BENTLEY BROOK ESTATES

BOZRAH, CONNECTICUT

MARCH 1990

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut
Resource Conservation
and Development Area, Inc.

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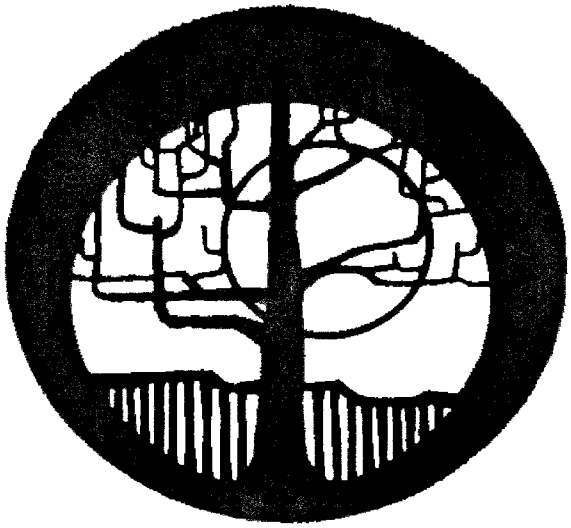

Review Date: January 25, 1990

Report Date: March 1990

Eastern Connecticut Environmental Review Team
Eastern Connecticut Resource Conservation and Development Area, Inc.
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203-345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

BENTLEY BROOK ESTATES
PHASE I AND II

BOZRAH, CONNECTICUT

This report is an outgrowth of a request from the Bozrah Planning & Zoning 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, January 25, 1990. Team members participating on this review included:

Peter Aarrestad	**Fisheries Resource Technician** **DEP - Eastern District**
Patrice Beckwith	**Soil Conservationist** **USDA - Soil Conservation Service**
Dan Mayer	**Environmental Analyst** **DEP - Inland Water Resource Management**
Tom Seidel	**Regional Planner** **Southeastern CT Regional Planning Agency**
Elaine Sych	**ERT Coordinator** **Eastern Connecticut 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 draft plans, drainage calculations and deep test hole information. The Team met with, and were accompanied by the Bozrah First Selectman, a member of the Planning & Zoning Commission and the land surveyors 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 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:

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1. LOCATION AND PROJECT DESCRIPTION

The ±138 acre irregularly shaped site is located in eastern Bozrah at its border with Norwich. A short segment of Gifford Lane borders the site on the north. Private, wooded land abuts the property on the north and south. Bentley Brook, a Yantic River tributary, flows through the western parts of the site. Access to the proposed subdivision site will be made available via Candlewood Drive and Birchwood Drive on the east in Norwich. These streets will direct traffic generated by the proposed subdivision onto Yantic Lane and Wawecus Hill Road in Norwich.

A CL&P right-of-way bisects the northern parts of the site in a northwest-southeast direction. The utility maintains a ±150 foot easement to prevent tree and vegetation growth and for maintenance and repair access. On the parcel, the CL&P right-of-way comprises 4.82 acres and bisects 9 proposed lots. Five out of the nine lots contain 25% or more of the CL&P right-of-way: Lot 4-41%; Lot 5-26%; Lot 21-41%; Lot 22-28%; Lot 23-25%. Prospective owners of these lots should be made aware of all restrictions imposed by the utility on the right-of-way. Noting them on the plan may be helpful. Good planning would provide sufficient land area on each lot to support a complete residential development outside of the easement area.

Town officials noted on the review day that the entire site is zoned R-l, which allows single-family homes on lots of 80,000 square feet or about 2 acres. Present plans indicate that the ±138 acre site will be divided into two phases; Phase 1 and 2. Phase 1, which consists of 23 lots on 58.58 acres occurs in the northern half. Lots will range in size from 1.87 acre to 3.45 acres. Phase 2, which consists of 32 lots on 80 acres is located in the southern half of the site. Acreages for these lots were not available for team members on the review day.

Each lot in the proposed subdivision will be served by individual on-site septic systems and water supply wells.

The proposed subdivision site, which is undeveloped and generally unused, is located directly west of a medium density, residential subdivision located off Yantic Lane in Norwich.

The subdivision of the Yantic Lane area commenced prior to 1965. In an attempt to lower the high ground table condition that characterized this area, the land was extensively disturbed and natural drainage greatly disrupted during the construction of the subdivision. The proposed subdivision site retains features resulting from this work, which includes man-made drainage ditches that transport stormwater from portions of the Yantic Lane residential development to Bentley Brook and areas of stockpiled soil and large boulders. It should be noted that septic tank effluent emanating from failing septic systems serving homes on Cedar Lane and Bozrah Drive was observed during a walking tour of the site. The effluent, which discharges to the ground surface ultimately drains via road drainage and/or by overland flow towards the proposed subdivision site. Strong septic odors were also noticeable in this area during the field walk. Town officials should contact the Uncas Health District in Norwich regarding this public health hazard condition and consideration for conducting a sanitary survey of the area.

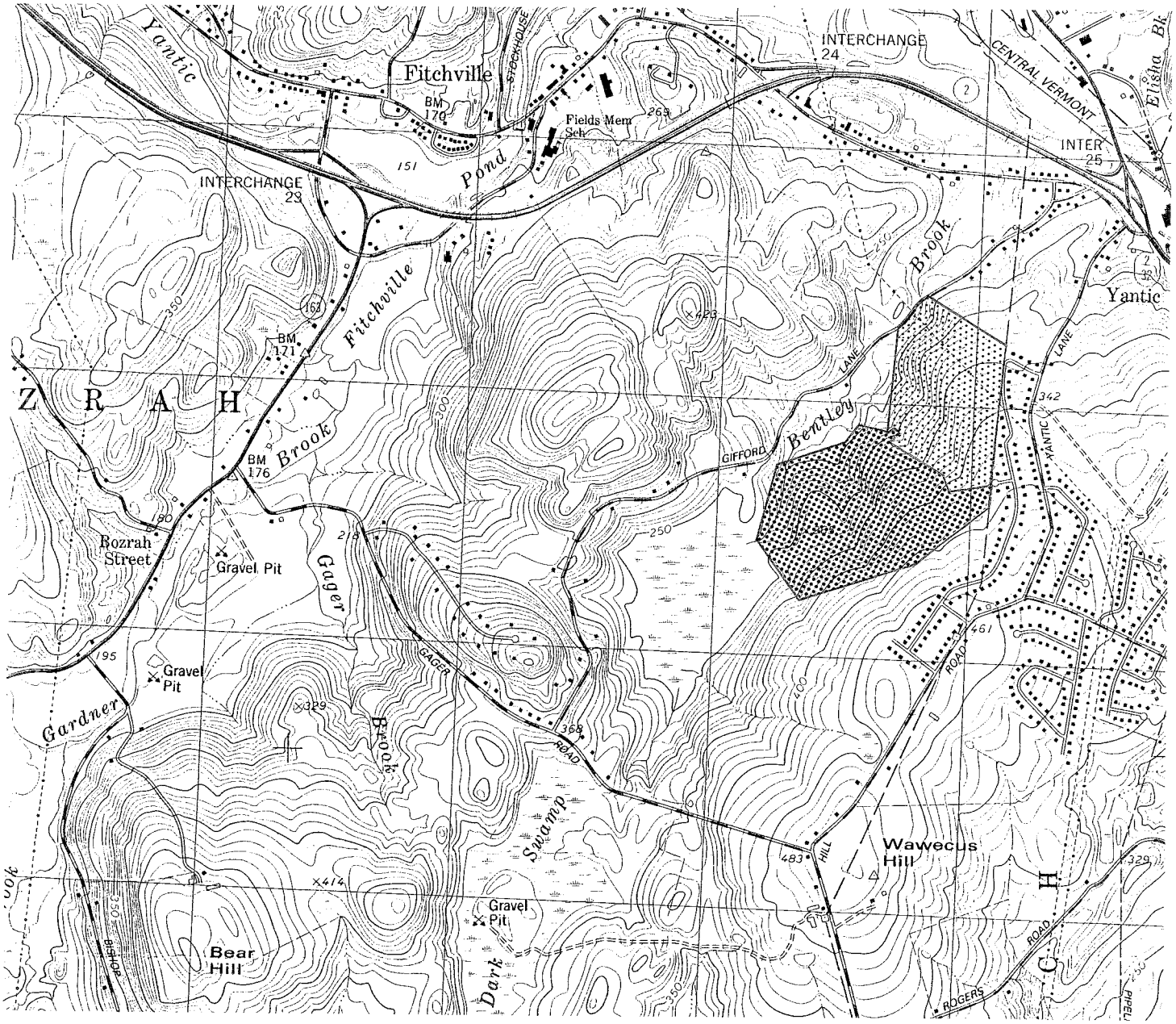
Land-uses north and east of the site consists of a mix of low-density residential and agriculture. In the past, the removal of sand and gravel took place in the vicinity of Lot 6. This area, which has been left as an eyesore on the landscape was extensively disturbed and retains features resulting from the excavation. These features include poorly drained depressions, areas absent of the soil solum (top soil and subsoil zones), and steep, nearly vertical slopes.

Based on a review of air photos of the site and vicinity that date back to 1934, land use changes in the area include a decrease in farmland, and an increase in wooded and residential land.

LOCATION MAP

SCALE 1" = 2000'

Phase I
Phase II



2. TOPOGRAPHY

The site flanks the west side of Wawecus Hill at its northern end. Overall, the site slopes moderately northwestward to Bentley Brook but it also includes areas of gentle and steep slopes. Small areas of gentle and flat slopes occur at the southern parts of the site. Very steep slopes occur principally along the western property boundary. Site elevations rise from about 200 feet above mean sea level along the Bentley Brook floodplain at the site's western border to about 400 feet above mean sea level at the site's eastern limits.

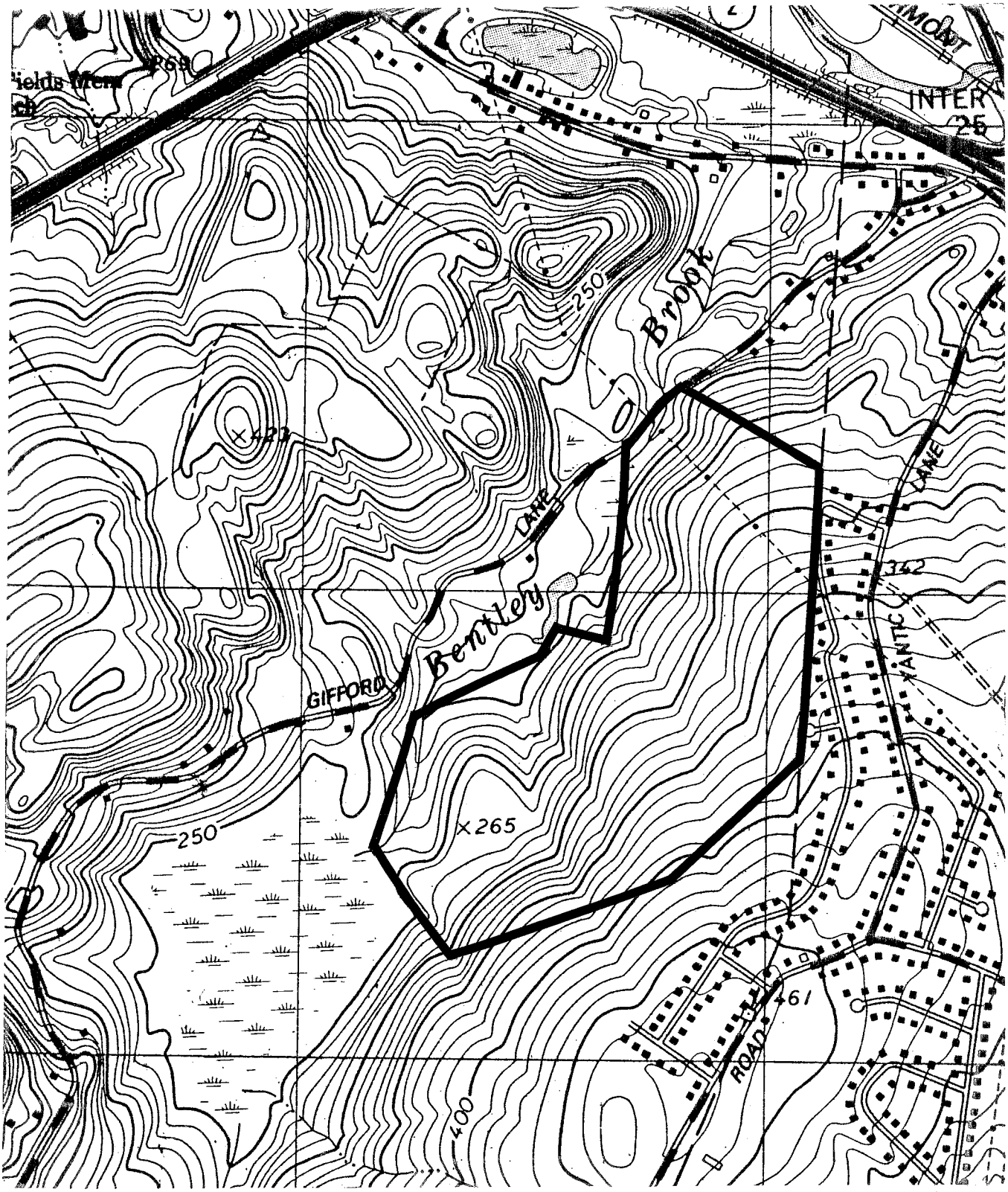
Except for two relatively short segments, the proposed interior road system has been designed to cross slopes and conform to contours rather than perpendicular to them. This should help to reduce the amount of cuts and fills for the roads and limits the amount of disturbance due to grading. In order to meet town road grade requirements, it is likely that the road segments which are constructed perpendicular to the slopes will require cuts and fills. In places, these cuts may encounter bedrock and/or seasonally high water tables. As such, blasting or special road drainage requirements may be necessary. Where this work is needed, the cost of site development will undoubtedly increase. (See also SEWAGE DISPOSAL section). It is suggested that deep test holes be excavated in these areas to determine subsurface conditions.

Another concern relative to the moderate and steep slopes on the site is the potential for erosion and sedimentation problems, especially since the soils on the site contain silt and fine sands. The seasonally high ground water table condition will aggravate this potential adverse condition. Every effort should be made to protect adjacent water resources such as Bentley Brook. This can be accomplished by implementation of proper erosion and sedimentation control measures, minimizing disturbed areas and construction sequencing (see HYDROLOGY section).

TOPOGRAPHIC MAP

SCALE 1" = 1000'

Approximate Site Boundary



3. GEOLOGY

The subdivision site lies entirely in the Fitchville topographic quadrangle. A bedrock geologic map (U.S. Geological Survey Bulletin 1161-I by G.L. Snyder) and surficial geologic map GQ-485, by Fred Pessl, Jr. for the quadrangle have been published by the U.S. Geological Survey. Also, referenced for the GEOLOGY section of the report was the "Bedrock Geological Map of Connecticut" by John Rodgers, 1985. These maps are available at the Department of Environmental Protection's Natural Resource Center in Hartford.

Bedrock Geology

The rock core of Wawecus Hill which includes the subject site is identified as the Yantic Member of Tatnic Hill Formation, a light-gray, fine- to medium-grained schist. At the site's western boundary, it is in contact with a narrow band of Hebron Gneiss, an interlayered dark-gray schist and greenish-gray, fine to medium-grained calc-silicate gneiss. The band of Hebron Gneiss rocks is roughly aligned with Bentley Brook in the vicinity of the site.

"Schists" and "gneisses" are crystalline rocks that have been geologically altered by great heat and pressure within the earth's crust. The terms "schist" and "gneiss" refer to the textural and structural aspects of the rocks. The rocks underlying the parcel have undergone deformation (metamorphism) one or more times during the period following their deposition as deep ocean sediments. The stresses of deformation caused the alignment of platy, flaky and elongate minerals into thin sheets or bands. Where the alignment has resulted in a slabby rock (i.e., one that parts relatively easily along the surface of mineral alignment or foliation planes), the rock is termed a "schist". Where the alignment has resulted in a banded but more massive rock, the rock is termed "gneiss". Both rock types may grade into another in a single outcrop.

Ledgerock exposures were not observed on the site during the field walk. However, there were several areas where large boulders cover the surface of the ground. It is likely that these surface boulders will need to be removed for landscaping.

Subsurface exploration for on-site sewage disposal conducted by the applicant's

technical consultant did not encounter ledgerock. This work involved the excavation of 46 deep test holes in the Phase 1 area. The deep test holes ranged between 6 and 9 feet below ground surface. On the other hand, soil mapping data denotes that the northern and southern parts of the site contain Charlton-Hollis fine sandy loam soils (CrC and CrD) (see SOIL RESOURCE section). Because they are in such a complex and intermingled pattern, the Charlton and Hollis soils have not been separated in mapping. The concern here is that the Hollis soils are characterized by shallow to bedrock conditions, generally less than 20 inches to bedrock. As such, there may be areas within the site where shallow to bedrock conditions exist.

The underlying bedrock is the source of water for most homes in Bozrah and is likely to be the aquifer serving the proposed subdivision.

Surficial Geology

Except for the sand and gravel deposits that flank Bentley Brook floodplain at the western limits, a glacial sediment called till covers the site. Till is a poorly sorted mixture of rock fragments and particles deposited directly by glacier ice. Rock fragments and particles found in the soil were derived from the local gneisses and schists. Based on soil mapping data, it appears that two varieties of till cover the site. Approximately half of the site appears to be covered by a sandy, stony and loose variety, which probably does not exceed much more than 10 feet in most places. They include the CbB, CbC, CrC, CrD soils identified on the accompanying soils map. The other half contains a siltier variety which is typically characterized by a relatively shallow compact soil zone (WzC on the soils map). The presence of a compact soil zone commonly results in seasonally high water tables, soil mottling (an indicator of high ground water tables) and slow percolation rates (see SEWAGE DISPOSAL section).

The other surficial deposit of glacial origin, found in the western parts, is stratified drift. Stratified drift, whose major components consist of sand and gravel, was deposited by glacial meltwater streams issuing from chunks of glacial ice. The texture of the stratified drift in the area of the former mining pit is pebble gravel to cobble gravel in the upper portions of the deposit, but it becomes finer (sand) in the lower parts. The exact thickness of the sand and gravel deposits on the site is unknown.

The Soil Survey of New London County, Connecticut,1983, identified regulated wetland soils on the site as Rn (Ridgebury-Leicester-Whitman extremely stony fine sandy

loams). This has not been verified by the applicant's soil scientist.

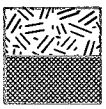
The Rn soils mentioned above have been mapped as an undifferentiated unit comprising Ridgebury-Leicester-Whitman soils. All three soils are very deep, loamy soils that formed in glacial till. The Ridgebury and Whitman soils develop in the compact glacial till while the Leicester soils develop in the more friable till. They range from poorly drained (Leicester and Ridgebury) to very poorly drained (Whitman). In general, the Ridgebury, Leicester and Whitman soils are nearly level or gently sloping soils found in drainageways and low-lying positions of till covered uplands.

The major concern of these soils from an engineering standpoint focuses on a seasonally high water table. A high water table condition is at or near ground surface in the Leicester and Ridgebury soils generally between November and May. In the Whitman soils, a high water table condition, at or above ground surface, occurs September through June.

The project (Phase I & II) calls for 5 wetland road crossings of the Rn soils that total about 830 linear feet. This does not include possible driveway crossings of regulated soils and road/driveway grading that may infringe on wetland soils. Since these soils are regulated under Connecticut Inland Wetland and Watercourse Act, Connecticut General Statutes Section 22a-36 through 22a-45, inclusive, any activity, such as road crossings and placement of fill material, that impacts wetlands will require a permit from the local inland wetland agency. Before the agency acts on the proposal they should fully understand the function of the wetland in the area of the crossing with regard to potential impacts of the activity on the wetland. As such, details on all road crossings should be provided to the town for review purposes including, pipe sizes, amount and type of fill material to be used, area of impact, and the presence of important biologic or ecologic features in the area. Also, "feasible and prudent alternatives" that minimize the number of road crossings or re-configure roads keeping them entirely out of wetland areas should be investigated by the developer. It does not appear that this has been done.

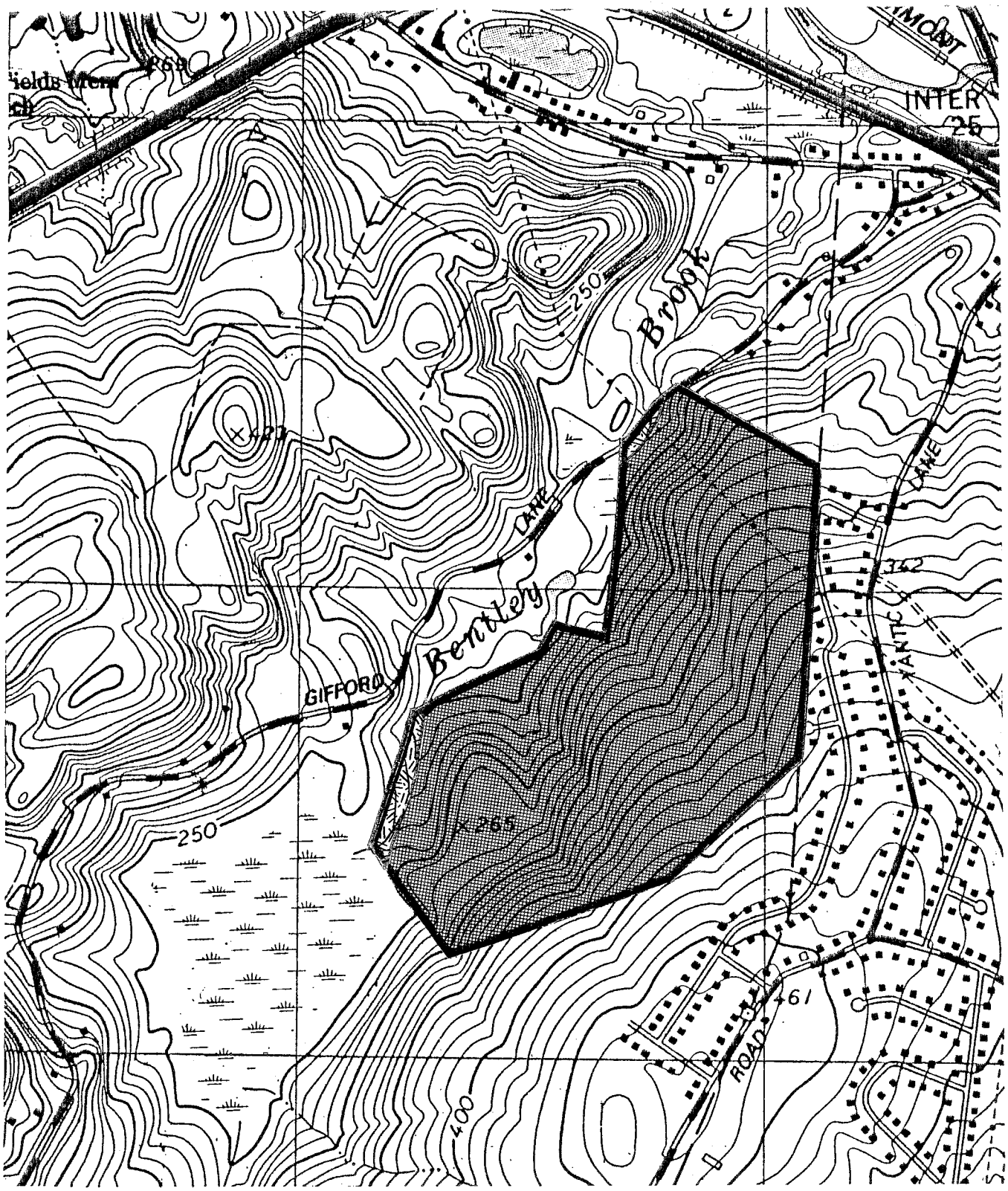
BEDROCK GEOLOGIC MAP

SCALE 1" = 1000'



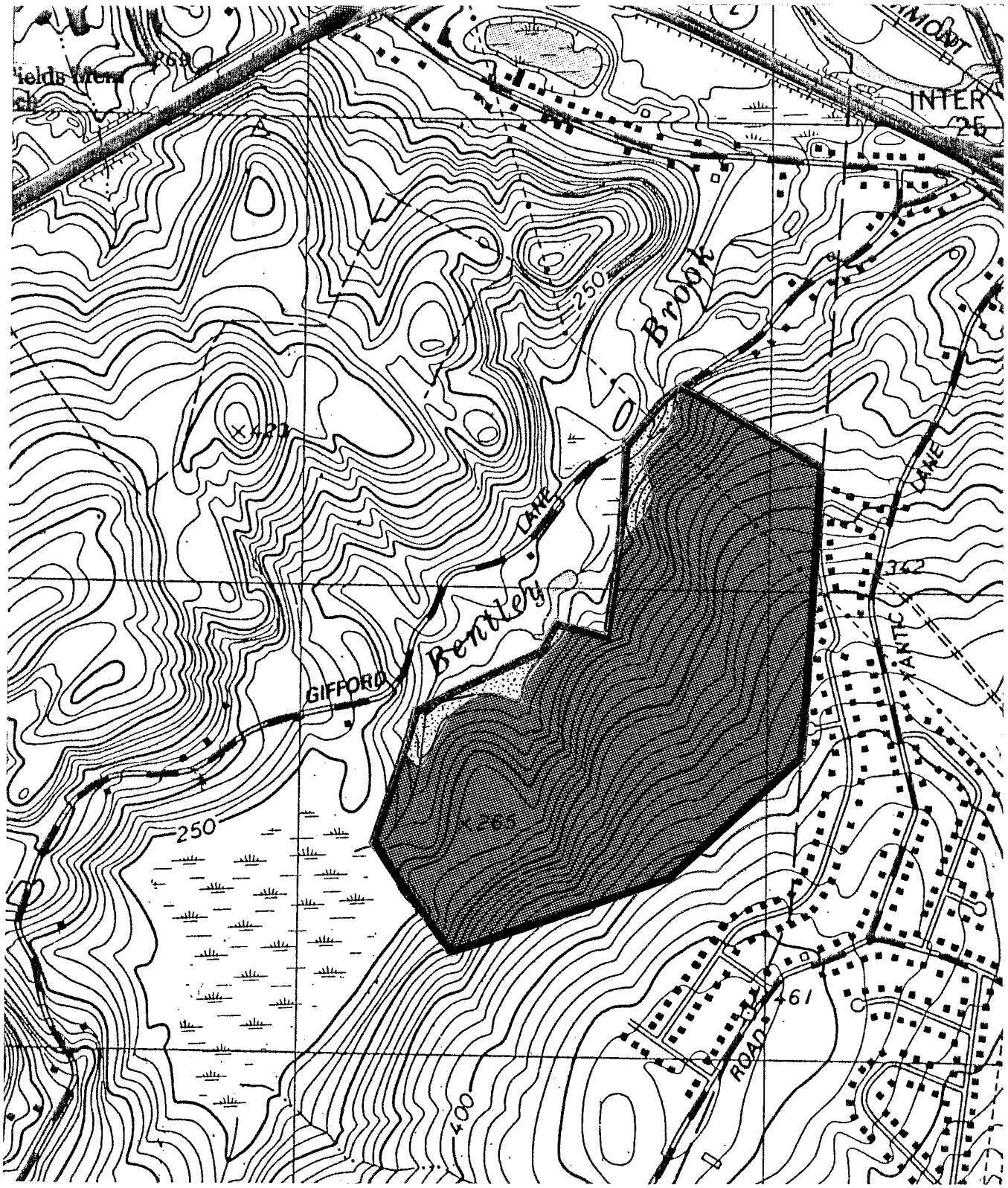
Hebron Gneiss

Yantic Member of Tatnic Hill Formation



SURFICIAL GEOLOGIC MAP

SCALE 1" = 1000'



4. SOIL RESOURCES

Phase I of the project is located primarily over Charlton Hollis, Paxton and Woodbridge soils. The Charlton-Hollis is a well drained fine sandy loam, however, the limiting factor to development is the shallow depth to bedrock and slope. Additional considerations would be to conduct an in depth feasibility study. This would include an increased investigation to utilize the deepest soils and flattest slopes. State regulations will not allow a permit to be issued to install an absorption field if the depth to bedrock, of the naturally occurring soil, is less than 24 inches. The Paxton and Woodbridge soils exhibit a seasonably perched water table and slow to very slow percolation rates in the substratum. These are identified as areas of special concern by state regulation - an engineer's design will be required. Corrective measures would include filling and/or curtain draining with drainage swales to divert surface and subsurface water away from the field and filling, or building up of the field. Designing an absorption field to distribute effluent over a larger area. Much of the area in Phase II of the project exhibits similar soil characteristics. A substantial portion of the site is steep and stony. Both these factors make installation of on site septic systems difficult and costly. Care must be taken to prevent effluent from breaking out the slope. Common corrective measures include serial distribution of effluent through the use of high level overflows.

A good portion of the site was mapped as wetlands. Because the mapping and field delineation of the wetlands were done several months ago, some of the wetlands flags have been disturbed. There was a discrepancy in small pockets of wetland that may not have been accounted for. The wetland areas were proposed to be breached six times with road crossings. No details of the proposed activities in this area have been disclosed. It is suggested that the commission require the applicant to provide a plan map with the field delineated boundaries of the wetlands and the station numbers shown. The soil scientist who performed the field work should then review and sign a statement on the map(s) certifying that the information is substantially correct. The certification statement should be similar to the following:

> "The wetland soils on this site were identified in the field using the criteria required by Connecticut P.A. 72-155 as amended by Connecticut P.A. 73-571, Connecticut P.A. 87-338 and P.A. 87-533. The boundaries of these soils and of identified watercourses are accurately represented on the plot plan."

A Sediment and Erosion Control Plan has not been prepared for this project. Special consideration should be given to the areas around each wetland disturbance. Because of the slopes and extensive wetlands on the site, the E&S Plan will be particularly critical. As with all good plans, proper maintenance of the control structures is critical.

SOILS MAP

SCALE 1" = 1320'

Soil Descriptions

Aa - Adrian and Palms mucks

These nearly level, very poorly drained soils are in pockets and depressions of stream terraces, outwash plains, and glacial till uplands. Slopes range from 0 to 2 percent. Adrian soils have a high water table which is at or near the surface for most of the year. Permeability is moderately rapid in the organic layers and rapid in the substratum. Palms soils have a high water table which is at or near the surface for most of the year. Permeability is moderately rapid in the organic layers and moderately slow in the substratum. The available water capacity is high for these soils. Runoff is very slow or ponded. These soils are strongly acid through slightly acid. These soils are not suited to cultivate crops, but they are suited to trees. Windthrow is common because of shallow rooting depth above the water table. These soils are poorly suited to community development.

These soils are in capability subclass VIw.

CbB - Canton and Charlton fine sandy loams, 3 - 8 percent slopes

These gently sloping, well drained soils are on glacial till upland hills, plains, and ridges. Permeability of the Canton soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. Permeability of the Charlton soil is moderate or moderately rapid. The available water capacity in these soils is moderate. Runoff is medium. This soil warms up and dries out rapidly in the spring. These soils are well suited to cultivated crops. The hazard of erosion is moderate. These soils are suited to trees.

These soils are in capability subclass IIe.

CbC - Canton and Charlton fine sandy loams, 8 - 15 percent slopes

These sloping, well drained soils are on glacial till upland hills, plains, and ridges. Permeability of the Canton soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. Permeability of the Charlton soil is moderate or moderately rapid. The available water capacity for these soils is moderate. Runoff is rapid. These soils warm up and dry out rapidly in the spring. Unless limed, the soil is strongly acid or medium acid. These soils are suited to cultivated crops. The hazard of erosion is severe. These soils are suited to trees. Major limiting factor for community development is steepness of slope.

These soils are in capability subclass IIIe.

CrC - Charlton-Hollis fine sandy loams, very rocky, 3 - 15 percent slope

This gently sloping to sloping complex consists of somewhat excessively drained and well drained soils on glacial till uplands. Rock outcrops cover up to 10 percent of the surface. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Charlton soil is moderate or moderately rapid, the available water capacity is moderate. Permeability of the Hollis soil is moderate or moderately rapid above the bedrock, the available water capacity is low. The runoff of this complex is medium or rapid. It warms up and dries out rapidly in the spring. It is strongly acid or medium acid. These soils are not suited to cultivated crops. The hazard of erosion is moderate to severe. These soils are suited to trees. Windthrow is common on the Hollis soil because of the shallow rooting depth. The major limiting factor for community development is the shallow depth to bedrock.

These soils are in capability subclass VIs.

CrD - Charlton-Hollis fine sandy loams, very rocky, 15 - 45 percent slopes

This moderately steep to steep complex consists of somewhat excessively drained and well drained soils on glacial till uplands. Rock outcrops cover up to 10 percent of the surface. Stones and boulders cover 1 - 8 percent of the surface. Permeability of the Charlton soil is moderate or moderately rapid, the available water capacity is moderate. Permeability of the Hollis soil is moderate or moderately rapid above the bedrock, the available water capacity is low. Runoff of these soils is rapid or very rapid. These soils warm up and dry out rapidly in the spring. They are strongly acid or medium acid. These soils are not suited to cultivated crops. The Hollis soil has a shallow rooting depth and is droughty. These soils are suited to trees. Windthrow is common on the Hollis soil because of the shallow rooting depth. The major limiting factors for community development are steepness of slope, shallow depth to bedrock, and rock outcrops.

These soils are in capability subclass VIIs.

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.

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.

Sf - Scarboro mucky fine sandy loam

This nearly level, very poorly drained soil is on stream terraces and outwash plains. The Scarboro soil has a high water table at or near the surface for most of the year. Permeability is rapid in the organic layer and rapid or very rapid in the mineral surface layer and substratum. The available water capacity is low. Runoff is very slow, or the soil is ponded. Scarboro soil is very strongly acid through medium acid. This soil is not suited to cultivated crops. The hazard of erosion is slight, and controlling erosion is easy. This soil is suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. The major limiting factor for community development is wetness.

This soil is in capability subclass Vw.

SxB - Sutton extremely stony fine sandy loam, 0 - 8 percent slopes

This nearly level to gently sloping, moderately well drained soil is on upland glacial till plains, hills, and ridges. Stones and boulders cover 8 - 25 percent of the surface. The Sutton soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate or moderately rapid. The available water capacity is moderate. Runoff is slow or medium. Sutton 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 slight or moderate. This soil is suited to trees. The major limiting factor for community development is the seasonal high water table.

This soil is in capability subclass VIIs.

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

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.

5. HYDROLOGY

The entire site lies within the drainage area of Bentley Brook which flows through the western limits of the site. From its point of outflow to Yantic River, Bentley Brook drains an area of 1.79 square miles or 1,146 acres. The subdivision site, therefore, represents 12% of the Bentley Brook watershed.

Bentley Brook has not been classified by the Connecticut Department of Environmental Protection (DEP) but is considered a "Class A" water resource by default. Class A waters may be suitable for drinking, recreational or other use and may be subject to absolute restrictions on the discharge of pollutants, although certain discharges may be allowed.

Subdivision of the property as planned, followed by the construction of new homes, roads and driveways will increase runoff from the site. In order to assess the potential changes in the overall drainage patterns, resulting from the proposed residential subdivision, pre-development and post-development calculations were done by the applicant's technical staff. A copy of this report was submitted to Team members. The methodology used in these calculations is based on the U.S. Soil Conservation Service TR-55 (Tabular Method) utilizing the 100 year storm frequency. A review of the report indicates that the procedure is incomplete and does not appear to be followed in compliance with the latest TR-55 Urban Hydrology for Small Watersheds, June 1986. Also, it does not appear that road drainage arising from the Yantic Lane residential development has been considered in the drainage calculations. An examination of road culverts in this area is warranted.

It is suggested that the applicant's engineer use the latest TR-55 handbook for the hydrologic review. The peak discharges from the 2-year, and 10-year frequency 24-hour duration, type III distribution storms before and after development and downstream impacts should also be analyzed as part of the study. This information and other factors will help determine whether or not the post-development water management plan should include control structures (detention basins). Properly located and designed detention basins may be used to avoid increases in peak flows discharging from the site. Once this work has been completed, town officials should seek assistance from the New London County SCS office for the review of the hydrology report and overall stormwater management plan. It is realized that the stormwater management plan supplied to

Team members during the pre-review meeting is only in draft form. As a result, it is inadequate for review purposes. The plans indicate that road drainage will be artificially collected in catch basins and piped to various discharge points. In view of steep slopes, erodible soils and high water tables, special care needs to be taken for the proper location and protection of all discharge points. Final locations should be shown on the subdivision plan. Energy dissipators which will help reduce flow velocities and prevent erosion at the outflow should be constructed for all discharge points. Discharge points should be kept out of regulated wetlands.

Present plans indicate according to drainage calculations that the 48 inch corrugated metal pipe presently crossing on Gifford Lane is undersized for existing and proposed flows. As such, it will be replaced by a box culvert that is 18 feet wide by 5 feet deep. There is concern that flooding problems may be transferred to downstream areas, since the box culvert will pass flows from the 100-year storm frequency. This should be thoroughly checked by the applicant's engineer. (Also, please refer to FISHERIES RESOURCES section)

Another concern with increased runoff is the potential for streambank erosion and sedimentation problems. Due to site topography (moderate to steep slopes), necessary grading for access roads and driveways, and seasonally high groundwater conditions, it is prudent to take measures that will minimize the possibilities of adverse environmental impacts to wetlands or watercourses on or off site due to sedimentation and erosion. As noted earlier, silts and fine sand are significant components of the majority of the till soils on the site.

A comprehensive erosion and sedimentation control plan is needed to minimize potential adverse environmental impacts to water and wetland resources on and off the site during construction. Erosion and sediment control measures such as silt fences, hay bales, anti-tracking devices, temporary/permanent sediment ponds should be used to prevent the transport of sediments or turbid water. Because of the hostile conditions that exist on the site, these measures should be policed regularly by the town.

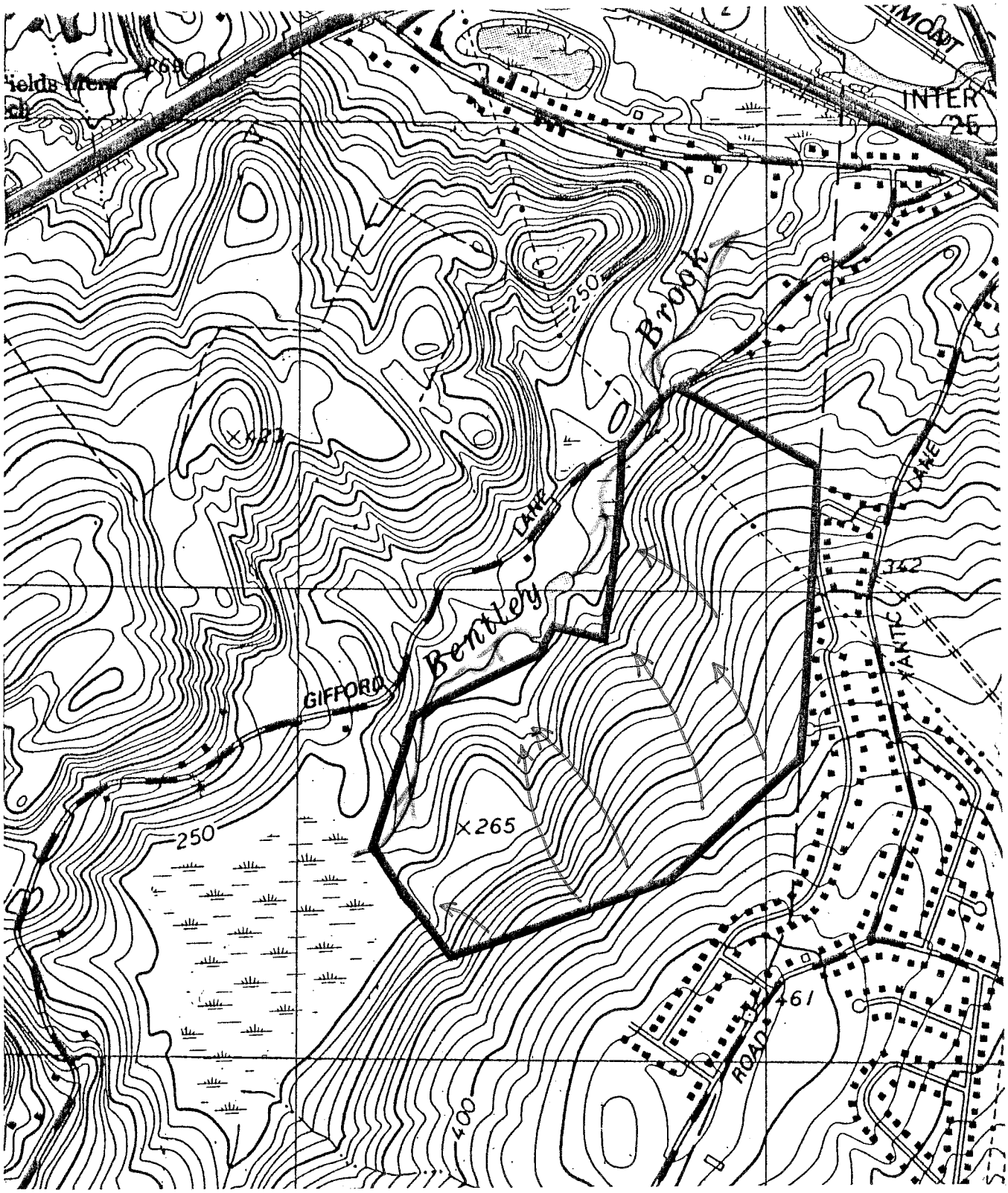
The seasonal high water table apparent on the site warrants the installation of building foot drains around all homes constructed in the subdivision. They will hopefully keep basements dry.

WATERSHED BOUNDARY MAP

SCALE 1" = 1000'

Entire site drains to Bentley Brook

Watercourses showing direction of flow



6. WETLAND REVIEW

Site Description and Proposed Activity

The site under review is located on Gifford Lane in the Town of Bozrah, just south of interchange 25 off of Route 2. The parcel is approximately ±138 acres in size and will be divided into two phases. The Phase I will contain 23 building lots on ±58.58 acres and the second phase will contain 32 building lots on ±79.82± acres. The Parcel is located on a west facing slope and contains several watercourses and swales which run into Bentley Brook which flows along the western border of the parcel. The vast majority of the site is forested and contains considerable slopes ranging from 5% to over 40% in some areas.

The application information received by the DEP-Inland Water Resource Management office (Subdivision Plan, Phase 1, Bentley Brook Estates, 1"= 100' and 1"= 40' scale, dated January 1989, Camp Land Surveyors), contained specific construction details at a scale of 1"= 40' for lots 1 - 8 only, (for Phase I). The remaining 15 lots which are proposed in Phase I contained no information regarding building, septic or sediment and erosion control locations. It is recommended that the applicant be required to supply specific construction information for each individual lot prior to any permit approval for the subdivision. The overall project, (Phases I & II) will contain roughly 1.5 miles of roadway which will service the 55 building lots, and require 5 crossings of wetlands and/or watercourse areas. Each of the building lots will have on-site septic systems and water wells. Several areas which must be addressed, but are not contained within the application materials, include proposed contours for roadway and individual building lots, a stormwater management system and discharge points from the site, sediment and erosion control measures for each lot and roadway, and a narrative for the sequencing or construction activities, (this should include the what, when and how of construction activities).

Wetland Functions and Impacts

The wetlands which are located on this parcel are associated with several swales, seeps and stormwater discharges from the subdivision located up slope from the proposed construction area. All of these wetlands drain into Bentley Brook which is located along the western border of the site. Bentley Brook flows to the

north into the Yantic River, which is located about 1.25 miles from the site. A small open water body also exists within Bentley Brook, approximately west of lot 8 on the subdivision plans for Phase I. As defined by the U.S. Fish and Wildlife Service in the National Wetland Inventory Mapping for Connecticut, these wetlands are classified as:

PFO1E	Palustrine, forested, broad leaved deciduous, seasonally saturated.
POWH	Palustrine, open water, permanent.

These wetlands function primarily to convey water through the site and into Bentley Brook. In doing so they provide essential renovation of runoff waters prior to discharge into Bentley Brook. With the exception of Gifford Lane and the developments off of Yantic Lane and Wawecus Hill Road, the majority of the Bentley Brook watershed is undisturbed and provides excellent wildlife habitat. While Bentley Brook is not stocked by the DEP Fisheries Bureau, it provides good finfish habitat and may support some native brook trout. (Please see FISH RESOURCES section) These habitat and wildlife values add to the recreational and educational opportunities for the site, and increase the value of water renovation, sediment trapping and aesthetics which the wetlands on the site provide.

The proposed activities present several areas of impacts including filling, increased runoff and sedimentation, a potential increase in nutrient loading from septic system effluent, encroachment on and interruption of the wildlife corridor along Bentley Brook and an overall reduction in the habitat value along the eastern portion of the Bentley Brook watershed. Additionally, the overall drainage pattern which presently exists on the hillside will be significantly modified. Due to their intermittent nature many small waterways and swales do not appear on the mapping for the site, but will have to be collected and concentrated as part of stormwater management system to control runoff from the site. The discharge points from and stormwater management system will need to be carefully located and designed due to the slopes and anticipated flows in order to prevent serious erosion and sedimentation problems and impacts to the water quality of Bentley Brook and the Yantic River.

Comments and Recommendations

1) The site under review and the Bentley Brook watershed area as a whole possess considerable functional value for water renovation, sediment trapping, wildlife habitat, recreation and educational opportunities. Additionally, the site now proposed for development provides a significant buffer to the main corridor of Bentley Brook for both aesthetic qualities and renovation of waters from the development located at the top of Wawecus Hill. Development of this buffer area could cause a reduction in the quality and functional capacities of this corridor.

2) The physical characteristics of the site present considerable constraints to its development, including its slope, surficial hydrology and soils. (Please reference appropriate sections for greater detail). These factors combined will make the risk and potential for adverse impacts to the wetlands and watercourses on and adjacent to the site extremely high.

3) The technical data and thoroughness of design and planning within the application materials does not appear to be sufficient at this time. Several crucial areas including erosion and sedimentation controls, water well and septic system locations, proposed contouring, hydraulic analysis and landscaping/stabilization have not been adequately addressed or designed. Until such issues have been sufficiently considered and planned for it is recommended that the local commissions not grant any permits for this proposal.

In conclusion. the site under review possesses many functional qualities of value to the area, watershed and community, and also contains considerable environmental constraints for development. At this time the application materials, data and level of design and planning appear to be insufficient to address all of the concerns and issues which development on this site presents.

7. WATER SUPPLY

The water supply for each lot in the proposed subdivision will be derived from drilled (6-inch diameter) wells with steel pipe cased firmly into solid rock and completed as open boreholes in the underlying metamorphic bedrock. The steel casing should extend at least 5 feet into the bedrock. It should be noted that the Yantic Lane residential development to the east is served by municipal water made available by the City of Norwich Water Department. In the event of water quality problems to the bedrock aquifer in the area, it seems likely that extension of the municipal water mains may be feasible.

A typical depth for a bedrock well ranges from 150-300 feet. Although bedrock is not known to be a prolific aquifer, Water Resources Bulletin No. 15 (Lower Thames and Southeastern Coastal River Basins), which encompasses Bozrah, indicates that 9 out of 10 bedrock wells which tap bedrock yield at least 3 gallons per minute. A yield of 3 gallons per minute is equivalent to 4,320 gallons of water for a 24-hour period.

The Team's geologist reviewed eleven well completion reports for drilled wells located along Gifford Lane in Bozrah, west of the site. A summary of this findings is shown in Figure 1.

These wells, drilled between 1970 and the present have yields that ranged from 1 gallon per minute to 50 gallons per minute. The depth of the wells varied from 134 feet below ground surface to 720 feet below ground surface.

Figure 1 **Summary of Domestic Water Supply Wells Drilled on Gifford Lane, Bozrah, Connecticut ***

Well	Total Depth of Well (ft.)	Well Yield (gpm)
1	329	50
2	160	8
3	290	50
4	230	3.5
5	134	1
6	270	3
7	200	15
8	200	8

9	720	2
10	600	1
11	495	15

*All wells surveyed tapped the underlying bedrock aquifer.

Because lot sizes are relatively large (2 acres or more) and because approximately 95% of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal systems (this emphasizes the need for careful design, installation and maintenance of sewage disposal systems). The annual groundwater usage for the site should not exceed annual groundwater recharge. If the underlying bedrock is fractured and capable of transmitting water to drilled wells, then the bedrock aquifer should adequately meet the water demands of the proposed subdivision. Additionally, lots two acres in size should allow for separating distances of 200 feet between neighboring wells. If this is attained, each well has approximately 1 acre of recharge or about 595 gallons per day. This assumes a recharge rate of about 8 inches per year for an upland till covered site. It is estimated that a family of 5 would use about 375 gallons per day or 75 gallons per person per day.

In order to provide the adequate protection of the bedrock aquifer, all wells must be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board Regulations. Additionally, the town sanitarian must inspect and approve all well locations.

The natural quality of groundwater should be satisfactory. However, Water Resource Bulletin No. 15 indicates that the bedrock in the area has potential for mineralizing well water with elevated iron and manganese levels. At elevated levels, these minerals tend to lower the overall water quality of drinking water. If elevated iron and/or manganese levels are present in the water, suitable treatment filters may be necessary.

According to the Water Quality Classification Map of Connecticut (Murphy, 1987), groundwater in the area of the site is classified as GA, which means groundwater beneath the site are suitable for private drinking water supplies without treatment.

8. SEWAGE DISPOSAL

Partial subsurface exploration for on-site sewage disposal has been conducted on the proposed subdivision site by Camp Land Surveyors, P.C., of Norwich. It is understood that previous soil testing had been conducted on the site but this data was not available to Team members. The most recent testing included the excavation of 46 deep test holes located randomly throughout Phase 1, most of which have been left open. The deep test pits, generally 6 feet to 9 feet in depth typically encountered topsoil (4 to 15 inches thick), a fine silty loam subsoil zone (4 to 50 inches) and then gravel. The gravel deposits identified by the applicant's technical staff in all test pits are not consistent with the texture of the surficial geologic materials described by the surficial geologic map for the Fitchville Quadrangle, except along the western limits.

According to the 46 test pits excavated in Phase 1, depth of the water table is an important design constraint in several areas as demonstrated by shallow depths to the water table and/or soil mottling (an indicator of high water table conditions). The seasonally high water table condition is probably a perched water table that results from the slowly permeable compact soil zone that occurs in the Woodbridge and Rainbow soils (WzC) on the site. In places, steep terrain will also be a hindrance for on-site sewage disposal.

During the Team geologist's/sanitarian's field walk on January 30, 1990, more unfavorable conditions were observed on the site than what were reported in the deep test hole data supplied to Team members. The groundwater table was at or near the top of the majority of test pits that were left open. It appears that the soil testing conducted by the applicant's technical consultant may have been done during the dry time of year (summer or early fall months) when water tables are typically low. This information was not included on the plan or deep test hole sheets.

Many of the proposed lots in Phase 1 have not been tested to date. Additionally, the test holes that have been excavated were not necessarily located in the proposed active or reserve leaching areas. Before an accurate determination of the site's suitability for leaching purposes can be made, lot-by-lot investigation of subsurface conditions in the area of the proposed active and reserve leaching systems will be required. This work, which includes percolation tests should be done in conjunction with Bozrah's certified sanitarian. Standpipes should be installed on each lot and water levels monitored

throughout the coming spring months.

If thorough testing of any proposed lot fails to identify a satisfactory leaching area and unsuitable conditions as identified in Section 19-13-B103e(a)(3) exist, the lot should be combined with adjacent properties or otherwise removed. Based on visual observations made during the field walk, it is expected that many of the proposed lot lines will require some adjustment prior to forward submission to the Planning and Zoning Commission resulting in the reduction of the number of lots in Phase 1.

Due to the soil types, steeply sloping areas, and groundwater conditions, it is probable that a high percentage of the lots will require detailed plans prepared by a registered professional engineer. Most lots will likely require filled and raised systems that are relatively large and spread out over the contours and, where topography allows ground water control drains to protect leaching field areas.

Unless the area of the former gravel pit is regraded (slopes reduced, soil solum replaced), the proposed active leaching area for Lot 6 appears too close to the gravel pit face. The concern here is that partially treated septic tank effluent may breakout at the face especially in view of the rapidly permeable soils in the area. Another area of concern that warrants careful examination are those leaching system areas that are located in proximity to cut areas that may be needed for roads and driveways and the man-made ditch traversing Lots 1-4 on the site. The concern here is that partially treated effluent may break out at the cut embankment and subsequently degrade surface water quality. In these areas, it is recommended that a minimum separating distance of 50 feet be maintained, but 75 feet would be preferable.

Sewage Disposal - Phase II

No subsurface data has been compiled to date for the Phase II section of the proposed subdivision. In consideration of soil mapping data and visual observations made during a walking tour of the Phase II section, it appears that the limitations (steeply sloping areas, high water table, potentially slow percolation rates) that were also encountered in Phase I will be a hindrance for the residential development of Phase II. However, individual lot testing will provide the town sanitarian with the necessary information to determine suitability for leaching purposes. Again, it is probable that due to hostile subsurface conditions in the area, soil testing will result in some realignment of the present preliminary lot layout and an overall reduction in the number of lots

presently desired. Also, it seems likely that most, if not all septic systems in Phase II will require detailed plans prepared by a registered professional engineer.

In summary, the presence of failing septic systems serving homes in the Yantic Lane development clearly underscores the need for detailed soil testing on the site and the proper design, installation and maintenance of on-site septic systems. This will help protect surface and groundwater quality in the area and help minimize the chance for public health hazard conditions such as failing septic systems.

9. FISH RESOURCES

Site Description

Bentley Brook Estates is a subdivision proposed for 138 acres along the eastern boundary of Bozrah. The subdivision is located entirely within the Bentley Brook watershed. Bentley Brook (approximately 550 feet of it) flows through the northeast portion of this parcel in the immediate vicinity of Gifford Lane. Numerous wetlands and intermittent watercourses drain through the property and into Bentley Brook. A drainage easement granted in favor of the Pleasant View Heights Subdivision (town of Norwich) provides for stormwater transport in an open swale from Candlewood Drive into Bentley Brook along the northern property line. A smaller swale handles stormwater from Birchwood Drive. The topography of this site is relatively steep, ranging from 180 to 410 feet above sea level.

This subdivision is proposed in two phases of roughly 58 and 80 acres respectively. Draft site plans containing the following information were reviewed: 1) lot and road layouts for Phase I (23 lot total; lots 1-8 were detailed as to house, driveway and septic locations); 2) an overall layout for both phases showing wetlands and proposed unnumbered lots and road locations ; 3) road and subterranean drainage profiles for Phase I. A site inspection encompassing most of the property was undertaken. The inspection generally followed the proposed road network as flagged in the field and it also focused on the Gifford Lane/Bentley Brook area.

Aquatic Resources

Bentley Brook is the major aquatic resource within the proposed subdivision. Bentley Brook is a first order or headwater stream with a watershed of 1.79 square miles. Most of this watershed is lightly developed with the exception of its eastern edge which contains part of the Pleasant View Heights Subdivision. Bentley Brook is tributary to the Yantic River, an important "major trout stream" in eastern Connecticut. The Yantic River is annually stocked with nearly 13,000 adult (9-12") brown, brook, and rainbow trout in the towns of Bozrah, Lebanon, and Franklin. Many of these trout are stocked below Fitchville Pond, some within one quarter mile of Bentley Brook. Bentley Brook is not stocked, but it should support a fish community typical of small headwater streams. Fishes expected to inhabit Bentley Brook include tessellated darter, native (wild) brook

trout, longnose dace, blacknose dace, common shiner and white sucker. Ponded stream areas created by beavers or man would be expected to contain species more typical of slow moving streams or warmwater ponds such as brown bullhead, golden shiner, chain and or redfin pickerel, largemouth bass, and various species of sunfish.

Surface waters of Bentley Brook are classified by the Department of Environmental Protection (DEP) by default 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.

Potential Subdivision Impacts

The following impacts can result during and after the construction of subdivisions if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of watercourses : During construction topsoil will be exposed and susceptible to runoff events, especially if suitable erosion and sediment controls are not properly installed and maintained. Erosion and sedimentation due to construction has long been regarded as a major cause of stream degradation since silt is recognized as a major stream pollutant. Excessive sedimentation could damage aquatic ecosystems in the following ways:

(A) Sediment reduces the survival of resident fish eggs and hinders the emergence of newly hatched fry. Adequate water flow, free of sediment is required for fish egg respiration and successful hatching.

(B) Sediment reduces the amount of usable habitat required for spawning purposes. Excessive fines can clog spawning gravels causing fish to disperse to other areas.

(C) Sediment reduces the survival of aquatic insects. Since aquatic insects are important prey items for most fish, reduced insect populations levels will adversely affect fish growth and survival as fish expend excess energy locating prey.

(D) Sediment reduces stream pool depth. Pools are invaluable stream components since they provide necessary cover, shelter, and resting areas for fish. A reduction of usable fish habitat can result in reduced population levels.

(E) Turbid waters impair normal gill function and feeding activities of fish. High concentrations of sediment can cause mortality by clogging gills and interfering

with the fish's respiration.

(F) Sediment encourages the growth of filamentous algae and nuisance proportions of aquatic weeds (CT DEP 1989). Eroded soils contain nutrients that function as fertilizers resulting in accelerated plant growth. Presently, Bentley Brook is not suspected of having aquatic weed problems.

(G) Sediment contributes to the depletion of dissolved oxygen (CT DEP 1989). Organic matter associated with soil particles is readily decomposed by microorganisms thereby effectively reducing oxygen levels.

2. Road construction : Instream culvert placement in concert with placement of fill alongside wetlands and intermittent streams will inevitably result in stream degradation from sedimentation (see above) in downstream areas if proper erosion and sedimentation practices are not followed. Adequate fish passage is not a concern at road crossings in the small intermittent streams on this property but it is concern at the Gifford Lane crossing of Bentley Brook (see Recommendations, #2).

3. Percolation of septic effluent into watercourses : A failure of individual septic systems to operate properly (refer to SEWAGE DISPOSAL section) may be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems may enter stream waters in the event of a septic system failure or infiltrate the groundwater during the spring when water tables are near the surface. Effluent may also stimulate the growth of nuisance aquatic vegetation and algae in downstream areas.

4. Aquatic habitat degradation in streams due to the influx of stormwater drainage : Stormwaters from road systems can contain a variety of pollutants that are detrimental to aquatic organisms. Pollutants commonly found in stormwaters include: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Nutrients in stormwater runoff can fertilize stream waters causing water quality degradation. Additionally, fine silts in stormwaters that remain in suspension for prolonged periods of time often cannot be effectively removed from roadway catch basins and/or stormwater detention basins. Accidentally spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills if introduced in high concentrations. Stormwater drainage can also result in increased stream flows, potentially resulting in flooding or streambank erosion.

5. Transport of lawn fertilizers and chemicals to watercourses : Runoff and leaching of nutrients from fertilizers on lawns may stimulate instream filamentous algae growth

and degrade water quality. Introduction of lawn herbicides can result in "fish kills" and overall water quality degradation. Rooted or floating aquatic vegetation may proliferate in slower moving stream reaches.

6. Degradation of wetland habitat : Wetlands serve to protect stream water quality by: (1) controlling flood waters by acting as a water storage basin, (2) trapping sediments from natural and man-made sources of erosion, and (3) filtering out pollutants and nutrients from runoff before they enter watercourses. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact wetlands by hindering their ability to properly carry out these functions.

7. Impacts to downstream environments : Any water quality problems and habitat degradation that occurs within this area will eventually be observed downstream. In addition to resident stream fish populations, Bentley Brook may be colonized by adult hatchery trout that are stocked into the Yantic River annually.

Recommendations

These draft plans for the Bentley Brook Estates Subdivision represent a maximum use of this property as determined by meeting specific geometric requirements (i.e. lot size, lot configuration, etc.). Since these plans were developed to meet only these geometric criteria, they show little environmental sensitivity. The following recommendations should be considered by the Town of Bozrah to mitigate impacts to local aquatic resources.

1. It is recommended that at the minimum, a 100 foot naturally vegetated buffer be maintained along all wetland boundaries, especially those that directly abut Bentley Brook or the intermittent watercourses tributary to it : 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). These buffers will absorb surface runoff and other pollutants before they can enter wetlands, ponds, and stream ecosystems. Additionally, buffer zones can improve the quality of instream habitat for fishes. For example, research has shown that brook trout habitat units can increase 2,400% when well-vegetated buffer zones are used for stream corridor protection (HEP Notes, 1988).

Recommendations Continued # 4 - 7

During Phase I, the draft plans propose wetland crossings that are unnecessary for the successful completion of Phase I, since no wetlands will be crossed by Candlewood Drive, and all 23 lots in Phase I can be readily accessed from Candlewood Drive. It is unclear why the two crossings are proposed.

4. The Inland Wetlands and Watercourses Agency (IWWCA) should ask for feasible and prudent alternatives to the proposed wetland crossings: A total of five wetland road crossings are shown on the plans (Phases I and II). These crossings total approximately 850 linear feet (from street centerlines shown on plans). One alternative might be to enter Phase II with only a single road that crosses wetlands in their narrowest areas. The road could enter Phase II in the location between lots 12 and 13 on Phase I; cross the next wetland area slightly to the north, loop northwestward to make the westernmost crossing, and then loop back around. The total crossings would be reduced from 5 to 4, with a linear reduction from approximately 850 to 225 feet. This alternative will result in fewer lots than proposed but will be a more environmentally compatible development. Other possible alternatives should also be considered to reduce direct impacts to on-site wetlands and intermittent streams, and reduce potential impacts to the aquatic resources of Bentley Brook.

5. The IWWCA must should ensure that all intermittent streams are shown on site plans : The small wetland pockets near the southern boundary (Phase II) drain downslope though this parcel. This small intermittent stream and others like it must be shown on plans so that intelligent decisions can be made by local commissions relative to road construction and drainage.

6. All instream work and land grading/filling near streams or wetlands should take place during periods of low precipitation : This will help minimize the impact to the 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. The wetland crossings on this site may be especially challenging due to the extremely rocky terrain and large number of intermittent stream channels.

7. Install and maintain proper erosion and sedimentation controls during site construction activities : 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. Regular monitoring of erosion and sedimentation controls by either the town or an independent engineering firm is key to proper erosion and sedimentation control performance.

2. Replacement of the Gifford Lane culvert : Although not shown on the plans, the applicant has discussed with the town of Bozrah the possibility of replacing the single 48"culvert at Gifford Lane with twin 60" culverts. If a culvert replacement is done, it is recommended that a single "oversized" culvert be used instead. This culvert should be installed at or below streambed level so as to avoid problems with fish passage. Twin culverts would likely cause fish passage problems at periods of high or low flow. Span bridges are generally recommended by the Inland Fisheries Division for crossing perennial streams since they allow unrestricted fish passage and protect instream habitat. A culvert is acceptable in this instance since it is replacing a similar structure. Box culverts are preferred over cylindrical pipes.

3. Construction Phasing : Due to the sensitive nature of the property, a phased construction project will be necessary. Land use commissions in Bozrah may wish to allow construction of phase II of this project only after the successful completion of Phase I. Local commissions may wish to increase the number of phases of this project to ensure maximum site protection.

8. Watercourse setbacks for septic systems (refer to Sewage Disposal section) : Septic systems must be properly located and designed to effectively renovate septic effluent. Septic effluent can be one of the greatest threats to the ecology of streams. When septic leach fields are proposed to be located within 100 feet of wetlands or watercourses, the town sanitarian or IWWCA should require analyses of phosphate and nitrate transport to ensure that leachate does not interfere with aquatic resources. Doing this may go beyond the standards of the State health code but is warranted to protect surface waters from avoidable sources of eutrophication. Systems located on steep slopes adjacent to streams are also dangerous due to the increased potential of leachate "breakout". All septic systems should be maintained on a regular basis. Residents should be encouraged to utilize non-phosphate laundry detergents.

9. Limit liming. fertilization, and the introduction of chemicals to subdivision lawns : This will help abate the amount of additional nutrients to aquatic resources. Non-phosphorus lawn fertilizers are currently available from various lawn care distribution centers.

10. The development team should submit detailed stormwater management plans for town review : The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of catch basins and downgradient outletting devices. When possible, stormwaters should only be outletted

into non-wetland habitat; thus avoiding direct contact with wetlands. Timely maintenance of catch basins is of critical importance. Roadway catch basins should be regularly maintained to minimize adverse impacts to riverine/wetland habitats. The use of road salt to deice roads should be minimized when possible. The Town of Bozrah should invoke postdevelopment runoff standards to minimize aquatic resource degradation caused by peak flows and velocities.

11. Open Space : The Bozrah Planning and Zoning Commission (PZC) should carefully analyze the topography and natural resources of this site to determine the most appropriate location of open space. The draft plans have no provisions for open space. The Connecticut General Statutes (sect 8-18(4)) allow the commission to designate the location of open space. The PZC has the flexibility to minimize using wetland areas as open space unless it feels that special protection is warranted. Appropriate locations for open space acquired for the purpose of environmental protection include areas adjacent to streams and wetlands. Steep slopes adjacent to these resources are especially appropriate. Since many municipalities are reluctant to own, outright, parcels of open space, protection of these areas by conservation easement or direct ownership by a land trust or other conservation group may prove to be viable alternatives. The acquisition of and method are protection of open space should be a well planned and coordinated effort.

Summary

This review encompassed an area of 138 acres within the currently lightly developed watershed of Bentley Brook in Bozrah Connecticut. The major aquatic resource within the site is Bentley Brook, a tributary of the Yantic River. The site is characterized by generally steep slopes, numerous wetlands and intermittent streams. This report contained a summary of potential impacts to aquatic resources that can result from land development and a general listing of appropriate mitigative measures. The most serious potential threats to the aquatic resources in Bentley Brook are likely to be caused by excessive wetland crossings and inadequate erosion and sedimentation control during all phases of construction on this site.

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10. PLANNING CONCERNS

The proposed 78 lot subdivision (two phases) is located on the westerly side of Birchwood Drive, Bozrah Drive, Candlewood Drive and Cedar Lane in the eastern section of Bozrah adjacent to the City of Norwich. Gifford Lane borders the proposed subdivision to the west. Surrounding land uses are medium density residential in Norwich and undeveloped, forested land in Bozrah.

The area of the proposed subdivision is depicted as mixed suburban uses on the adopted Regional Development Plan, with recommended residential densities of one dwelling unit per 1.5 acres to two dwelling units per acre.

The area is zoned R-1 single-family residential with 80,000 square feet lot sizes and a street frontage requirement of 200 feet.

No proposed open space is indicated on the proposed subdivision plan. Section 6.15 of the Bozrah Subdivision regulations allow the Commission to require up to ten percent of a subdivision tract for open space. As eastern Bozrah develops there will be increasing pressure in future years for both active and passive recreation areas. The subdivision process provides the town with the means to set aside this land now at no cost to the town.

It appears that not all wetlands were field marked, or if fieldmarked, were not picked up on the property survey, especially in Phase 2 areas. (Please refer to SOIL RESOURCES section) In the area of the proposed subdivision closest to Norwich the odor of raw sewage was evident in the wet areas. An investigation should be conducted to determine if there is a sewage overflow or breakout problem and how this will affect wells to be constructed in the proposed subdivision. The adjacent homes in Norwich are served by the municipal water system. The Connecticut Department of Utility Control Regulations sections 16-262m-1 through 16-262m-9 and the Connecticut Department of Health Services Regulations section 19-13-B51m should be reviewed by Bozrah and the developer to determine if none, some or all of the lots will have to tie into the Norwich water system.

Bozrah subdivision regulations require a road to have 32 feet of pavement. As shown all new roads will enter and exit the subdivision through Norwich roads. This

means that Bozrah school buses, fire trucks, emergency vehicles and town trucks will have to drive relatively long distances to serve this subdivision. Although it would require a wetlands crossing, the possibility exists of connecting the proposed road system to Gifford Lane on the western edge of the property. A small culvert already exists in this area across Bentley Brook and was used as a logging road into the subject property.

Data from the Institute of Transportation Engineers indicate that a single-family development can be expected to generate ten daily trips per home. Twenty-three single-family units in Phase one would mean 230 daily new trips and 55 lots in Phase 2 would mean 550 daily new trips. No traffic counts are available for local roads in the area. No major highway improvements are indicated in the Regional Transportation Plan for this area of Bozrah.

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.