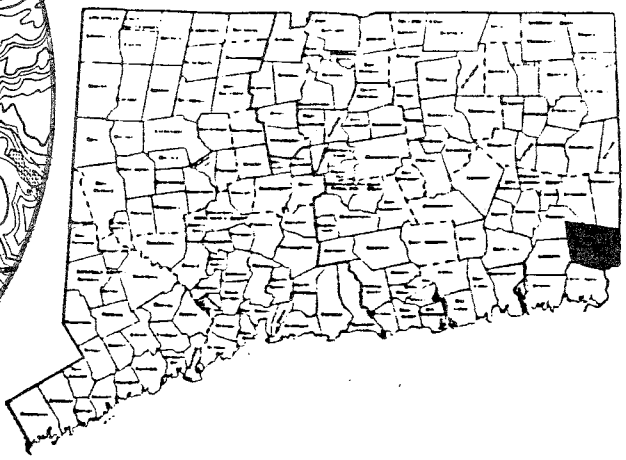
EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Site Location

PENDLETON BROOK ESTATES

NORTH STONINGTON, CONNECTICUT





EASTERN CONNECTICUT

RESOURCE CONSERVATION

& DEVELOPMENT AREA

ENVIRONMENTAL REVIEW TEAM REPORT

ON

PENDLETON BROOK ESTATES

North Stonginton, Connecticut

This report is an outgrowth of a request from the North Stonington Conservation Commission and Inland Wetlands Agency to the New London Soil and Water Conservation District (S&WCD). The S&WCD referred this request to the Eastern Connectciut 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, April 7, 1988. Team members participating on this review included:

Barry Cavanna	--District Conservationist - U.S.D.A., Soil Conservation Service
Brian Murphy	--Fisheries Biologist - DEP, Eastern District
Richard Serra	--Regional Planner - Southeastern CT Regional Planning Agency
Elaine Sych	--ERT Coordinator - Eastern CT RC&D Area
Bill Warzecha	--Geologist - 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. The Team met with, and were accompanied by the Chairman of the Conservation Commission, a member of the Planning and Zoning Commission and the surveyor for the project. 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 and conclusions 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 Committee hopes you will find this report of value and assistance in making your decisions on this proposed subdivision.

If you require any additional information, please contact:

Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P. O. Box 198
Brooklyn, CT 06234
(203) 774-1253

TABLE OF CONTENTS

TABLE OF MAPS AND CHARTS

LOCATION

Scale 1" = 2000'

ONE: INTRODUCTION, SETTING AND TOPOGRAPHY

The Eastern Connecticut Environmental Review Team has been asked to assist the North Stonington Conservation Commission and Inland Wetlands Agency in the review of the proposed Pendleton Brook Estates Subdivision. This report contains a natural resource inventory of the site, highlights areas of concern and makes recommendations that should be considered in the decision-making process.

The proposed subdivision site is located in the east central part of North Stonington. It consists of approximately 89 acres of wooded land, on which 22 building lots are presently proposed. It is understood that the Town has given approval for 4 lots in the subdivision to date, and that there is about 20 acres of open land (cornfields) south of the parcel on which four (4) additional building lots are also proposed. Therefore, the total number of houses to be constructed on the parcel including the 20± acre piece to the south is 30 lots. (See Location Map)

The site is bounded to the south by Fowler Road and Grindstone Road, to the east by Pendleton Hill Brook and private undeveloped land to the north and west. Hetchel Swamp Brook traverses the northern sections in an easterly direction to Pendleton Hill Road.

The site is located in R-80 zone, which means permitted uses includes residential homes with minimum lot sizes of 80,000 square feet or about 2 acres. Lots range in size from about 1.8 to 6.5 acres. It should be pointed out that the latter does not include the lots on the 20 acre parcel to the south. No plans or soil data was available on the review day for these lots, but reference will be made to them throughout this report. Lot 11, located in the northern part, is about ±9 acres in size and is the proposed open space for the subdivision.

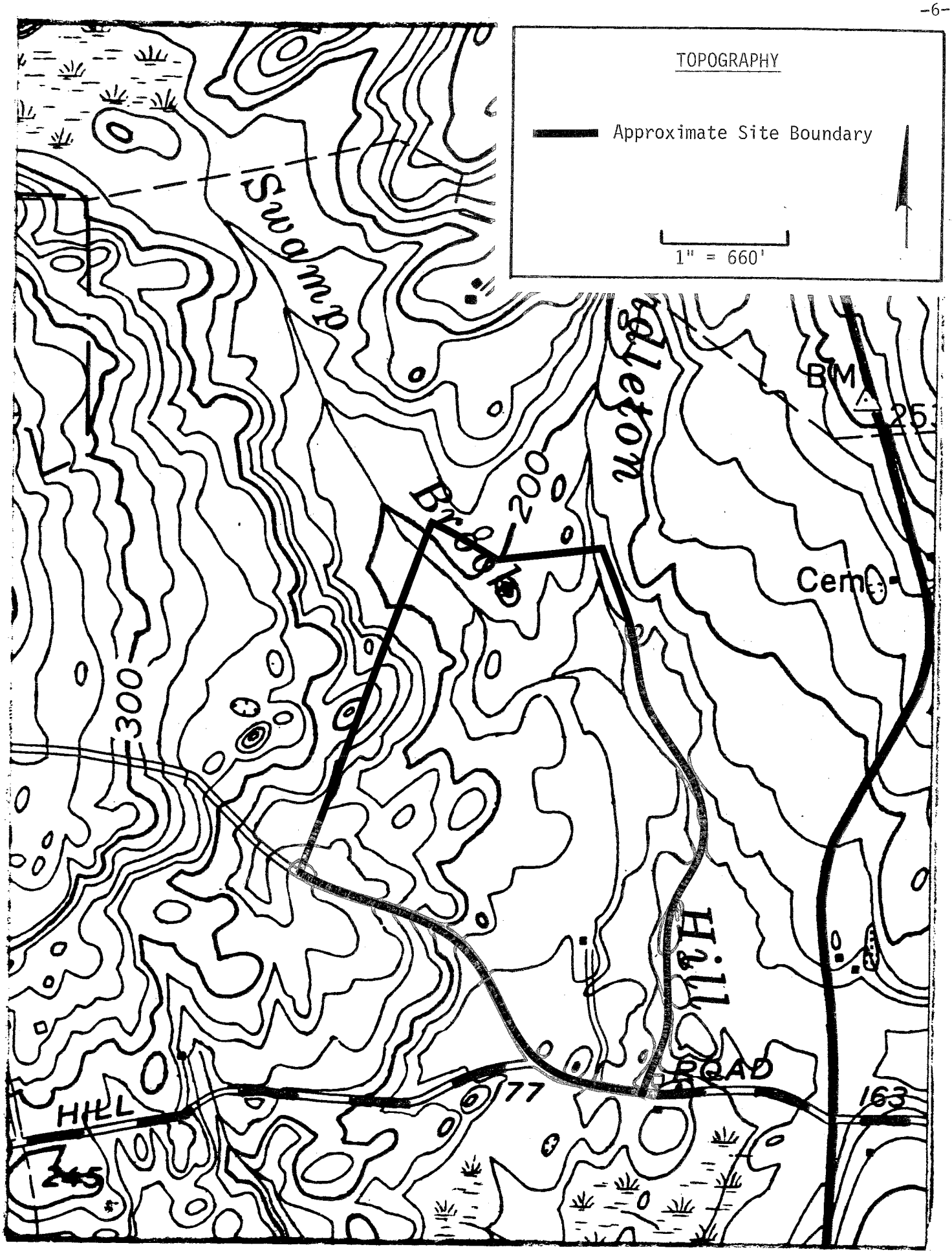
The parcel will be accessed off of Fowler Road by a loop road called Brookview Circle. A cul-de-sac, called Brookview Court will be located off the loop road in the northern part and will serve 4 building lots.

Current land use in the area of the proposed subdiviison is characterized by hummocky topography shaped by glacial meltwater deposits of sand and gravel.

Maximum and minimum elevations on the site are about 250 feet above mean sea level and 210 feet above mean sea level, respectively.

TWO: BEDROCK AND SURFICIAL GEOLOGY

The subdivision site is located entirely within the Ashaway topographic quadrangle. A bedrock geologic map (GQ-403 by Tomas Feininger, 1965) and a


TOPOGRAPHY
Approximate Site Boundary
1" = 660'
Swamp
Brook
Water
Hill
ROAD
HILL
BM
Cem
300
200
77
163
245

surficial geologic map (GQ-712, J. P. Schafer, 1968) have been published for the quadrangle to date.

The bedrock underlying the entire site is metamorphic; that is, it has been geologically changed by great heat and pressure within the earth's crust. Except for a small western part of the site, the bedrock underlying the site is classified as Hope Valley Alaskite Gneiss. It is described as a white, medium grained granitic gneiss. Major minerals includes quartz, feldspar and coarse muscovite. "Gneisses" are generally coarse-grained, foliated rocks characterized by alternating bands of light and dark minerals.

A small area in the western part is underlain by a fine to medium grained light-gray, strongly foliated (layered) granite gneiss which contains large, conspicuous microcline crystals.

Map GQ-403 dilineates a northwest/southeast trending fault that aligns with Hetchel Swamp Brook. As a result, it seems likely that the upper 150-250 feet of bedrock is fractured and moderately weathered. A "fault" is a structural feature that formed during the geologic past, but geologists believe they are no longer experiencing active movement. The presence of fractures is important in terms of the ability of the bedrock underlying the site to transmit water to drilled rock wells. (See **Water Supply Section**). The underlying bedrock is a source of water to most homes in North Stonington and will be the likely source of domestic water to homes in the proposed subdivision.

Two types of glacial sediment cover the site; till and stratified drift. Till covers the upland sections of the site mainly in the western part.

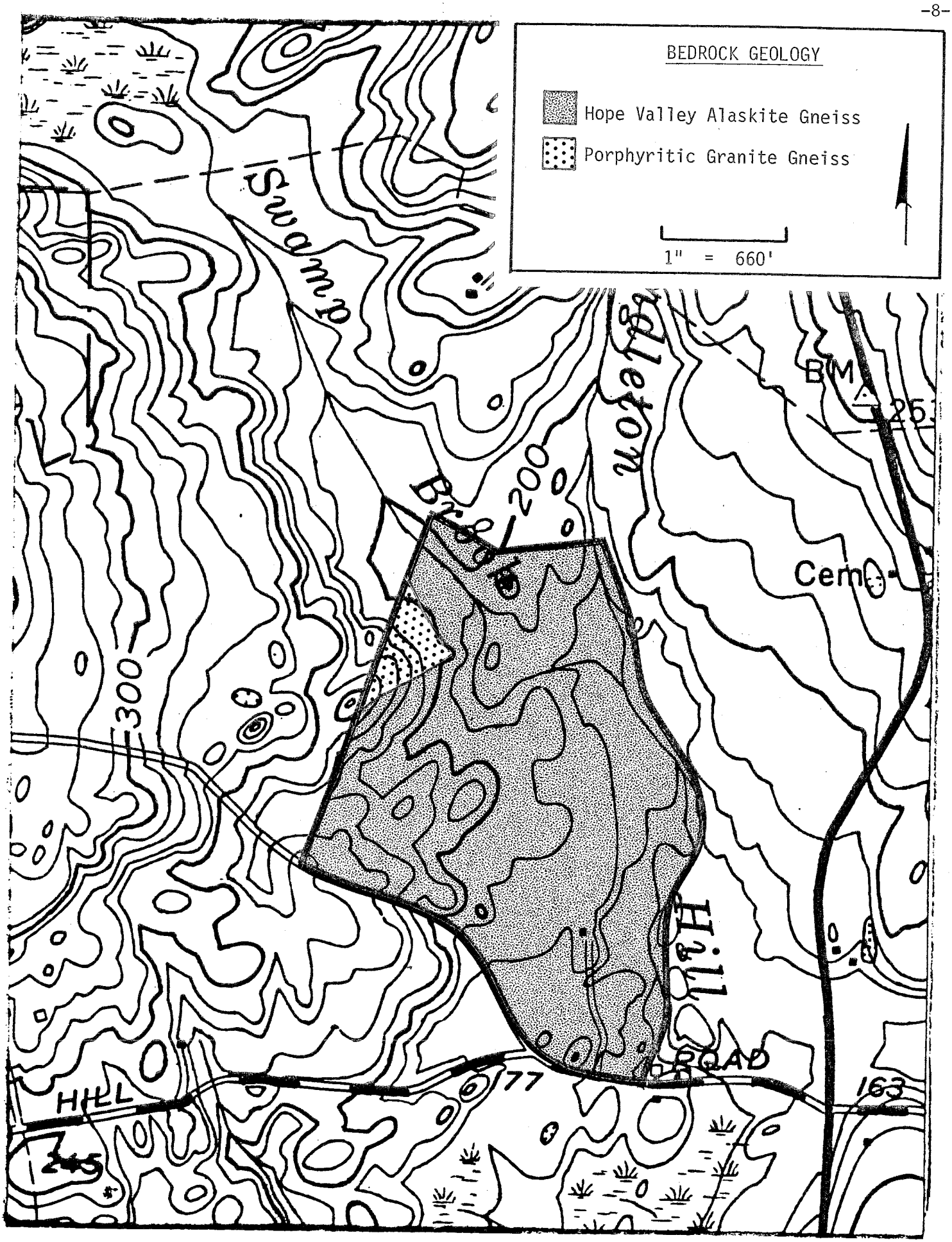
The till consists of a light gray mixture of sediments that range in size from clay size particles to large poulders, but dominantly sand and silt. Based on deep test hole data and soil mapping information, the texture of most of the till on the site is generally sandy and loose. The till sediments were deposited by glacial ice as it moved across the bedrock surface from north to south-southeast. It is 10 feet thick (or less) in most places.

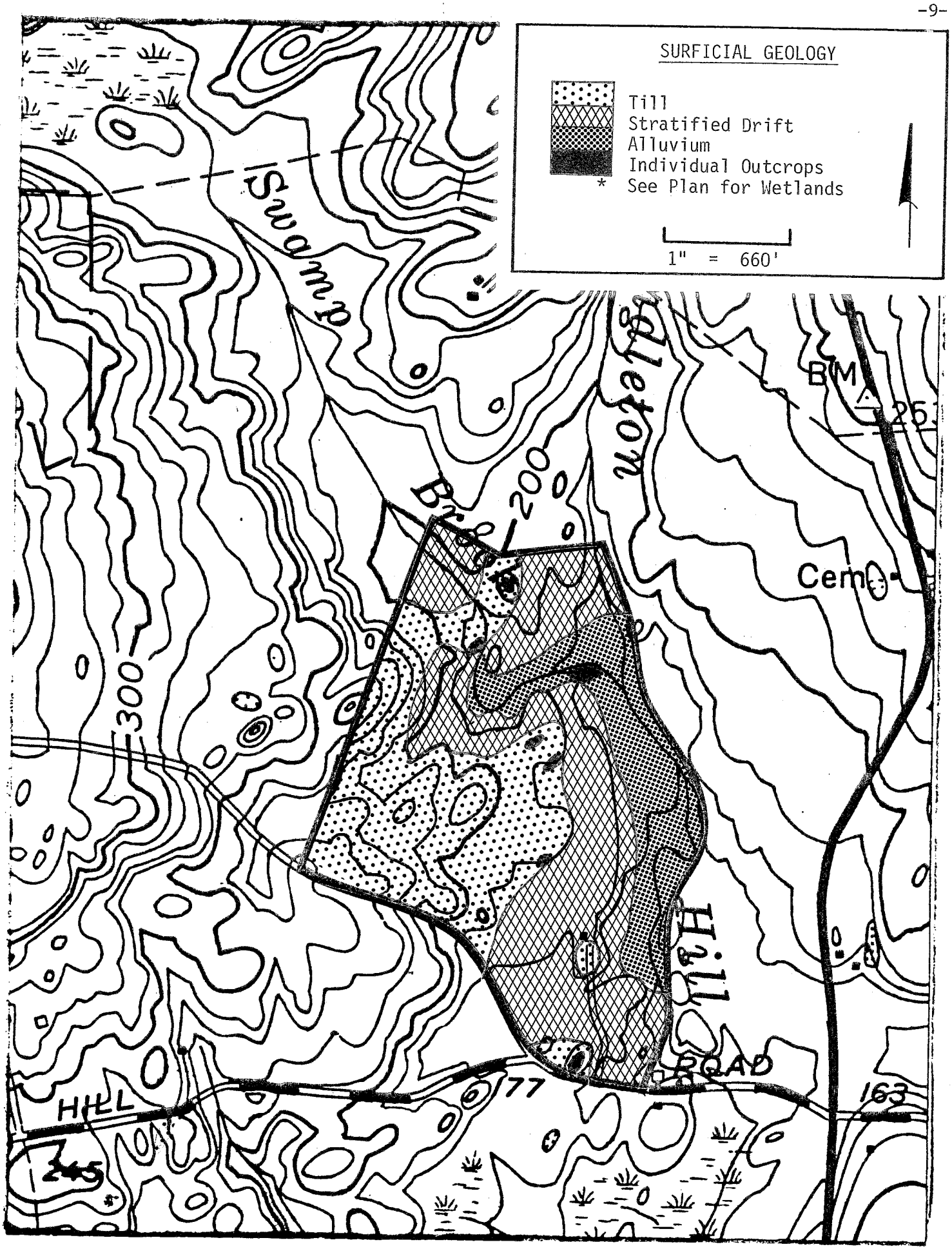
The sandy, gravelly deposits in the eastern parts were deposited by glacial meltwater streams during ice retreat in Green Falls River Valley. These deposits, which are called stratified drift, are 10 feet or less.

Two types of post-glacial deposits may be found on the site, alluvium and swamp deposits (inland-wetland soils).

Alluvium, which consists of silt, sand, gravel and boulders was deposited in floodplains of streams such as Hetchel Swamp Brook and Pendleton Hill Brook.

The applicant's soil scientist has identified regulated inland-wetland areas throughout the site. Their boundaries, which include the alluvial deposits,


BEDROCK GEOLOGY
Hope Valley Alaskite Gneiss
Porphyritic Granite Gneiss
1" = 660'
Swamp
Brook
Water
BM
Cem
Hill
ROAD
HILL
300
200
77
163
245


SURFICIAL GEOLOGY
Till
Stratified Drift
Alluvium
Individual Outcrops
* See Plan for Wetlands
1" = 660'
Swamp
Brook
Woods
BM
Cem
Hill
ROAD
HILL
300
200
77
163
245

have been superimposed onto the subdivision plans. These regulated areas generally parallel the major streamcourses on the site as well as drainageways. The latter areas act as conduits to the floodplains and larger setlands. Individual pockets of wetland have formed in depressional features on sandy soils. The most widespread wetland area is in the northern part of Lots 11.16, 11.17 and 11 (open space).

Project plans submitted to Team members indicates that the interior road system will cross wetlands in two areas. One, which is about 40 feet in length, will occur on Brookview Circle between the northern end of lots 11.02 and 11.03. The other, which is about 20 feet in length will occur on Brookview Court between lots 11.20 and 11.15. A potential wetland road crossing that needs to be more closely examinied by the applicant's engineer is on Brookview Circle between lot 11.24 and 11.12 and 11.13. It appears that the wetland boundary terminates at the road and does not continue eastward to Pendleton Hill Brook. Topographically, it seems likely thatthe two are hydraulically connected. Based on the field walk, surface runoff is widely spread out in this area but as it flows eastward may be encountering better drained soils before it reaches Pendleton Hill Road. As a result, the surface runoff is absorbed by the better drained soils and ultimately flows as groundwater to Pendleton Hill Brook. Nevertheless, the project engineer needs to carefully design road drainage in this area. Stormwater calculations, which will help to ensure a properly sized culvert, will be needed. Also, it seems likely that fill material will need to be placed on regulated wetland soils in this area.

Another area which needs close examination is the section of Brookview Circle near the wetland pocket on Lot 11.06. It appears that this wetland area may be affected by fill material for the road. The extent of all fill lines on regulated wetlands should be shown on the subdivision plan. This will help local commission members during the permit process. The present layout of lots indicates that driveways serving each lot can be accomplished without affecting wetlands.

Wetland crossings can be feasible provided they are properly designed (e.g. culverts are properly sized and installed and permeable road base fill material is used). The roads should be constructed at least 1.5 feet and preferably 2 feet above the surface elevation of the wetlands. This will allow better drainage of the roads and decrease the frost heaving potential of the road. The best time for road construction through wetland areas is during the dry time of the year with adequate provisions for effective erosion and sediment control. Detailed plans for all road crossing through wetlands should be shown on the subdivision plan and carefully reviewed by Town officials.

Because the soils in the preceding paragraphs are classified as inland-wetland soils in Connecticut, they are regulated under Chapter 440 of the General Statutes. Any activity which involves modification, filling, removal of soils, etc., will require a permit and ultimate approval by the Town's Inland-Wetland Commission. In reviewing a proposal, the Commission needs to determine the impact that the proposed activity will have on the wetlands. If the Commission determines that the wetland is serving an important hydrological or ecological function and that the impact of the proposed activity will be significant, they may deny the activity altogether or, at least, require measures that would minimize the impact.

As mentioned earlier, the regulated areas that parallel Hetchel Swamp Brook and Pendleton Hill Brook have good flood control attributes. The latter, wide wetland pockets on the site also have good flood control and sediment retention qualities. These areas are capable of retaining flows during storm events. The narrow wetland areas that parallel the seasonal drainageways on the site act as conduits to the wetland/floodplains along the eastern limits. It seems likely that the wetland areas on the site would have good ecologic characteristics.

THREE: SOIL CONCERNS

1. The Sediment and Erosion Control Plan for road construction is inadequate. It should have a construction sequence as required by the Connecticut Guidelines For Erosion and Sediment Control, and there are several other omissions.

2. To maintain a 100' buffer on sand and gravel soils it would appear that lots 11.06, 11.07 and 11.08 should be combined into two lots.

3. Please see the following soil map and charts for soil types present at the site and the soil potential ratings.

FOUR: HYDROLOGY

The entire site lies within the Pendleton Hill Brook drainage area. At its intersection with Grindstone Hill road, the Brook drains an area of 4.02 square miles or about 2,573 acres. The site, about 89 acres, would represent only 3.5 percent of the drainage area. It should be pointed out that this drainage area includes Hetchel Swamp Brook, which feeds Pendleton Hill Brook at the northern limits of the site. Surface runoff from several lots in the northern half drains to Hetchel Swamp Brook.

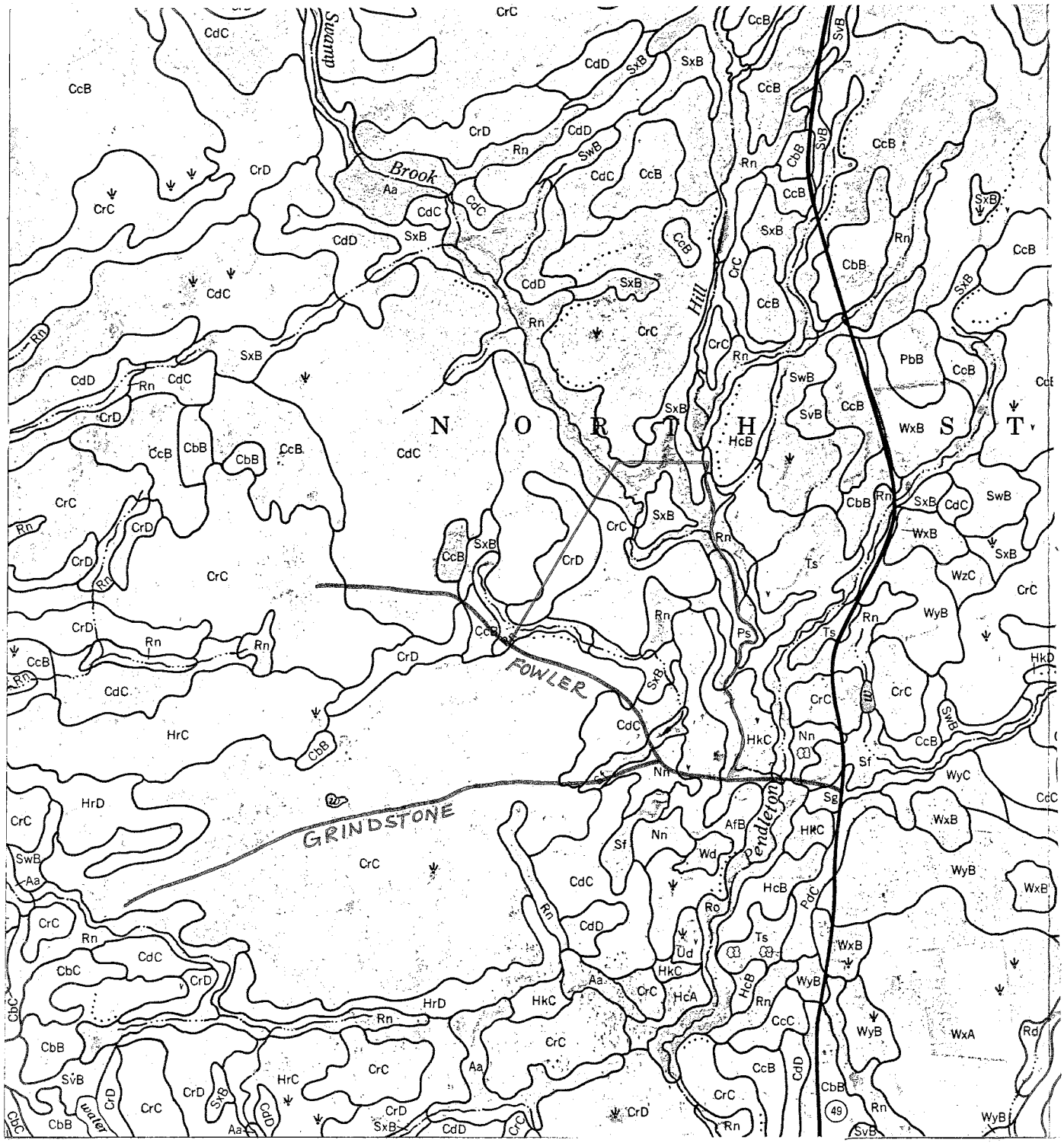
The subdivision of the property as planned, followed by the construction of new homes, driveways, roads, and cul-de-sacs can be expected to lead to increases in the amount of runoff shed from the site. The wetland pockets throughout the site serve as natural runoff detention areas. This will help to lessen the effects of post-development runoff from the site. Also, because the proposed density is relatively low and soils are permeable, post-development runoff increases would not be expected to be very high. However, in order to determine the impacts of post-development runoff, the applicant needs to produce a stormwater management plan which includes pre and post-development hydrologic calculations. To date, the applicant's engineer has provided computations only for the sizing of culverts designed for the 50-year storm event passing under the proposed roads. Once the stormwater drainage plans and computations have been completed, the town's engineer and/or a

United States Department of Agriculture

Soil Conservation Service

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

Scale 1"=1320'



SOIL POTENTIAL RATINGS FOR SEPTIC TANK ABSORPTION FIELDS BY MAP UNIT
NEW LONDON COUNTY, CONNECTICUT

MAP SYMBOL	MAP UNIT NAME	POTENTIAL RATING	CONCERNS	CORRECTIVE MEASURES	ADDITIONAL CONSIDERATIONS	STATE REGULATIONS
AfB	- Agawam fine sandy loam, 3-8% slopes	HIGH	Fast perc rate.	Double separating distance between wells and absorption field.		1
CdC	- Canton and Charlton extremely stony fine sandy loams, 3-15% slopes	VERY HIGH	None.			
CrC	- Charlton-Hollis fine sandy loams, very rocky, 3-15% slopes	MEDIUM			Feasibility study. Increase area of investigation to utilize the deepest soils. Verify depth to bedrock.	
	Charlton part	very high	None.			5
	Hollis part	extremely low	Depth to bedrock.			
CrD	- Charlton-Hollis fine sandy loams, very rocky, 15-45% slopes	VERY LOW			Feasibility study. Increase area of investigation to utilize the deepest soils and flattest slopes. Verify depth to bedrock.	1 for slopes >25% 5
	Charlton part	high#	Slope.	Design and installation to accommodate for slope.		
	Hollis part	extremely low	Slope, depth to bedrock.			
HkC	- Hinckley gravelly sandy loam, 3-15% slopes	HIGH	Fast perc rate.	Double separating distance between wells and absorption field.		1
Nn	- Ninigret fine sandy loam	LOW	Fast perc rate, depth to water table.	Fill. Double separating distance between wells and absorption field.		1
Ps	- Pootatuck Variant fine sandy loam	VERY LOW	Fast perc rate, depth to water table, flooding.	Fill. Solution to flooding problem is site specific.		1,3
Rn	- Ridgebury, Leicester, and extremely stony fine sandy loams	VERY LOW**	Depth to water table.	Curtain drain and fill.	Access to drainage outlet.	2,3,4
Sf	- Scarboro mucky fine sandy loam	EXTREMELY LOW	Fast perc rate, depth to water table.		Drainage needed. Access to drainage outlet unlikely.	2,3,4
SxB	- Sutton extremely stony fine sandy loam, 0-8% slopes	LOW	Depth to water table.	Fill, curtain drain and drainage swale.	Access to drainage outlet.	1

**The rating assumes that the water table in the naturally occuring soil can be drained to a depth of 18 inches or more.

1 Identified as an area of special concern by state regulations - engineer's design required.
2 Identified as unsuitable in its natural condition by state regulations - an engineer's evaluation is needed to determine whether an absorption field can be built.
3 Identified as inland wetlands or tidal wetlands by state regulations. Local, state, and/or federal wetland permits may be required.
4 A permit to install an absorption field cannot be issued if the site cannot be drained. A permit cannot be issued if the groundwater level is less than 18 inches below the soil surface for one month or longer.
5 A permit to install an absorption field cannot be issued if the depth to bedrock, of the naturally occurring soil, is less than 24 inches.

consulting engineer familiar with road drainage should review the plan. In view of the preceding discussion, and because of the sites close proximity to Pendleton Hill Brook, it does not seem likely that on-site detention basins will be necessary. However, not until drainage calculations are prepared, can an accurate determination be made.

Another concern with increased runoff is the potential for stream-bank erosion and gulleying. Also, in view of the moderately sloping area and the presence of silty soils, there is the potential for siltation related problems unless a comprehensive erosion and sediment control plan is developed for the subdivision. The Connecticut Soil Erosion and Sediment Control Act (Public Act Number 83-388), which became fully effective July 1, 1985 requires a detailed erosion and sediment control plan should be properly enforced by the Town. Disturbed areas should be kept to a minimum.

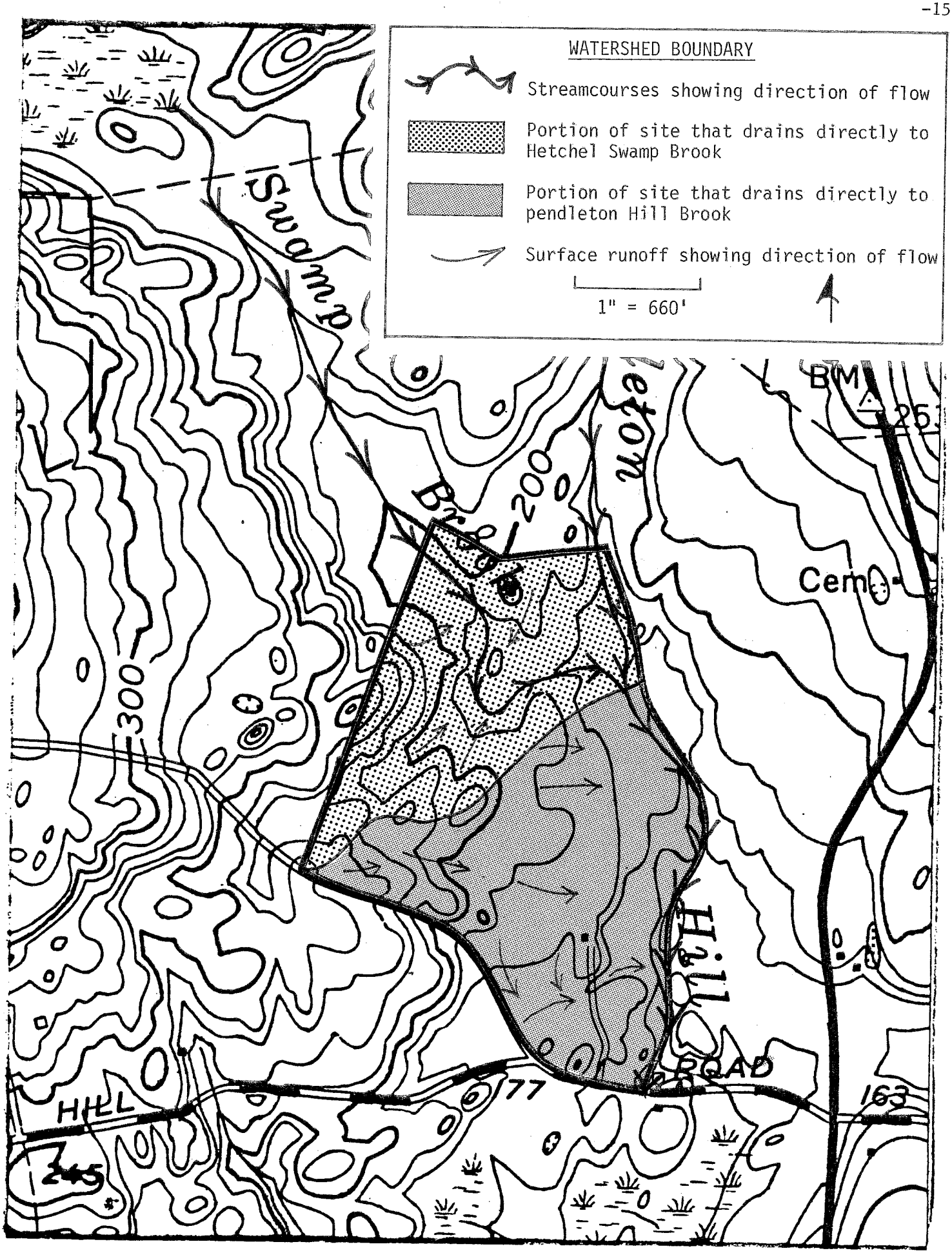
FIVE: GEOLOGIC DEVELOPMENT CONCERNS

In terms of the proposed subdivision development, the principal geologic limitations found on the site include: (1) the presence of till soils, some of which have the potential for seasonally high groundwater levels (NOTE: A percolation test conducted on lot 11.12 recorded a slow percolation rate (40 minutes per inch); it might be wise to conduct another perc test in another area on the lot. Also, not all lots appear to have been perc tested); (2) areas of seasonal and permanent wetness; and (3) the presence of some shallow bedrock.

It is understood that the proposed building lots would be served by on-site sewage disposal systems. The geologic limitations mentioned above will be a hindrance in terms of providing adequate subsurface sewage disposal systems to the proposed homes. It seems likely that good planning and engineering will be needed in order to surmount the geologic limitations.

Deep test hole information supplied to Team members confirms that some lots would be classified as areas of special concern and warrant detailed site investigation and engineering plans in order to assure each subsurface sewage disposal system is properly constructed. The major item of concern includes the potential for seasonally high groundwater due to the relatively shallow depth to soil mottling noted in many deep test pits and the limited areas where bedrock was observed at depths of less than seven feet below existing grade. With regard to the latter, several deep test holes are warranted on lots which have shallow to bedrock conditions, in order to establish a good profile of the bedrock surface.

As mentioned above, the limiting factor on many lots is the presence of shallow soil mottling which would be indicative of seasonal high water tables. Every effort should be made to determine if these lots are suited


WATERSHED BOUNDARY
Streamcourses showing direction of flow
Portion of site that drains directly to Hetchel Swamp Brook
Portion of site that drains directly to pendleton Hill Brook
Surface runoff showing direction of flow
1" = 660'
Swamp
BM
Cem
HILL
ROAD
245
300
200
100
77
163

for installation of groundwater intercepting drains (curtain drains). There is a possibility that curtain drains could be installed in conjunction with the building footing drains. It is likely that select fill material will need to be placed on these lots to elevate trench bottoms sufficiently above the seasonally high water table. These engineering measures should help to protect the leaching system from groundwater interference.

Because most lots are about two acres or more in size, the design engineer will be afforded greater flexibility for locating septic systems.

Due to the various geologic limitations noted on several lots, it is suggested that detailed plans be prepared by a professional engineer prior to issuance of building permits. Where there is concern with respect to the varying seasonally high groundwater elevations, provisions should be made for installation of groundwater monitoring pipes to facilitate water level monitoring during the spring period. It should be noted that some deep test holes were observed during the dry time of the year (October).

Because of the potential for wet soil conditions on some lots (at least seasonally) it is strongly suggested that building footing drains be installed around foundations. Building footing and curtain drains will need to be outletted at points which will not present problems in terms of septic systems, on-site wells or drainage to neighboring properties.

Although no deep test hole data was available for the proposed 4 lots on the 20 acre parcel to the south, soil mapping information and cursory inspection by the Team's geologist of remnant soils from deep test holes, indicates that soils throughout the cornfield are sandy and gravelly and would be favorable for on-site septic systems. Septic systems should be located outside of the depressional features on the lots, which tend to collect surface water and eroded soils (silt) off the cornfields. The latter can result in very slow perc rates and standing water, both of which can interfere with the proper functioning of septic systems. A potential concern with the sandy, gravelly soils is fast percolation rates. If the percolation rate is faster than 1 minute per inch, then separating distances between well and septic systems need to be doubled. This may vary from lot to lot depending upon the withdrawal rate of the well, but for most domestic purposes it usually requires an increase in separation distance from 75 feet to 150 feet.

A final hydrogeologic concern with the construction of homes on the cornfield area is that past agricultural use (fertilization) of the land may have affected the nitrate levels in the groundwater.

SIX: WATER SUPPLY

Since there are no public water supply lines accessible to the parcel, it seems likely the proposed subdivision would be served by individual on-site wells. It appears that wells will need to tap the underlying bedrock aquifer. Wells drilled in bedrock generally supply small but reliable yields of groundwater. However, since the yield of a given well depends upon the number and size of water bearing fractures that it intersects, and since the distribution of fractures in bedrock is irregular, there is no practical way, outside of

expensive geophysical testing, of predicting the yield of a well drilled in a specific location. As noted earlier, the presence of a fault bisecting the site, indicates the likelihood of fractured and weathered bedrock. Both provide groundwater storage in the bedrock, making it available for domestic use. Because fractures in the rock generally occur within the first 100 to 150 feet below the surface, it has been shown that the probability of increasing the yield of a well decreases with depth below this level.

Ideally, each well should be located on a relatively high portion of the lot, properly separated from the sewage disposal system and any other potential pollutant, (road drainage, 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 the bedrock water, all wells will need to be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board regulations. In addition, the Town Sanitarian will need to inspect and approve well locations.

In the lower Thames and Southeastern Coastal River Basin, wells tapping crystalline bedrock (i.e., gneisses, schists, etc.) were surveyed in Connecticut Water Resources Bulletin No. 11. Approximately 90 percent or 9 out of 10 wells surveyed, were able to yield 3 gallons per minute or more of water. A well yield of three (3) gallons is generally satisfactory for most households.

The natural quality of groundwater should be satisfactory. Groundwater beneath the entire site, including the 20 acre parcel is classified as Class A. This means that groundwater is suitable for private drinking water supplies without treatment.

SEVEN: FISH RESOURCES

1. Site Descritpion

Two perennial streams, Hetchel Swamp Brook and Pendleton Hill Brook flow through the proposed development. Ten building lots (numbers 11.08 -- 11.17) will be built adjacent to the brooks. Property lines of these lots extend onto the floodplains of both brooks.

Both streams contain excellent instream and streamside habitat for trout and other coldwater resident fishes. Stream flows were close to spring maximum levels at the time of the field review. Streambed substrate varies from "cobble" (2-12" diameter) type rocks to large boulders on fine sands and gravels. Undercut streambanks are common. Small low-lying rock dams have been strategically placed in order to create large deep pools. These structures provide beneficial cover "hiding and resting areas" by fish since aquatic insects, their primary food source, reside in these areas. Sufficient over-

head shading is provided by streamside trees. Shading benefits aquatic resources by cooling stream waters. Stream waters are tea-stained due to naturally occurring tannic acids in upstream swamp areas. The lack of filamentous algae and nuisance aquatic vegetation is evidence of healthy, clean waters.

Both Pendleton Hill Brook and Hetchel Swamp Brook are prone to flooding. In these areas, stream channels break up into numerous small channels flowing in a "braided-like" fashion through extensive wetland habitat. Inland wetland boundries in many sections along these streams extend far from the stream edge.

2. Fish Population

Pendleton Hill and Hetchel Swamp Brook both support a valuable recreational coldwater fishery. Fish species expected to inhabit these brooks are: native (wild) brook trout, longnose dace, blacknose dace, and white sucker. The Bureau of Fisheries (DEP) stock Pendleton Hill Brook on an annual basis with more than 600 yearling (6-8") brook trout in the town of North Stonington.

Waters of these brooks are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for a "Class A" watercourse are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses. The character is uniformly excellent, and may be subject to absolute restrictions on the discharge of pollutants.

3. Impacts

The following impacts on the streams that lie on this property can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of streams 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 long been regarded as a major cause of stream degradation. Silt is considered a major stream pollutant. In particular, silt deposition will:

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

- Reduce aquatic insect production - sediment free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are important food items in fish diets. Reduced insect levels will adversely effect fish growth and survival since excessive energy demands are required to locate preferred aquatic insects when populations levels are low.

- 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 of the brooks not affected by siltation.

- Reduce stream pool depth - pools provide cover, shelter, and resting areas for fish. They are important fish habitat areas. Siltation of pools will cause a further reduction in usable fish habitat.

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

- 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.

- Encourage the growth of rooted aquatic plants and promote filamentous algae growth in streams - eroded soils contain plant nutrients such as nitrates and phosphates. Although algae and aquatic plants require these nutrients for growth, most aquatic ecosystems contain very limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into aquatic habitats resulting in accelerated plant growth. Presently, both streams contain very insignificant amounts of rooted aquatic plants.

2. Percolation of septic effluent into streams - a failure of individual septic systems to operate properly would be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems could possibly enter streamwaters in the event of a failure or infiltrate the groundwater during the spring when water tables are close to the surface. The introduction of septic effluent could result in a major threat to fish habitat, public health, and overall water quality conditions. Effluent will also stimulate the growth of nuisance aquatic vegetation and algae.

3. Aquatic habitat degradation due to the influx of stormwater drainage - waters that contain pollutants such as salt, gasoline, and oil can be introduced into the streams and cause water quality and aquatic habitat degradation. Fine silts in stormwaters that remain in suspension for prolonged periods of time cannot be effectively removed from stormwaters. Stormwater runoff will eventually fertilize stream waters and result in water quality degradation.

4. Transport of lawn fertilizers and chemicals to streams - runoff and leaching of nutrients from fertilizers on lawns will stimulate filamentous algae growth in streams and degrade water quality. Introduction of lawn herbicides may result in "fish kills" and water quality degradation.

5. Impacts to downstream environments - any water quality problems and habitat degradation that directly occurs within these streams will eventually be observed in downstream areas such as Spalding Pond. Increased eutrophication (aging) or nutrient enrichment over time can be expected in Spalding Pond if it receives elevated levels of nutrient enrichment. Increased pond aging will result in the creation of dense algae blooms, sediment accumulation, nuisance amounts of aquatic vegetation, and increased production of microorganisms that cause fish disease. The probability of partial or complete fish kills will increase.

4. Recommendations

The wide ranging impacts on Pendleton Hill and Hetchel Swamp Brook may be somewhat minimized by implementing the following suggested recommendations:

1. Install and maintain proper erosion and sedimentation controls during site construction activities - this includes such mitigative measures as silt fences, hay bales, and catch basins. The Town of North Stonington should have an appointed official that would be responsible for checking this development to ensure that contractors have complied with all stipulated mitigation devices. Past stream miltation 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.

2. Maintain at the **minimum a 100 foot** open space **buffer zone** along the wetland boundaries that border both streams - no construction and alteration of riparian habitat shall take place in this zone, otherwise the ability of the buffer zone to function properly will be reduced. Research has shown that 100 foot buffer zones will protect aquatic resources by helping to prevent surface runoff, septic leachate and other pollutants from entering streams (USFWS 1984; USFWS 1986; ODFW 1985). The Town of North Stonington should be responsible for the regulation of all activities that can take place within the buffer zone.

3. Properly design and locate individual septic systems (refer to **Sewage Disposal** Section) - the addition of septic effluent to these streams can be one of the greatest threats to stream ecology. Septic systems should be maintained on a regular basis. Prevent the disposal of harmful chemicals into septic systems which may negatively effect operation and possibly result in system failure.

4. Properly design, locate, and maintain catch basins on subdivision roads to ensure the proper management of stormwaters and roadway runoff - maintenance is extremely critical. Catch basins should be regularly maintained to minimize adverse impacts to streams. Catch basins will only trap heavy, coarse sediments reducing the likelihood of stream sedimentation; however, waters that contain pollutants such as salts and even small amounts of fine enriched sediments will eventually cause water quality and aquatic habitat degradation. This impact

cannot be prevented. Stormwaters should not be directly outletted to streams.

5. Limit liming, fertilization, and the introduction of chemicals to subdivision building lots - this will help abate the amount of additional nutrients to the streams. Non-phosphorus lawn fertilizers are currently available from various lawn care distribution centers.

5. Bibliography

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). 64 pp.

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). 65 pp.

EIGHT: PLANNING CONCERNS

1. General

This site has extensive wetlands on it including Pendleton Brook. This wetland area is depicted as an area of concern in a recent SCRPA "Inland Wetlands Protection Study" due to its water supply and flood control potential. This stream and wetlands are locatd on coarse-grained stratified drift and within a special flood hazard area. Approximately 16 of the 26 lots located on the north side of Grindstone and Fowler Road have a significant wetland area as part of each lot. The suitability of the non-wetland soil area to adequately support on-site subsurface sewage disposal systems and wells is critical.

The road drainage system is also important as the outflow will be into Pendleton Brook. The type and amount of potential contaminants from the roadway should be minimal as they will primarily be small quantities of oils and road salts. The drainage system outflow proposed, utilizing rip rap for approximately 125 feet prior to reaching the brook, should assist in mitigating any potential adverse impacts from the road oils and salts.

It is important that sediment and erosion control measures be in place prior to any disturbance for road or lot construction.

Additionally minimizing areas to be disturbed adjacent to wetland soils is important, especially with regard to the road cuts.

2. Traffic

The proposed 30 lots have the potential to generate 288 trips to and from the site each day. This would result in an A.M. peak flow of 23 trips and P.M. peak flow of 31 trips. The flow of traffic would be to Route 49 and would be split between via Grindstone and Hangman Road. State of Connecticut DOT average daily traffic (ADT) volumes of 1985 show an ADT of 1900 vehicles from Route 184 to Hangman Road and a ADT of 1300 vehicles from Hangman to Grindstone. From Grindstone Road north the ADT drops to 800 vehicles. The average capacity of a two way rural highway with geometric characteristics similiar to Route 49 is approximately 1800 vehicles per hour. Accordingly the additional traffic flow generated by this proposal should not change thie existing level of service on Route 49 or significantly impact the local roads which access the site.

Curb cuts from the site itself for road and driveways are extremely important due to the curves and vertical alignment changes of Grindstone and Fowler Roads.

The proposed placement of Brookview Road does have adequate site clearance in both directions and at both points of entry onto Fowler Road.

Curb cuts for driveways from a number of the proposed lots may create a hazard if not placed appropriately. Lot number 11.01,..02, .03, .04, .05, .06, .07 and the 4 or 5 lots to be created on the south side of Grindstone fall into this category.

Lots which front on the proposed Brookview Road should access this road where conditions permit, such as lot numbers 11.02, 11.03, and 11.05. Driveway access should be at least 200 feet from the intersection of Brookview and Fowler Road. Lots 11.06 and 11.07 could have a combined apron which branches off onto two separate drives. There are various driveway cut locations and combinations which would be appropriate for the above lots. The intent is to minimize the number of curb cuts for driveways which will minimize the points of conflict for the traffic flow. This is especially important on highly travelled roads and roads such as Grindstone Road and Fowler Road which have numerous vertical and horizontal alignment changes.

About The Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, archeologists, recreation 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 area.

The Team is 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, sanitary landfills, commercial and industrial developments, sand and gravel operations, 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 officials 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. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, a statement identifying the specific areas of concern the Team should address, and the time available for completion of the ERT study. 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 regarding the Environmental Review Team, please contact Elaine A. Sych (774-1253), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, P.O. Box 198, Brooklyn, Connecticut 06234.