Mending Wall at Bozrah

Bozrah, Connecticut

June 1989

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut Resource Conservation and Development Area, Inc.

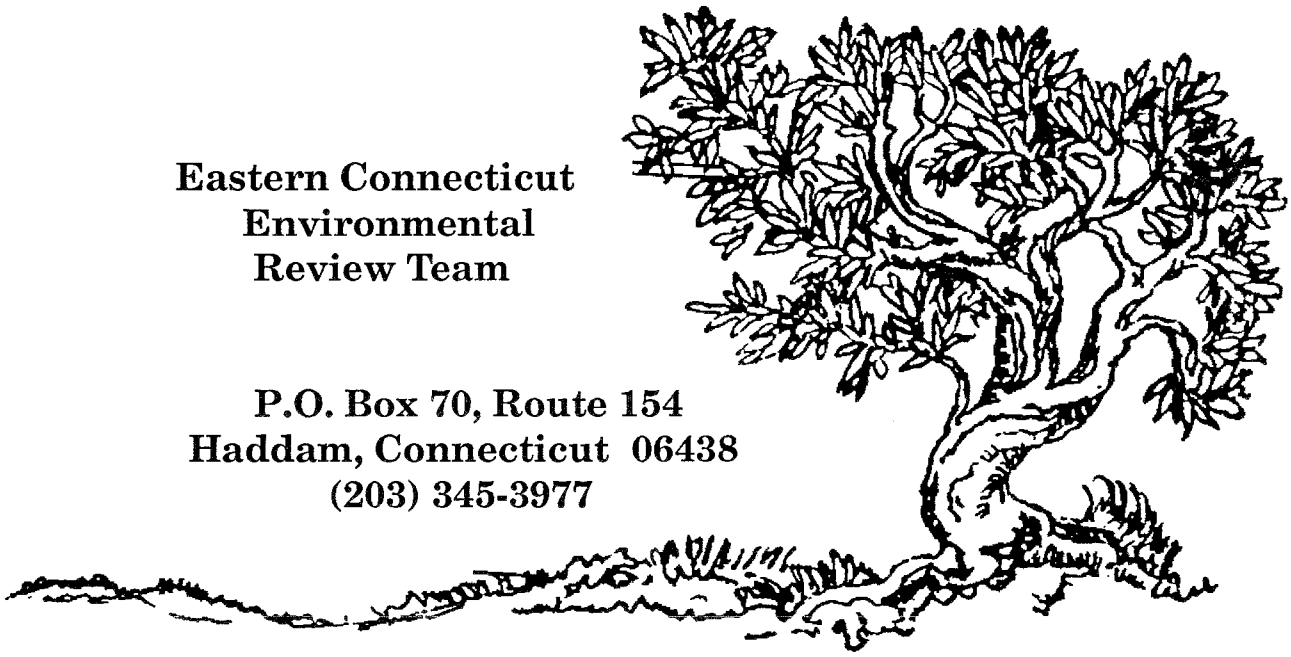
Mending Wall at Bozrah

Bozrah, Connecticut

Review Date: May 18, 1989
Report Date: June 1989

Eastern Connecticut
Environmental
Review Team

P.O. Box 70, Route 154
Haddam, Connecticut 06438
(203) 345-3977



ENVIRONMENTAL REVIEW TEAM REPORT
ON

Mending Wall at Bozrah
Bozrah, Connecticut

This report is an outgrowth of a request from Bozrah Planning and 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, May 18, 1989. Team members participating on this review included:

Patrice D'Ovidio	**Soil Conservationist**	**USDA-Soil Conservation Service**
Carla Harvey	**Environmental Analyst**	**DEP- Water Resources**
Brian Murphy	**Fisheries Biologist**	**DEP-Eastern District**
Tom Seidel	**Regional Planner**	**SE CT Regional Planning Agency**
Elaine Sych	**ERT Coordinator**	**Eastern CT RC&D Area**
Bill Warzecha	**Geologist/Santiarian**	**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, a property boundary map and a soils map. During the field review the Team members were given plans and additional information. The Team met with, and were accompanied by the Bozrah First Selectman, the Town Planner, the developer and his engineers. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

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

Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

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

If you require additional information, please contact:

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

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Table of Maps and Charts

1. Location, Zoning & Land Use

The proposed subdivision, known as "Mending Wall at Bozrah" is about 114 acres in size and is located in the southwest corner of Bozrah. The wooded site is bounded by and will be accessed via Route 163 on the west. To the north, east and south, the site is bounded by forested, undeveloped land under private ownership.

A land-locked parcel, under 3 acres in size, is located in the central parts of the site. It is understood that the applicant is attempting acquisition of this parcel, which would be included with the open space land for the proposed subdivision.

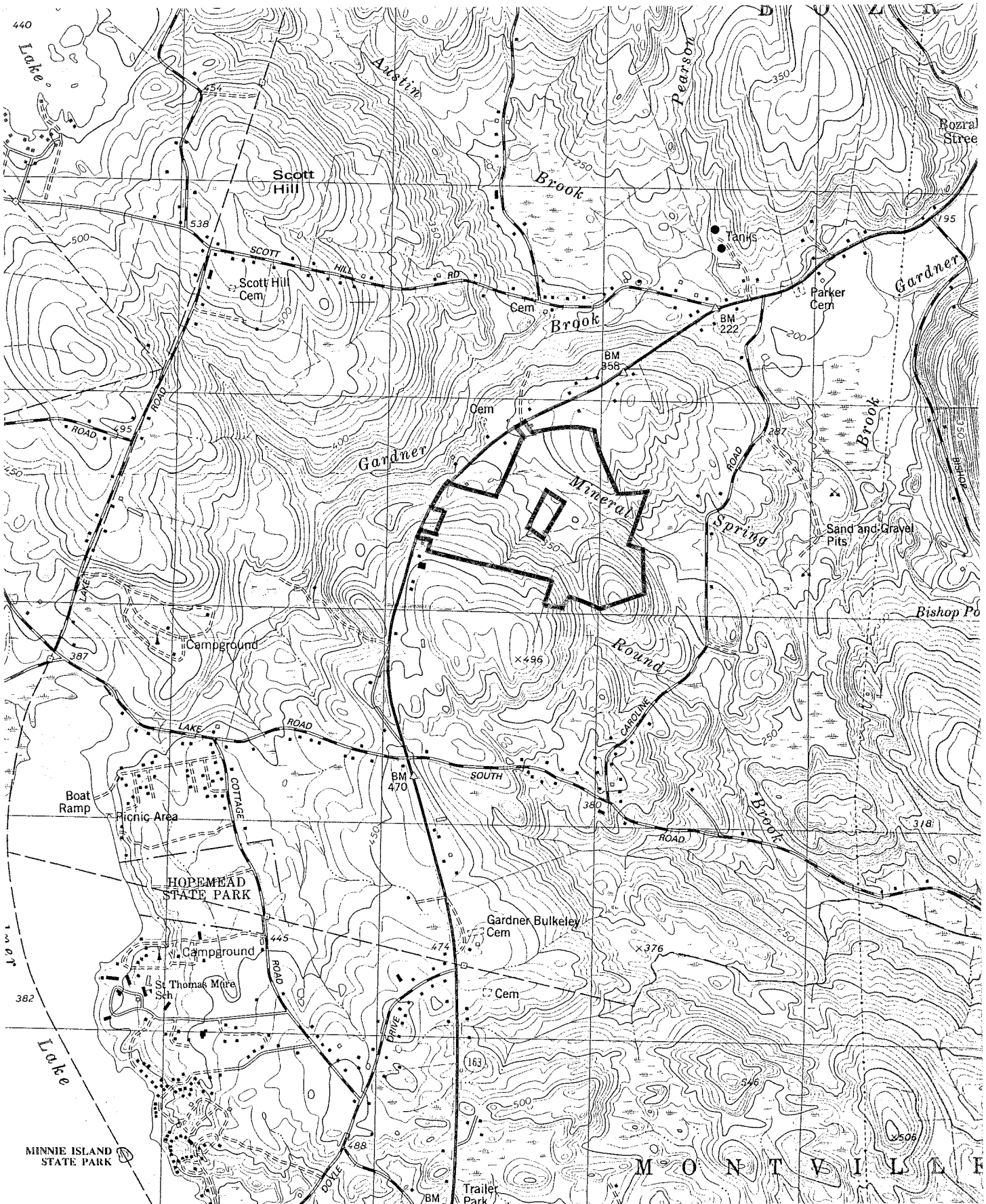
The site is presently zoned RU-1, which permits single family residences on lots of at least 80,000 square feet or about 2.0 acres. It appears that the proposed project will be compatible with the land-use in the area which is characterized by low-density residential and agriculture uses. A commerial boat sales facility is located south of the property. The presence of numerous stone walls transecting the property gives testimony to its agricultural past. Every effort should be made to preserve these stone walls.

2. Topography

The site is located in a topographic saddle which is bisected by Mineral Spring Brook, a Gardner Brook tributary. Land rises north and south from the brook to northwest-southeast oriented, glacially smoothed hills called drumlins. Slopes to the north are gentle, while slopes to the south range from moderate to steep. Steepest slopes occur at the southeast corners of the site. Maximum and minimum elevations on the site are 460 feet above mean sea level and 300 feet above mean sea level, respectively.

LOCATION

SCALE 1" = 2000' ——— APPROXIMATE SITE



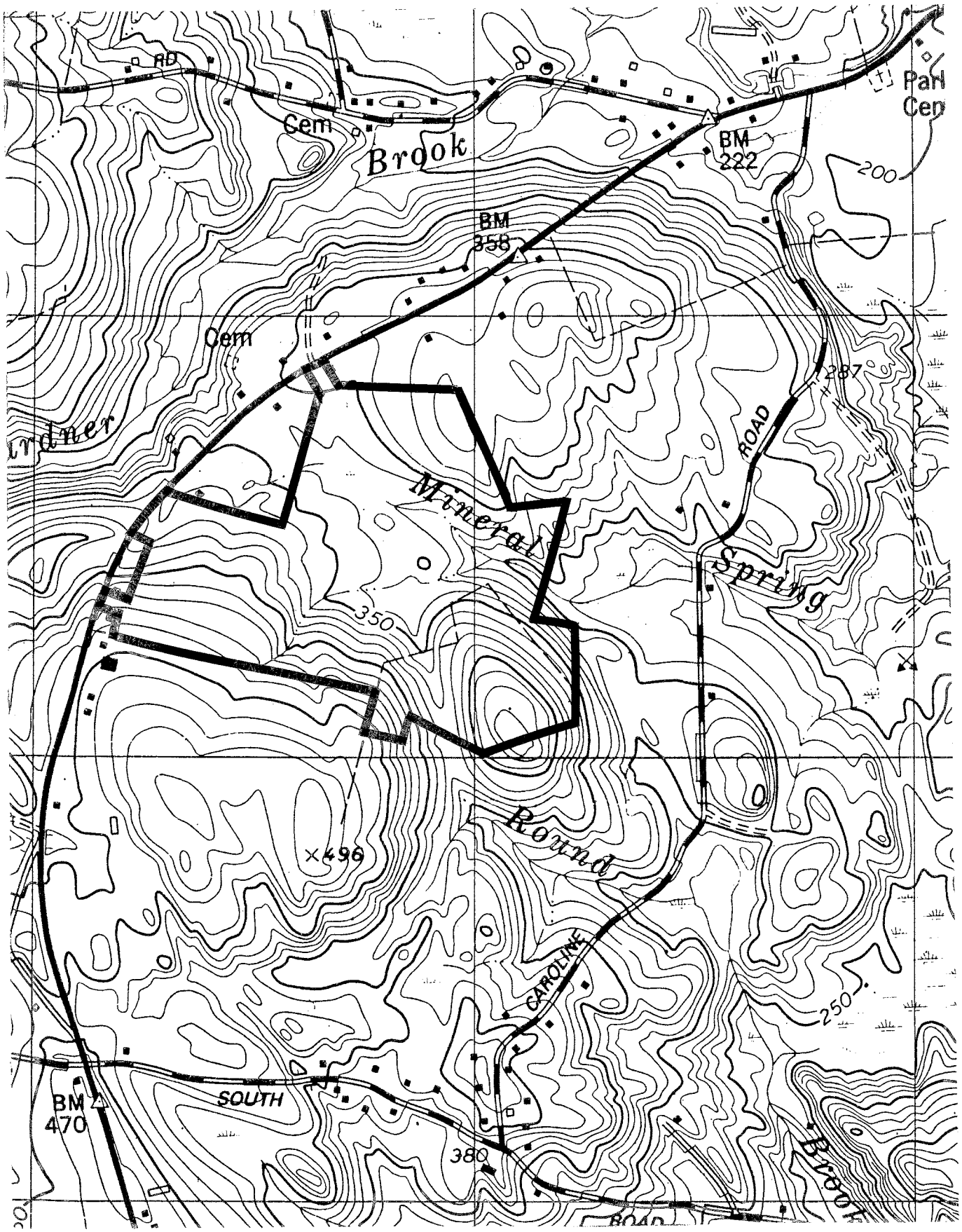
PROPERTY BOUNDARY

SCALE 1" = 1000'

SITE

TOPOGRAPHY

SCALE 1" = 1000' APPROXIMATE SITE



3. Geology

Bedrock outcrops are visible throughout the site. In addition, refusal was encountered on bedrock in numerous deep test pits at depths ranging between 27" and 80".

Bedrock underlying the site consists of crystalline, metamorphic rock that includes Scotland Schist and Canterbury Gneiss. Scotland Schist, a gray to silvery-gray, locally rusty, fine to medium-grained schist is found under the northern half of the site. (Also a small erosional remnant of Scotland Schist is located in the southcentral parts). Underlying the southern half of the site is the Canterbury Gneiss, a light-gray, medium-grained, locally strongly lineated gneiss. The Honey Hill fault, a major thrust fault in the region has been mapped about 1 mile south of the property. The fault zone is dark-colored and has a flinty, banded or streaked appearance. Depth to the bedrock surface probably does not exceed 10 feet in most places on the site. The underlying bedrock will serve as the major aquifer for domestic wells drilled in the subdivision. A public water main is not available to this rural area.

Most of the subdivision site is covered by till. Till is a glacial sediment that was deposited directly from glacier ice. The sediment consists of varying proportions of sand, silt, gravel, clay, and boulders. Particles of different sizes are generally mixed together in a complex fashion.

As indicated by deep test hole information for subsurface exploration, the texture of most of the till on the site is silty and tightly compacted. The compact zone is encountered below the weathered and rooted surficial soil zone (1.5 - 3 feet below ground surface). Above the compact soil zone, the texture of soil is normally loose or only moderately compact. The compact till ("hardpan") is characterized by seasonal high water tables and slow percolation rates. They are also very stony to extremely stony.

These soils are identified as WzC, WyB (Woodbridge and Rainbow soils) and PdB and PdC (Paxton and Montauk soils) on the soils map. A sandy till, which lacks a "hardpan", occurs in a few areas south of Mineral Spring Brook. Bedrock is at or near ground surface throughout this area. These soils are mapped as CrC (Charlton-Hollis soils) on the soils map.

Stratified, gravelly sands which were deposited by streams of glacial meltwater cover bedrock in the northeast corner of the site in Mineral Spring Brook Valley. These deposits are probably 10 feet thick or less.

According to the site plan made available to Team members the wetlands on the site occur in the central parts. They generally parallel the streamcourses on the site as narrow corridors, which flow west to east. The one notable exception is the broad wetland area east of the "Mineral Springs Lot" (proposed detention area). Based on visual observations made

during the field walk, the wetlands on the site are likely to have good flood control attributes; good wildlife habitat; and high ecologic benefits.

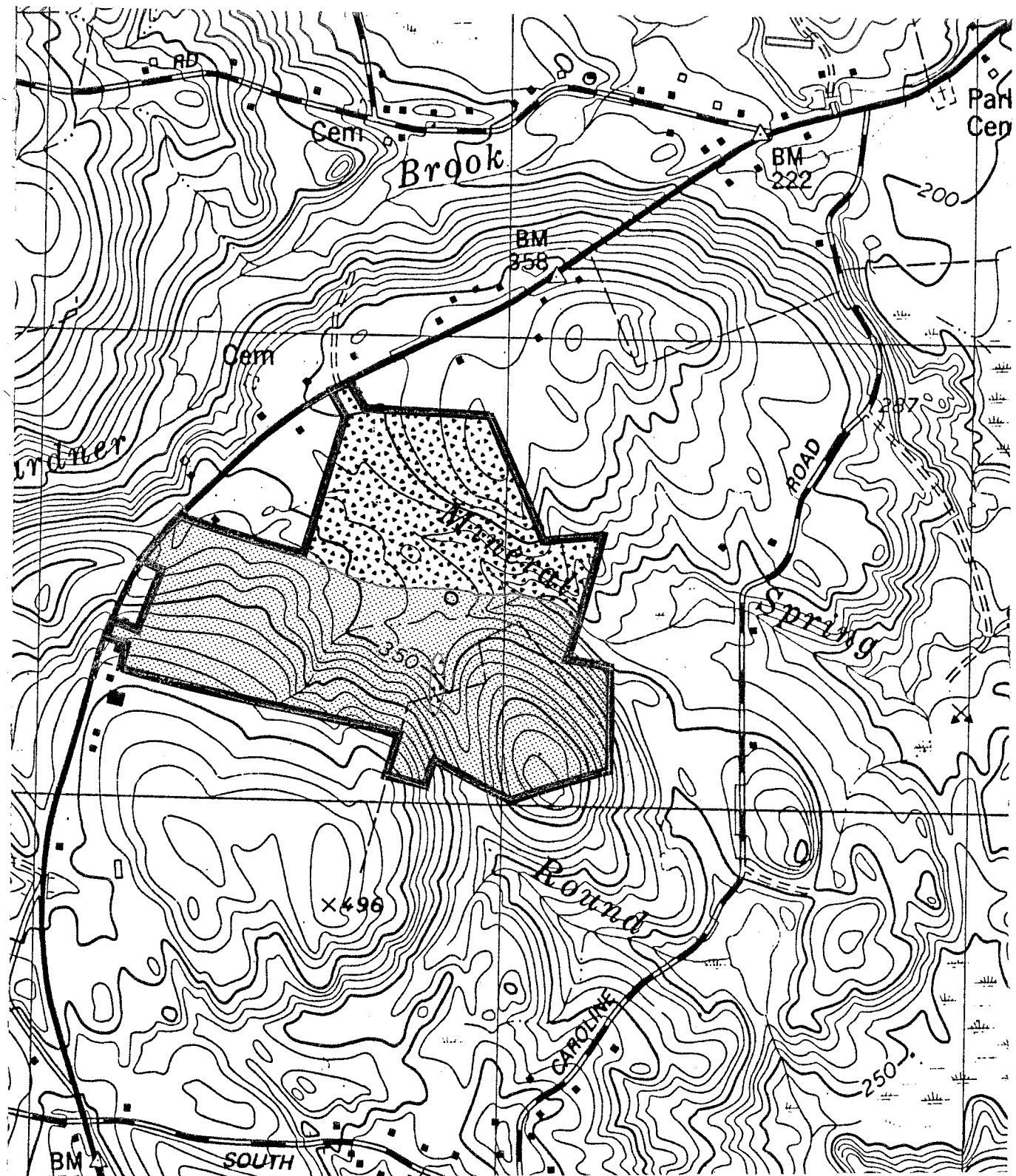
Wetland soils on the site have been mapped by a certified soil scientist. The boundaries of the soils have been superimposed onto the subdivision map. Most of the wetlands soils on the site consist of Rn soils (Ridgebury, Leicester and Whitman extremely stony, fine sandy loams), which parallel Mineral Spring Brook and other seasonal watercourses. Based on observations made during the field walk, it appears that wetlands were inadvertently omitted by the soil scientist in the area of Lots 14 - 16 and 20, 22 and 24, and the flagged wetland boundaries not surveyed on or near Lot 10. These areas should be rechecked by the applicant's appropriate technical staff so that they are properly delineated on the subdivision plan. (Also see **Wetland Review** section)

BEDROCK GEOLOGY

SCALE 1" = 1000'

Scotland Schist - gray to silvery gray, locally rusty, fine to medium grained schist.

Canterbury Gneiss - light gray, medium grained locally strongly lineated gneiss.



SURFICIAL GEOLOGY

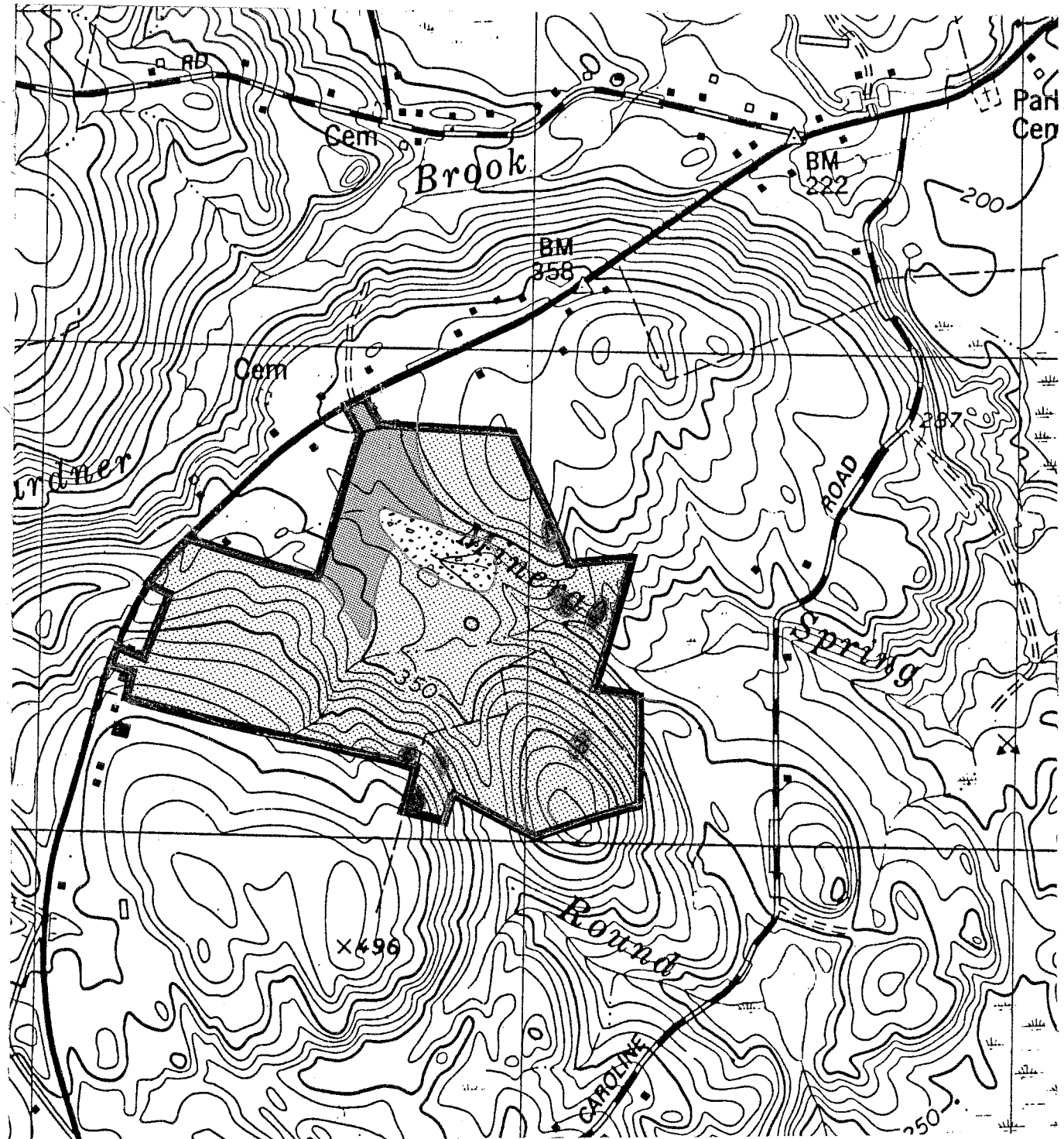
SCALE 1" = 1000'

Till

Sand and Gravel

Areas where bedrock is at or near the ground surface

Swamp Deposits



4. Soils Review

(1) A detailed site plan was not provided to the New London County USDA-SCS office.

(2) A sediment and erosion control plan was not prepared for this site. Please refer to the enclosed checklist for items which should be addressed in the plan.

(3) The New London County USDA-SCS office and Soil and Water Conservation District office does not advocate construction of a detention facilities with a wetlands. It is recommended that alternatives be investigated.

(4) Please note the soil limitations for septic system design and groundwater control as outlined in the soils description. (Also refer to the **Sewage Disposal** section of this report)

(5) There appears to be discrepancies in the inland wetland mapping delineations. (Refer to **Geology** and **Wetland Review** sections)

(6) A grading plan for the proposed roadway should be outlined on the site plan.

(7) If the project engineers decide to construct the proposed 5 foot dam in the wetlands, a CT DEP permit would be required.

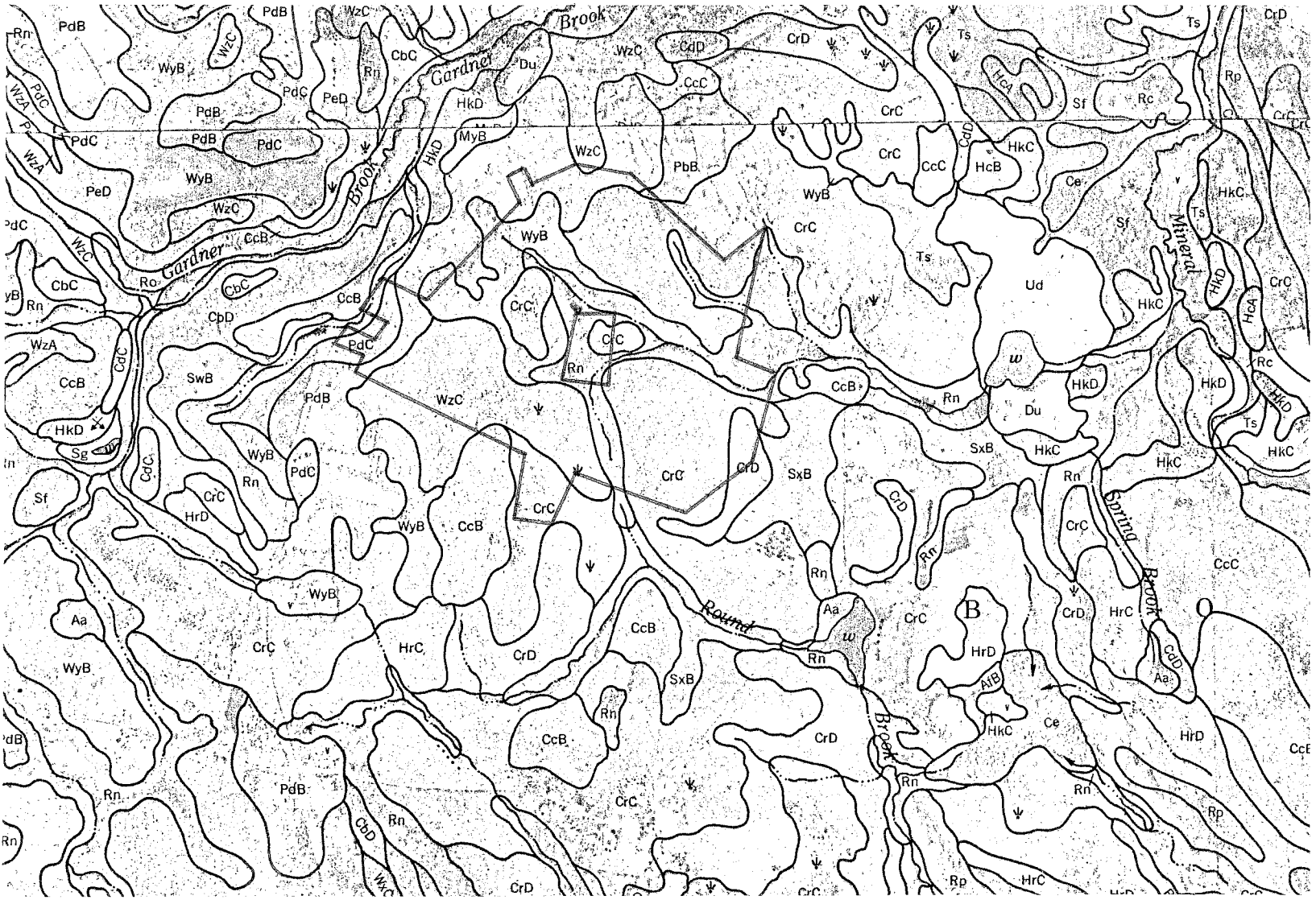
(8) Drainage calculations would need to be recalculated for the detention system alternatives.

(9) A watershed map and soils map, as described in the enclosed checklist, would be needed to verify calculations.

SOILS

SCALE 1" = 1320'

NEW LONDON COUNTY USDA-SCS
562 NEW LONDON TURNPIKE
NORWICH, CT 06360
887-4163



CrC Charlton-Hollis fine sandy loams, very rocky, 3 to 15 percent slopes.
CrD Charlton-Hollis fine sandy loams, very rocky, 15 to 45 percent slopes.
PdB Paxton and Montauk very stony fine sandy loams, 3 to 8 percent slopes.
PdC Paxton and Montauk very stony fine sandy loams, 8 to 15 percent slopes.
Rn Ridgebury, Leicester, and Whitman extremely stony fine sandy loams.
WyB Woodbridge very stony fine sandy loam, 0 to 8 percent slopes.
WzC Woodbridge and Rainbow extremely stony soils, 3 to 15 percent slopes.

CHECKLIST FOR REVIEWING REPORTS USING TR-55 ANALYSIS

SCS-CT-ENG-HYD1-Trial
April 1988

U.S. DEPT. OF AGRICULTURE
SOIL CONSERVATION SERVICE
STORRS, CONNECTICUT

This form should be used in conjunction with Chapter 9 of the Connecticut Guidelines for Sediment and Erosion Control to develop Hydrologic Reports.

This form should also be used with TR-55 (2nd edition) released in June 1986 which provides other hydrologic procedures not noted in Chapter 9.

CHECKLIST FOR REVIEWING
REPORTS USING TR-55 ANALYSIS

PROJECT: Mending Wall at Bozrah LOCATION: Rte. 163, Bozrah

BY: Starter Homes Association DATE: 5/18

1. * Watershed Map at a scale of 1" = 500' or larger. Show watershed boundary, subarea boundaries, and subarea names or numbers. (Optional - show Tc, CN, and Drainage Area for each subarea on the map) Contour maps must include some additional area outside the property line boundaries.

2. * Large scale map showing different soils within each subarea and subarea boundaries. May also be used to measure drainage areas. Could also show Tc calculation path used for each subarea.

3. ____ Tabulation sheet or computer printout showing Curve Number and Time of Concentration calculations for each subarea. Drainage areas, Hydrologic Soils Groups, and Land Use areas should be documented from soils maps or other references.

4. ____ Tabulation sheet showing calculations and equations used for any storage estimates to design a detention basin or other misc. calculations.

5. ____ TR-55 printout showing graphical or tabular peak discharge calculations. Include printouts for both pre-development and post development conditions. The printout showing the design of a detention basin should be included. These printouts should document the zero discharge increase for all required storms.

6. ____ The written report should state the initial conditions and storm frequencies to be analyzed. Include a summary table showing the pre-development, post development, and designed system peak discharges for all design frequencies. Show a sketch of the structure outlet system with elevations and dimensions.

EROSION AND SEDIMENT CONTROL PLAN WORKSHEET

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

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

Name of development Mending Wall at Bozrah

Materials received Drainage Calculations, Soils Information, Fact Sheet

Total Area 114.0 acres Location Rte. 163, Bozrah

Engineer Starter Homes Association

Date Received 5/18 Site Visit 5/18 Reviewed by SCS

Submitted by Bozrah Planning and Zoning

NARRATIVE SECTION DESCRIBING:

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

EROSION AND SEDIMENT CONTROL PLAN WORKSHEET CONT.

A SITE PLAN AT A SUFFICIENT SCALE SHOWING:

Natural Features

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

Project Features

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

Clearing, Grading, Vegetative Stabilization

_____ The sequence of grading, construction, and sediment and erosion control activities
_____ The location of and construction details for all proposed E&S control measures
_____ Recommended measures include _____
_____
_____
_____ Limits of disturbed areas
_____ Extent of areas to be graded
_____ Disposal procedure for cleared material
_____ Location of stockpiled topsoil and subsoil

EROSION AND SEDIMENT CONTROL PLAN WORKSHEET CONT.

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

Drainage System

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

House Site Developments

_____ Sediment and erosion control measures for individual lot development

Additional Comments

located in regulated wetlands, construction of the detention basin will require a permit from the local inland wetland commission. In reviewing the proposal, the commission needs to determine the impact that the detention basin will have on the wetlands i.e., submerged under water during certain storm events, etc. If the commission decides 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. (See further comments in **Wetland Review** section)

It is not known if flooding problems exist downstream. The closest location of a house to Mineral Spring Brook is southeast of the intersection of the brook and Caroline Road. Close examination of the culvert passing under Caroline Road is warranted. Beyond this culvert Mineral Spring Brook flows into a large pond excavated in sand and gravel and wetland before discharging to Gardner Brook. The need for on site detention facilities of the proposed magnitude may not be warranted in view of the natural detention capabilities mentioned above. This should probably be checked.

The potential for streambank erosion and siltation problems do not appear to have been addressed to date by the applicant. The widespread presence of silty soils and moderate to steep slopes indicates a potential for erosion and siltation problems. Every effort should be made to protect Mineral Spring Brook and other water resources from silt-laden runoff. It seems likely that a temporary and/or permanent sediment basin(s) will be required, especially during the construction phase. Detailed plans for sediment basin should be shown on the plan. Guidelines for Soil Erosion and Sediment Control - Connecticut (1985) should be closely followed with regard to erosion and siltation problems.

The proposed detention area may serve a dual function; stormwater detention and sediment retention. If it serves a sediment retention function, regular maintenance will be required. The capacity of the basin may be diminished by accumulated sediments.

Road construction on "hardpan" soils, particularly in cut areas, can be problematic if not properly addressed. Roads in cut areas should have a good gravel subbase and underdrains on either side of the road. They are extremely difficult to stabilize due to seepage of water over the "hardpan" layer. The water creates an unstable condition just below the seepage line, and the weight of the unstable soil causes the soil to flow down the slope. Once this begins, the slope is very difficult to stabilize. The establishment of a good vegetative cover is practically impossible on these eroding slopes. Besides the unsightly conditions, the eroded soil must be removed from the base of the slope. Also, leaching fields should be set back at least 75 feet from the cut embankment area to prevent partially treated effluent from bleeding out at these points.

Access to all lots except Lot 11 and possibly 12 will be accomplished by the construction of loop road from Route163. A boulevard-type setting is proposed from Route 163 to the point where the road splits. The construction of the interior road will require three road crossings of watercourses and their accompanying wetlands. Depending on house location on a few lots, driveways may also need to cross wetlands for example Lots 11, 33 and 37.

Although undesirable, wetland crossings are feasible, provided they are properly engineered. The road should be constructed adequately above the surface elevation of the wetlands. This will allow for better drainage of the road and decrease the frost heaving potential. Road construction through wetlands should be done during the dry time of year and should include provisions for effective erosion and sediment control. Any unstable, organic or mucky material should be removed and replaced with a permeable road base material. Culverts should be properly sized and located so they do not alter the water levels in the wetland or cause flooding problems.

Classified inland-wetland soils in Connecticut are regulated under Public Act 155. Any activity which involves modification, fillings, removal of soils, etc. will require a permit and ultimate approval by the Town's Inland Wetland Commission. (See **Wetland Review** section)

6.Wetland Review

This section of the report offers the following comments with respect to the wetland impacts of the proposed layout.

General Site Conditions

The wetlands on the property are primarily forested hardwood swamps that exist in narrow depressions along numerous meandering watercourses. A watercourse referred to as Mineral Spring Brook on the topographic map flows in an easterly direction just north of the proposed road. A large central wetland system extends laterally to the west, north, south and southeast along several brook channels. A small pond is located at the northern constriction of the central wetland.

The wetland soils have been mapped as the poorly drained and very poorly drained Ridgebury, Leicester, and Whitman soils (Rn) on 0 to 5 percent slopes. The wetland areas observed on the site were extremely stony, and some places were entirely covered with stones and boulders.

Project Impacts to Regulated Areas

The site plan provided by the applicant at the ERT meeting showed three wetland intrusions resulting from the looped roadway layout. This configuration calls for two wetland crossings of Mineral Spring Brook and its associated wetlands (one located to the northeast, the other to the southeast) and one disturbance of a wetland finger on the west side of the property.

The wetlands in the area of the first crossing are thickly vegetated. The shrub layer vegetation consists of a variety of hardwood saplings, Swamp Rose and Spicebush. The ground is covered with an assemblage of wetland plants including Skunk Cabbage, Jack in-the-pulpit, Marsh Fern, Sensitive Fern and various mosses. The canopy is dominated primarily by red maples and various oaks.

The second crossing involves a southeast wetland depression associated with Mineral Spring Brook. While the representative wetland vegetation remains much the same as above, the density of understory shrubs is reduced and the ground surface is much more stony, almost entirely covered with large stones and boulders.

The third intrusion involves a crossing of the roadway loop through a wetland finger. This wetland is essentially a drainage swale, exhibiting much of the same vegetation as mentioned above. However, since no grading plans were made available it is difficult to determine the extent of the impact that the road construction will have on the wetlands and watercourses in question.

The site plan does not show the wetland crossings for driveways that will be necessary to access several of the lots. The site plan also does not show the proposed stormwater detention basin that is to be located in the central wetland area. According the the report entitled "Stormwater Analysis for Property of John Rose, Route 163, Bozrah, CT prepared by Bascom Magnotta, Inc.", a stormwater detention facility is necessary in order to maintain the pre-development runoff rates after completion of the site development. This will be accomplished by the construction of two berms, the installation of outlet control pipes and some degree of excavation of the central wetland system to provide a detention area. One berm is to be located on a narrow wetland corridor between Lots 31 and 33.

A detailed plan of the proposed detention basin was not available to Team members, thus comments relating to the potential impacts that this activity will have on the wetlands are very nonspecific. It is the DEP-Water Resources general policy to discourage the excavation of wetlands for the construction of detention ponds. Wetlands, in their undisturbed state, provide natural retention and pollution attenuation functions, given they are not overtaxed.

The argument is often made that the introduction of an open water body provides another habitat type and results in an increase of species diversity in a given area. While a properly constructed pond may add to the habitat value of a particular ecosystem, a shallow pond constructed for the purpose of collecting runoff from a development site may not. The detention pond in this instance will be collecting runoff from impervious surfaces such as roads and rooftops which may contain salt, sand, oils, greases, chemical fertilizers and pesticides. If not properly maintained, the pond may become laden with sediment and other pollutants, making it an unattractive place for waterfowl and other amphibious creatures to inhabit.

According to the hydraulic report the elevation of the water in the proposed detention basin will not exceed the 346 foot contour level. If this is the case, very little excavation in the wetlands should be required. While stormwater detention may be necessary for this site, and the placement of the basin in the proposed area seems the most logical, efforts should be made to minimize the impact to the wetlands, i.e. minimal excavation (see comment #4 below).

Wetland Functions

This property in its entirety provides a good quality wildlife habitat. The combination of upland and wetland areas alone with the many intermittent and permanent streams facilitates the utilization of this site by a variety of animal classes (i.e. small mammals, various amphibian and reptile species, nesting birds and larger mammals such as deer). The vertical stratification in the wetlands (vegetative growth on all layers; canopy, understory, shrub story and ground) add to the habitat value of the wetland system by increasing shelter, feeding and nesting opportunities.

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

General Comments and Recommendations

1. While the site plan represented that the looped road layout will cross the wetlands only twice and infringe on one other wetland finger, the actual site features observed on the date of the visit appear to indicate that there may be more wetlands on the property than displayed on the plans, thus increasing the overall project impacts. One of the guestionable areas was in the vicinity of proposed Lots 20, 22 and 24. This swale exhibited wetland vegetation and flowing water on the day of the inspection and appears to be a wetland recharge area. Additionally, there appeared to be

wetlands in the area of proposed Lots 15 and 16. Although the soils in these areas may not be poorly drained or very poorly drained, they may be regulated areas under the definition of watercourses pursuant to CGS Sec. 22a 38(16) which reads:

> "Watercourses means rivers, streams, brooks, waterways, lakes, ponds, MARSHES, SWAMPS, BOGS and all other bodies of water, natural or artificial, public or private, which are contained within, flow through or border upon this state of any portion thereof ....

After re-examination of the site, if the soil scientist makes a finding that the soils exhibited in the questionable areas mentioned above are not wetland soils, the applicant should employ a biologist to determine whether these areas fall under the watercourses definition (a biologist could make a finding based on vegetation as to whether the above mentioned areas are swamps). The watercourses should then be flagged and incorporated onto the site plan so that an accurate determination of impacts to regulated areas can be made.

2. Flagged wetlands were also observed in the area of Lot 10, however, these wetlands did not appear on the site plan. This area, in addition to those areas mentioned above, should be re-surveyed so that the site plans accurately portray the field delineated regulated areas.

3. Several of the proposed lots on the inside of the loop (Lots 33, 37, 13, and 15) contain significant areas of wetlands. To reduce the level of wetlands impact associated with lot development, it is recommended that the two lots located along Mineral Spring Brook (Lots 33 and 37) be eliminated. Further, deed restrictions and conservation easements should be placed on the remaining lots containing wetlands.

4. It is recommended that the catch basins contain sumps and oil separators. This would help to remedy any potential sedimentation and pollution problem, provided they are maintained (cleaned) on a six month basis (January and June). If these measures are not taken and and required sediment and erosion controls are not installed and maintained properly, the result could be a degradation of water quality over time.

5. The Wetlands Commission is urged to require that the applicant provide alternative designs to the current proposal, along with a discussion including why each alternative was considered and why or why not each is feasible and prudent, (this would include alternative lot layouts, alternative road configurations and alternative detention areas). Connecticut General Statutes Section 22a 41(b) requires that in the case of an application which received a public hearing, a permit shall not be issued unless the Commission finds that a feasible and prudent alternative does not exist. This means that the Wetlands Commission should not issue a permit if a feasible and prudent alternative exists, and it is the responsibility of the applicant to provide alternative designs for the Commission to consider.

7. Water Supply

The water supply for each lot in the proposed subdivision would 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. In general, the casing should extend at least 5 feet into the bedrock.

A typical well 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 Basin) indicates that of 274 wells surveyed which tap metamorphic bedrock, 90% yielded 3 gallons per minute or more. Generally speaking, a yield of 2 - 3 gallons per minute is desirable for domestic purposes. A well yielding 3 gallons per minute would be equivalent to 4320 gallons of water for a 24 - hour period.

Because lot sizes are relatively large (will exceed 2 acres of more) and because a high portion (about 95%) of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal systems, the annual groundwater usage for the site should not exceed annual groundwater recharge. As long as the underlying bedrock is fractured and capable of transmitting water to drilled wells, the bedrock aquifer can be expected to adequately meet the water demands of the proposed subdivision. Lots 2 acres in size should permit separating distances of 200 feet between neighboring wells. This appears to be attainable, and if accomplished, each well would have about 1 acre of recharge per well or about 595 gallons per day. It is estimated that a family of five would use about 375 gallons per day or 75 gallons per person per day. The latter assumes the recharge rate of about 8 inches per year for an upland till covered site.

In order to provide the adequate protection of the bedrock aquifer, all wells will need to be properly installed in accordance with applicable State Public Health Code and Connecticut Well Drilling Board regulations. Additionally, the Town sanitarian will need to inspect and approve all well locations. The well location for each lot should be shown on the subdivision plan.

The natural quality of groundwater should be satisfactory, however, the Scotland Schist that underlies the northern half of the site may contain elevated iron and manganese, which would tend to lower the overall quality. If elevated iron and/or manganese levels are present in the water, it may be necessary to provide suitable treatment filters.

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

8. Sewage Disposal

Sewage disposal for the proposed subdivision depends upon the installation of private on-site subsurface sewage disposal systems. Subsurface exploration on the parcel has been conducted by the applicant.

Based on deep test data, soil mapping data and visual observation, the major geologic limitations with respect to sewage disposal on the site include the following; **(1)** areas of moderate to steep slopes; **(2)** the presence of "hardpan" in some till soils on the site (which have moderately slow to slow percolation rates and are susceptible to seasonally high water tables); and **(3)** presence of shallow to bedrock soils. The southeast corner (Lots 25 - 32) of the site appears to be least affected by the geologic constraints mentioned above and therefore may be capable of supporting conventional, non-engineered septic systems. Depending on the final location of septic systems on these lots additional soil testing may be necessary. It is important to note that subsurface conditions can change dramatically over relatively short distances. Nevertheless, every effort should be made to keep septic systems shallow and spread out wherever possible.

The remaining lots will probably require specially designed plans in order to surmount one or all of the geologic limitations mentioned above. For lots with seasonal high ground water tables improvements such as intercepting drains for leaching systems with suitable well-drained fill material will probably be required. Sufficient exploratory work is warranted on the lots that are characterized by shallow to bedrock conditions. Several deep test holes should be dug in shallow to bedrock areas so that the bedrock surface in the area of the leaching system is well documented. In areas of this soil coverage (shallow to bedrock) and "hardpan" layers, septic systems should be kept shallow, relatively large and spread out over the contours to enhance lateral disposal.

Finally, every effort should be made to keep leaching systems in areas where slopes do not exceed 25%. Cut and fill septic systems should not be permitted in steeply sloping areas. Partially treated effluent may "bleed out" in this type of installation.

The potential for seasonally high water tables associated with the "hardpan" soils suggest that building footing drains should be installed around homes. This should protect basements from getting wet during the winter and spring months. It is possible that the building footing drains can be connected to intercepting drains (curtain drains). The project engineer should address where each curtain drain will be located and discharged so that problems such as gullying, well contamination or interference with on-site or neighboring septic systems does not occur. These drain locations should be determined prior to subdivision approval.

Depending on topographic conditions some lots may be able to utilize groundwater intercepting drains. The separation distances between septic

systems on abutting lots becomes critical. Upgrade lots may have to be widened to ensure that their sewage disposal systems are at least 50 feet away from downgrade curtain drains.

Before subdivision approval, the applicant's engineering firm must show that each of the proposed lots in the subdivision meets the minimum soil standards set forth in Section 19-13-B103e (a)(3) of the State Public Health Code.

The approval of septic systems should be a coordinated effort between the design engineer and the town sanitarian. Because the majority of lots will be deemed of "special concern" by the State Public Health Code, plans for the design of the subsurface sewage disposal facilities (along with the placement of each on-site water supply well) must be prepared by a professional engineer and submitted to the health department for review and approval by their certified staff. The final configuration of lots should not be approved until the health department is assured that each lot meets all of the State Public Health Code requirements.

9. Fish Resources

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

Site Description

Mineral Spring Brook

The headwaters of Mineral Spring Brook originate within the property. The brook is a tributary of Gardner Brook. Initially intermittent in nature, the two branches join to form a perennial stream in the northeast portion of the property. The stream's riparian (streamside zone) is primarily comprised of wetland habitat. One of the primary functions of the upper sections of Mineral Spring Brook and associated wetlands is to provide clean and unpolluted waters to downstream areas of the watershed.

Surface waters of Mineral Spring Brook are classified by the Department of Environmental Protection (DEP) as "Class A" on the project site, and the segment of the stream from Caroline Road to its intersection with Gardener Brook is "Class B/A". Designated uses for this classification "B/A" are: fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

Fish Population

Viable fish population habitat was observed at the furthermost northeast section of the property boundary line below the proposed road crossing and above the Caroline Road crossing. Fish species expected to inhabit this area of the stream and downstream sections are: native (wild) brook trout, longnose dace, blacknose dace, American eel, fallfish, and white sucker.

Gardner Brook is annually stocked in the town of Bozrah by the DEP Bureau of Fisheries with more than 900 adult brown and brook trout.

Impacts

The following impacts of the proposed subdivision on Mineral Spring Brook can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of watercourses through increased runoff from unvegetated areas : During construction topsoil within the proposed building lots 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 residential construction is a major cause of stream degradation in eastern Connecticut. Excessive sediment deposition could damage aquatic ecosystem in the following ways:

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

(2) Sediment reduces the survival of aquatic insects. Since aquatic insects are important food items in fish diets, reduced insect populations levels in turn will adversely affect fish growth and survival. Fish require an excessive output of energy to locate preferred prey when aquatic insect levels decrease.

(3) Sediment reduces the amount of usable habitat required for spawning purposes. Excessive fines can clog and even cement gravels and other desirable substrate together. Resident fish may be forced to disperse to other areas not impacted by siltation.

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

(5) Turbid waters impair gill functions of fish and normal feeding activities of fish. High concentrations of sediment can cause mortality in adult fish by clogging gills.

(6) Sediment encourages the growth of filamentous algae and nuisance proportions of aquatic weeds. Eroded soils contain plant nutrients such as phosphates and nitrates. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth. Presently, both streams support very sparse aquatic weed communities.

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

2. Percolation of septic effluent into watercourses : A failure of individual septic systems to operate properly (refer to **Sewage Disposal** section) would be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems could possible enter stream waters in the event of a septic system failure or infiltrate the groundwater during the spring when water tables are close to the surface. Failure of individual septic systems could inflict long term damage to local aquatic environments since 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 in streams due to the influx of stormwater drainage from nearby residential housing : Stormwaters along the proposed road system will be outletted from catch basins at various discharge locations and outletted into the central wetland. Plans call for building berms at two constriction points to create a detention basin. Stormwaters can contain a variety of pollutants that are detrimental to aquatic organisms. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Once introduced into stream environments, stormwater runoff will 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 stormwater detention basins. More harmful still are spilled petroleum based chemicals or other toxicants that can precipitate partial or complete fishkills.

4. Degradation of wetland habitat : Proposed building lots will be constructed adjacent to vital wetland habitat. Wetlands will also be impacted by the proposed road network which will cross wetlands at three different areas. Moreover, stormwaters will be discharged into various

locations within wetlands and wetlands will be altered to form a detention basin. These wetlands serve to protect the water quality of Mineral Spring Brook. Wetlands are beneficial in many ways. They serve to: (1) control flood waters by acting as a water storage basin, (2) trap sediment from natural and man-made sources of erosion, and (3) help filter-out pollutants from runoff before they enter watercourses. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact these wetland complexes by hindering their ability to properly function.

5. Transport of lawn fertilizers and chemicals : Runoff and leaching of nutrients from fertilizers on lawns will stimulate filamentous algae growth in streams 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. Impacts to downstream environments : Any water quality problems and habitat degradation that occurs within Mineral Spring Brook may eventually be observed downstream in Gardner Brook.

Recommendations

The following recommendations should be considered by the Town of Bozrah to mitigate impacts to Mineral Spring Brook and wetlands.

1. It is highly recommended that at the minimum, a 100 foot open space buffer zone be maintained along all wetland boundaries : This buffer can be an effective mitigation measure at this development location. No construction and alteration of existing habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985). Specifically in regards to streams, these buffers act to: (1) filter fine sediment, debris and man-induced pollutants from penetrating streams, (2) provide invaluable shading of stream waters which maintain water temperature regimes necessary for survival of cold water fishes such as trout, (3) stabilize and prevent excessive undermining of streamside banks by maintaining masses of living roots, (4) assist in the regulation of stream hydrology, (5) provide fallen trees, woody debris, and leaves necessary for the survival of trout and aquatic insects, (6) regulate the natural productivity of aquatic ecosystems by supplying organic detritus to streams.

2. Install and maintain proper erosion and sedimentation controls during site construction activities : Silt fences and haybales should be placed within excavated trenches to ensure that all runoff is properly contained. A town official should be responsible for inspecting this

development on a daily basis to ensure that contractors have complied with all stipulated mitigation devices. Past stream siltation disturbances in Connecticut associated with residential housing developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis. Proper installation and maintenance of these devices is critical to environmental well being.

3. Properly design and locate individual septic systems : The Team Fisheries Biologist feels that systems should not be placed adjacent (within 100 feet) to sensitive wetland and aquatic ecosystems. It is critical that all septic systems be placed in areas that will effectively limit septic effluent. The addition of septic effluent to streams and wetlands can be one of the greatest threats to stream ecology. All 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. Residents should be encouraged to utilize non-phosphate laundry detergents.

4. The developer should submit a detailed stormwater management plan 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 stormwater detention basins. If on-site detention is not required, berms should not be constructed in wetlands to detain stormwaters. Stormwaters from catch basins should be initially outletted into non-wetland habitat;thus avoiding direct contact with wetlands. Maintenance of catch basins is very critical. 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 prohibited. Catch basins and stormwater detention basins will only trap heavy, coarse sediments reducing the likelihood of excessive stream sedimentation; however, waters that contain pollutants such as hydrocarbons, salts and even small amounts of fine enriched sediments will eventually cause water quality and aquatic habitat degradation. This impact can not be prevented since catch/detention basins will not remove these materials.

5. All work near streams and/or wetlands for the purpose of road construction should take place during low flow periods : This strategy will help minimize the impact to aquatic resources. Reduced streamflows and rainfall during the summer and early fall provide the least hazardous conditions in which to work near sensitive aquatic environments.

6. 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.

Bibliography

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

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10. Planning Review

The proposed 42 lot subdivision is located on the east side of Route 163 in the southwestern section of Bozrah. Caroline Road is located approximately one half mile east of the proposed subdivision. Surrounding land uses are low density residential and undeveloped, forested land. A commercial boat sales facility is located south of the proposed development along Route 163 and the Bozrah solid waste transfer station is located on the westerly side of Route 163 across from the proposed boulevard road entrance.

The area of the proposed subdivision is depicted as low density uses on the adopted Regional Development Plan, with recommended residential densities of more than 1.5 acres per dwelling unit.

The area is zoned RU-l residential with 80,000 square feet lot sizes and a street frontage requirement of 200 feet. Lots 25 and 26 do not appear to meet this frontage requirement.

The proposed open space is located in the center of the proposed subdivision adjacent to the proposed roads and the "mineral springs" property. It represents about seven percent of the total subdivision area. The right of way for the mineral springs property will follow the edge of the open space and Lot 3. It would be desirable to incorporate the "mineral springs" property into the open space or into the adjacent lots. With just a right of way serving the mineral springs property, it will not be a buildable lot because it does not have the required 200 feet of road frontage. The dry, usable portion of the open space adjacent to Lot 37 will require a wetlands crossing for access to the proposed road, a possible drawback to its

utilization. A shorter wetlands crossing to the south might be possible to tie this area to the open space area adjacent to the mineral springs property.

A boulevard road will be utilized to eliminate another town road and wetlands crossing leading to Route 163. The boulevard will effectively function as two town roads. Bozrah subdivision regulations require a road to have 32 feet of pavement. Two roads next to each other with a ten feet median totals 74 feet. The subdivision plan shows a 70 feet right of way for about 75 percent of the distance of the boulevard. Serious consideration should be given to increasing this right of way to 85 to 100 feet. A single town road requires a 50 foot right of way and two roads would require 100 feet of right of way. Some brush clearing will be required at the intersection of the boulevard with Route 163 to provide the sight lines required in the subdivision regulations and by the Connecticut Department of Transportation. The subdivision regulations allow a maximum road slope of ten percent. Depending on the amount of cutting and filling, this requirement could present a problem from the bottom of the hill at Lots 33 and 35 to the top of the hill at Lots 27 and 28.

Data from the Institute of Transportation Engineers indicate that a single-family development can be expected to generate ten daily trips per home. Forty-two single-family units would mean 420 daily new trips using Route 163 when the project is completed. In 1987 Route 163 had an average daily traffic (ADT) count of 1,300 in the area of the proposed development. No major highway improvements are indicated in the Regional Transportation Plan for Route 163 in 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.**