Lake Farms Subdivision

Lebanon, Connecticut

September 1989

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Lake Farms Subdivision

Lebanon, Connecticut

Review Date: June 20, 1989
Report Date: September 1989

Eastern Connecticut Environmental Review Team
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ENVIRONMENTAL REVIEW TEAM REPORT
ON

LAKE FARMS SUBDIVISION
LEBANON, CONNECTICUT

This report is an outgrowth of a request from the Lebanon 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 Tuesday, June 20, 1989. Team members participating on this review included:

Sharon Ashworth	**Wildlife Assistant**	**DEP-Eastern District**
Nick Bellantoni	**State Archaeologist**	**CT Museum of Natural History**
Barbara Buddington	**Regional Planner**	**Windham Regional Planning Agency**
Richard Carona	**Transporation Planner**	**ConnDOT-Bureau of Planning**
Patrice D'Ovidio	**Soil Conservationist**	**USDA-Soil Conservation Service**
Steve Hill	**Wildlife Biologist**	**DEP-Eastern District**
Charles Lee	**Environmental Analyst**	**DEP-Water Compliance**
Clarence Merrill	**Forester**	**DEP-Patchaug State Forest**
Brian Murphy	**Fisheries Biologist**	**DEP-Eastern District**
Nancy Murray	**Biologist**	**DEP-Natural Resources Center**
Meg Reich	**Planning Director**	**Windham Regional Planning Agency**
Elaine Sych	**ERT Coordinator**	**Eastern CT RC&D Area, Inc.**
Bill Warzecha	**Geologist/Sanitarian**	**DEP-Natural Resources Center**

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, and a soils map. During the field review the Team members were given subdivision plans and supplemental information. The Team met with, and were accompanied by members of the Lebanon Planning and Zoning Commission and members of the Inland Wetlands Commission, the property owner/developer and his engineer. 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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TABLE OF CONTENTS

TABLE OF MAPS AND CHARTS

1. SETTING LAND USE AND ZONING

The proposed Lake Farms Subdivision site, also known as the Savin Property, consists of about ±305.5 acres in southern Lebanon. The developer owns an additional ±273 acres of land that abuts the proposed subdivision site on the south and west. There were no definite plans for the remaining ±273 acres on the review day.

The site is bounded on the west by Roger Foote Road, which is paved a distance of about ±750' from its intersection with Route 616 (the remainder being unpaved), on the south by Route 616, on the east by Geer Road and private, undeveloped land and on the north by private, undeveloped land. Present plans to access the majority of interior lots of the subdivision will be accomplished by the construction of three interior roads; Farm Lake Drive on the west side and Deer Run and Fawn Drive on the east side. A total of three road crossings of a watercourse and its accompanying wetland will be required. Two of these crossings, both of which occur on the west side of Savin Lake, will coincide with an existing crossing of the watercourse and its accompanying wetlands.

Land-use in the area is characterized by low density residential and agriculture. Most of the proposed subdivision site is characterized by open farm fields and surface water bodies. Wooded land characterizes proposed Lots 17-34 on the east side and Lot 47, and Lots 71-76 on the west side.

Three major zones encompass the land to be subdivided and include the following; (1) RA-zone, (2) lake district zone and (3) light industry zone. The western and eastern limits are located in the RA-zone, which allows single family residences on lots of at least 2 acres (80,000 square feet). For the most part the lake district zone includes the land surrounding and in proximity to Savin Lake and North Pond. The lake district zone permits single family year-round dwellings on minimum 2 acre lot and/or seasonal dwellings or camps on a minimum 12,000 square foot (just over a quarter of an acre) lot. The final zone found on the parcel is the light industry zone, which occurs at the southeast corner of the parcel. Permitted uses in this zone include agricultural operations. Interested persons should refer to Lebanon's Zoning Regulations since there may be other permitted uses allowed in each of the zones described above. (Also refer to **PLANNING CONCERNS** section)

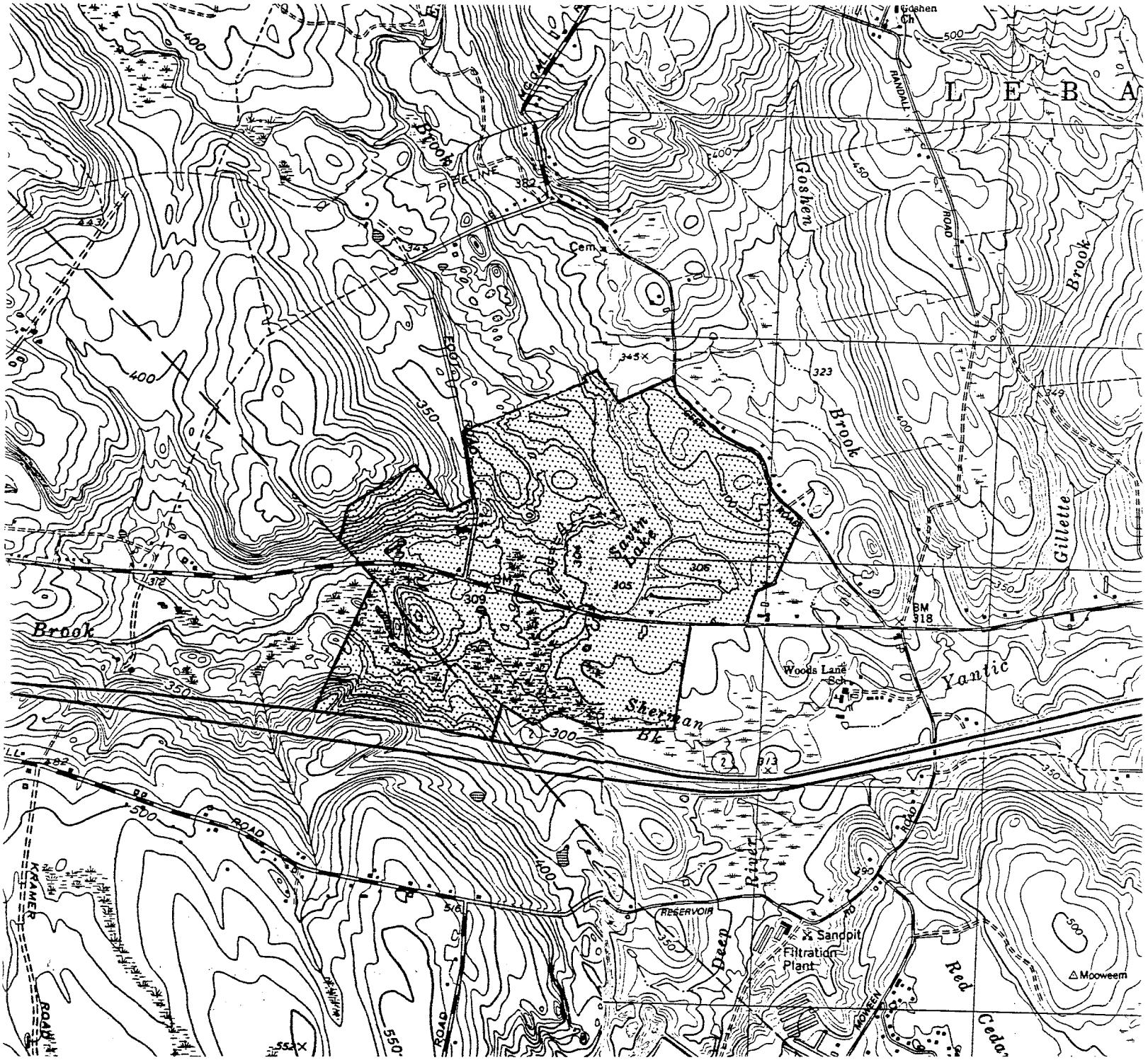
Present plans indicate that each of the proposed lots comprise 2 acres or more. In addition, each lot contains a 60,000 square foot buildable area as

required by the town of Lebanon's Zoning Regulations Section 5.4. As such, it appears the proposed subdivision is compatible with the Town's regulations. Each lot will include a single family home served by an individual on-site septic system and water supply well.

LOCATION MAP

Scale 1" = 2000'

Entire Approximate Property Owned by J. Kelley



2. TOPOGRAPHY

The major topographical feature of the subdivision site is Savin Lake and North Pond. They are ±56 acres and ±10 acres in size, respectively. A smaller pond, South Pond, which is ±3 acres in size is located south of North Pond and is located entirely in the light industry zone. Although in proximity to each other, surface flow between these surface water bodies does not exist.

All three water bodies are man-made, a result of sand and gravel mining which commenced on the site in the early 1960's. North and South Pond were created after 1970. It is understood that the majority of sand and gravel was used for road base material during the construction of Route 2.

The ponds were created by excavating sand and gravel below the water table in the Bartlett Brook Valley. Bartlett Brook enters the pond at the north end of Savin Lake. The outlet stream for the Lake is tributary to Sherman Brook, which flows in an easterly direction south of the proposed subdivision site.

The ±305.5 acre site is characterized by diverse terrain. Topographic conditions range from gentle to moderate across the site. Concentrated areas of very steep slopes were not visible on the site during the field walk nor are they indicated on topographic maps of the site.

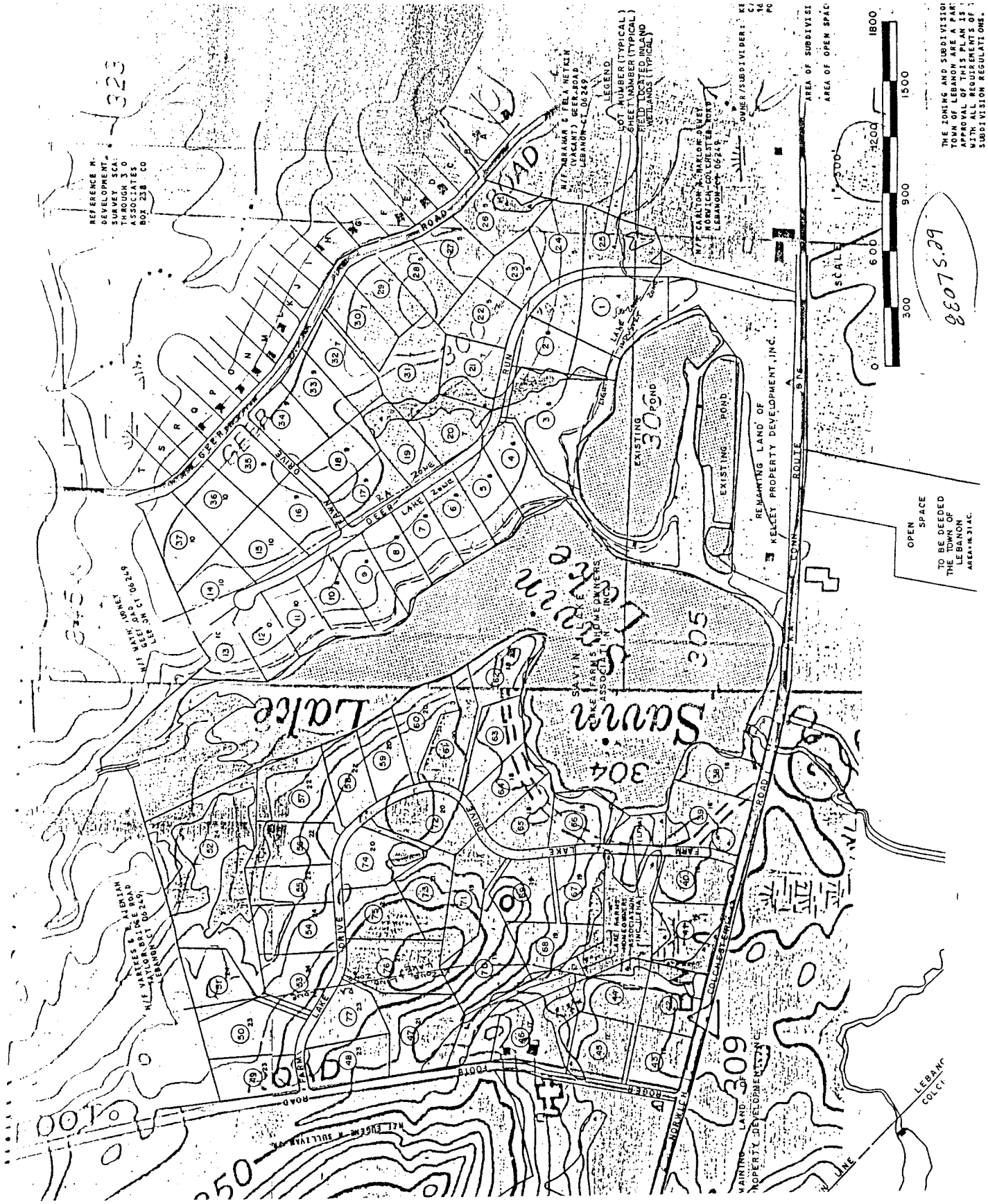
TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary
Lake Farms Subdivision
Other land of J. Kelley

SUBDIVISION PLAN

No Scale



3. GEOLOGY

Bedrock Geology

Based on visual observations made during the field walk and review of available geologic and soil mapping data, bedrock is not well exposed on the site. Published geologic data indicates that unconsolidated surficial geologic materials blanket crystalline metamorphic bedrock on most of the site. The ±305.5 acre site is underlain mainly by Brimfield Schist, a gray, rusty weathering, medium to coarse grained, interlayered schist and gneiss. The Hebron Gneiss is in contact with the Brimfield Schist at the northern limits of the parcel. These rocks are described as interlayered dark-gray schists and greenish gray, fine to medium grained calc-silicate gneisses.

In at least two areas on the site, outcrops of coarse grained pink or white granite-like rocks called pegmatites intrude the Brimfield Formation. These lenticular shaped rock bodies are rich in the minerals quartz, feldspar, minocline and muscovite or biotite.

The terms gneiss and schist indicate that the rocks are metamorphic (have been altered by tremendous heat and pressure within the earth's crust). Gneisses characteristically contain alternating bands of elongate minerals and more rounded minerals. "Schists" are characterized by the predominance and parallel orientation of fine-grained mica (biotite/muscovite) and by the ease of parting into thin layers.

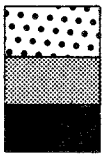
The bedrock of the region, which includes Brimfield Schist and Hebron FoFormation, originated as oceanic sediments. The Brimfield Schist consisted of sulfidic shales and siltstone while the Hebron Formation comprised well-bedded siltstones and calcareous siltstones. Following their deposition as oceanic sediments, the rocks were metamorphosed during periods of crustal movements that culminated about 330 million years ago. Pegmatites intruded the Brimfield Schist as molten material in layers and lenses later in geologic times.

Based on review of bedrock geologic maps and air photos for the area, a fault zone may traverse the central parts of the site in a northwest-southeast direction. It would be aligned with the Bartlett Brook Valley. If it does exist, there is a chance that the underlying bedrock in proximity to the inferred fault is fractured, weathered or both. The fault would have occurred during the geologic past and would no longer be active.

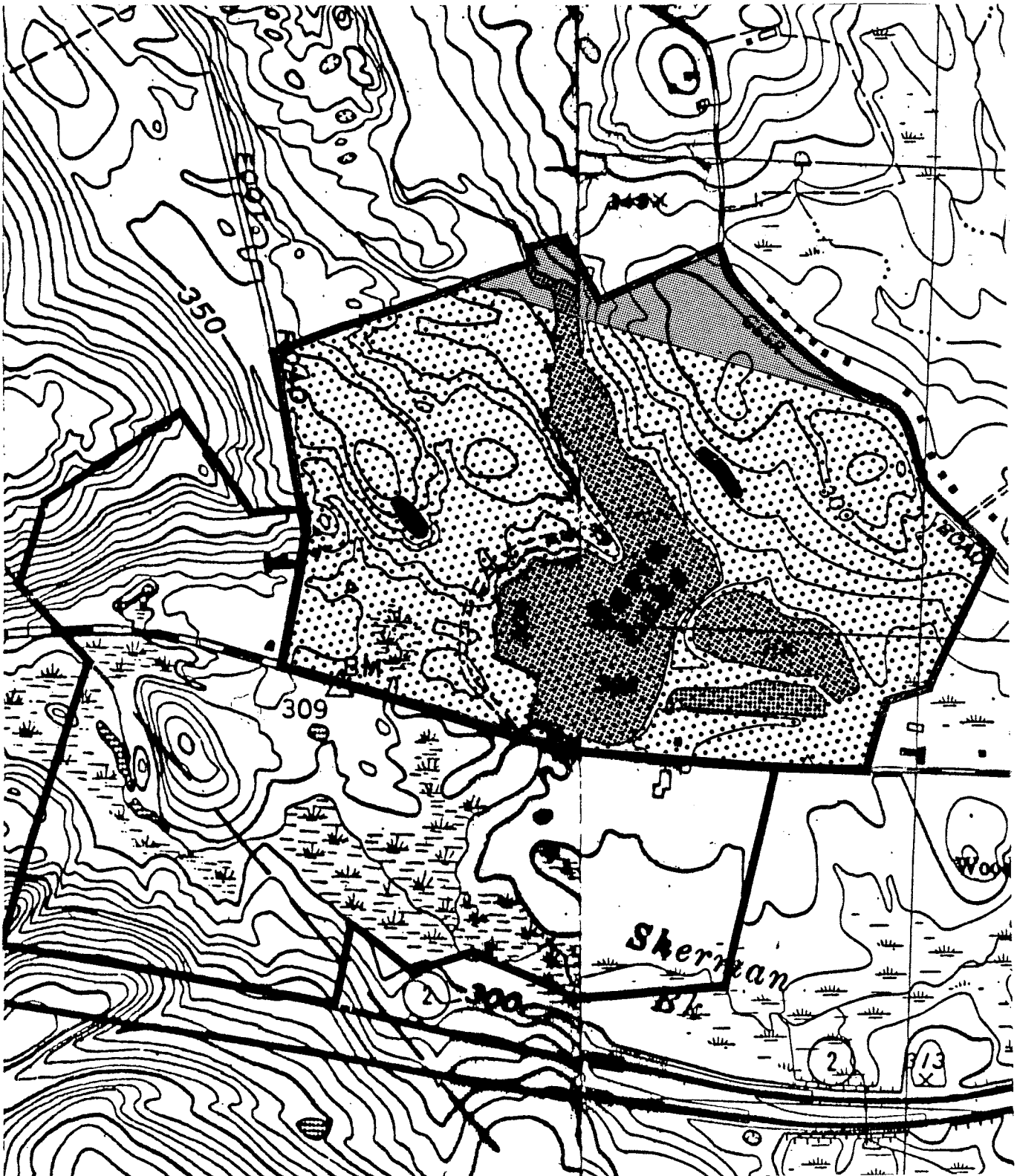
In general, the "layering" (foliation) of the local rock is dipping about 10-40 degrees to the west/southwest. Many domestic wells in the area rely on the underlying bedrock as a water supply source.

BEDROCK GEOLOGIC MAP

Scale 1" = 2000'



Brimfield Schist
Hebron Formation
Pegmatites



Surficial Geology

Overlying the crystalline, metamorphic bedrock on the site is a blanket of unconsolidated sediments of glacial origin called till and stratified drift (Stone, et al, 1985).

The upland portions of the site at the eastern and western limits are covered by till. The till consists of a mixture of sediments that range in size from clay size particles to large boulders. Based on soil mapping data, the texture of most of the till on the site is generally sandy and loose, but that silt-sized material may be found in an area at the eastern limits. A compact or "hardpan" zone may be encountered at a depth of about 15 - 24" below ground surface with the latter variety of till. Because the compact zone is slowly permeable, a seasonally high water table commonly develops in these soils. Also, slow percolation rates may be encountered in these soils.

The till sediments were deposited by glacial ice as it moved across the bedrock surface from north to south-southeast. It is probably ten feet thick (or less) in most places and covers about 1/3 of the proposed subdivision site.

The majority of the Savin Property site is covered by stratified drift deposits. Sand and gravel are the major components of stratified drift. Gravel sized particles generally characterize the stratified drift in the northern half of the site, while sand sized particles comprise the deposits in the southern half. The sand and gravel was deposited by streams from melting glacial ice that occupied the Bartlett and Sherman Brook valleys.

The stratified drift deposits differ from glacial till in that they consist of more rounded particles which have been sorted and deposited in layers by glacial meltwater. Stratified drift deposits are generally highly permeable and can store and transmit water easily, particularly coarse grained stratified drift. Because of this, they can be an important source of water for large water supplies, particularly where the deposits are extensive, coarse-grained and have a saturated thickness of 40 feet or more. There may be other hydrogeologic factors involved also. (See Surficial Geologic Map)

According to the map entitled Groundwater Availability in Connecticut (Meade, 1978), it appears that the stratified drift deposits, which occupy a narrow section of the Bartlett Brook valley north of Savin Lake, have the most favorable hydrogeologic characteristics for yielding high volumes of groundwater to individual wells. The remainder of stratified drift appears to be finer grained and

therefore, is probably capable of yielding only small to moderate amounts of water to individual wells. It should be pointed out that groundwater exploration for large scale water supplies was conducted on the Savin Property for the applicant by the Stephen B. Church Company . A copy of this exploratory work was made available to Team members. Four test holes were drilled on the proposed subdivision site. Two test wells (no. 1 and no. 3) located near Lots 74 and 75 were drilled to refusal which occurred at about 25 feet. These borings penetrated very coarse cobbles, gravel and boulders, and produced no water when pumped with suction pumps. Test wells no. 7 and 8 located in the light industry zone were drilled to refusal at 19 feet and 52 feet respectively. In general they penetrated gravel, silt and cobble sized particles. Test well no. 7 was not screened, but test hole no. 8 did not produce any water. These preliminary studies suggest that the sand and gravel deposits on the site may not be that favorable for large-scale groundwater development.

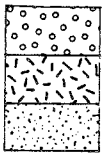
The exact thickness of stratified drift covering the site is unknown. It probably ranges from a few inches at its contact with the till deposits at the base of upland areas and may exceed as much as 80 feet thick in the area south of Savin Lake.

Post-glacial sediments found on the site include swamp and alluvial deposits. According to soil mapping data and site plan distributed to Team members on the review day, two major wetland areas occur on the site; one is located in the southwest corner while the other parallels an intermittent streamcourse in the eastern parts. The streamcourse ultimately flows into North Pond.

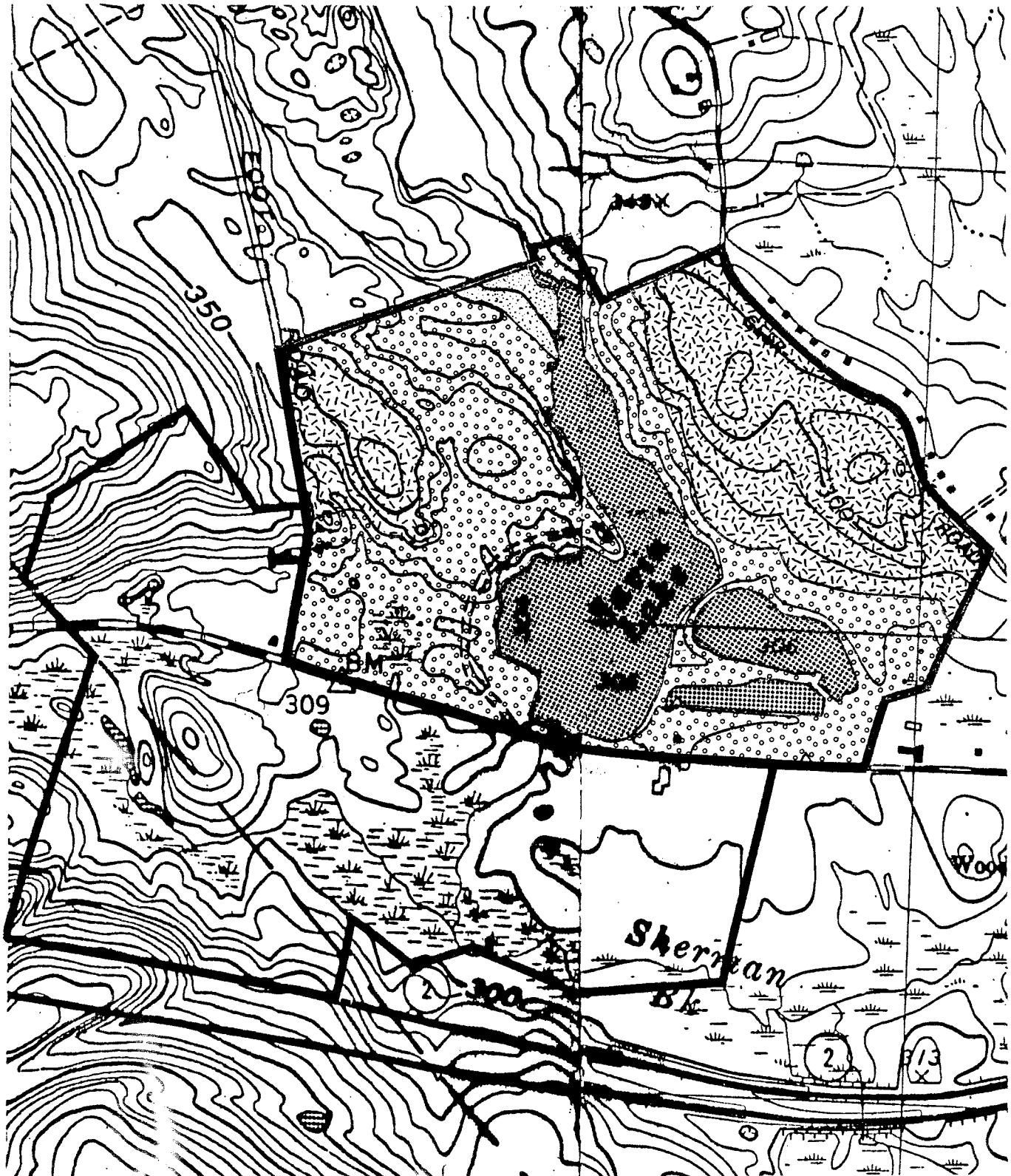
Alluvial deposits, which consist of sand, silt and fine gravel parallel Bartlett Brook north of Savin Lake. The alluvial deposits may also contain layers of clay and coarser gravel in place.

SURFICIAL GEOLOGIC MAP

Scale 1" = 1000'



Stratified Drift
Till
Alluvium



4. SOILS INFORMATION AND DESCRIPTIONS

Hinckley soils border both the eastern and western sides of Savin Lake. Hinckley soils are gravelly sandy loams which are excessively well drained, because of this the limitations for septic tank absorption fields can be severe. Groundwater pollution is a concern, and runoff is medium to rapid. Double separating distances between wells and absorptions fields is a suggested corrective measure. Increasing the size of the septic system leaching fields would also remedy the problem. Excessive erosion will occur unless proper control devices are employed.

The Canton Charlton complex soils are the next predominate soil units on this property. Again, on site septic systems may need to be engineered. Permeability is moderately rapid to rapid and may not provide proper filtration for sewage effluent, however, these soils have limitations which can be easily overcome. Individual test pit data is necessary to determine exact limitations. Again, erosion control devices are essential during construction.

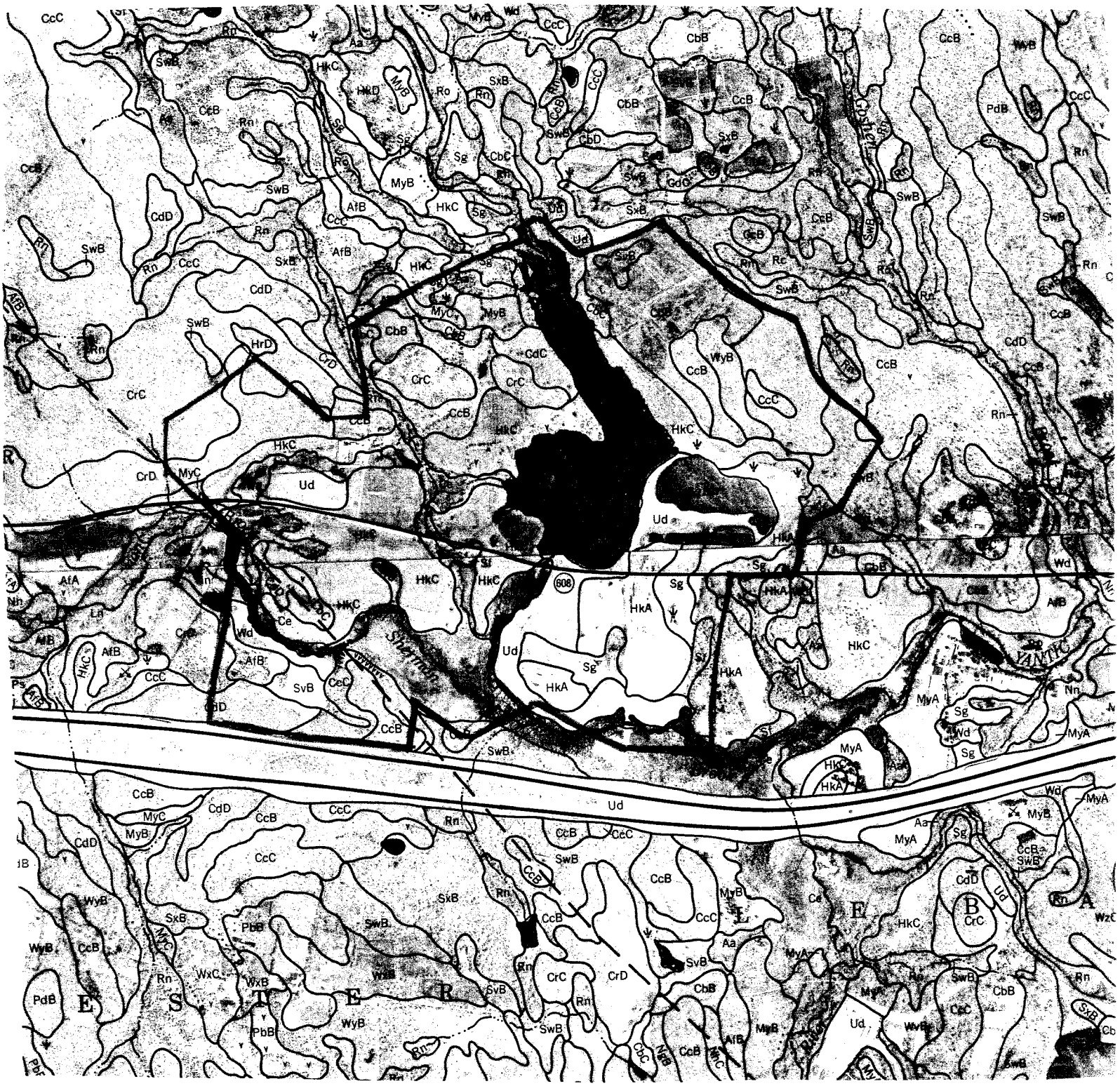
Much of the soil on this property is either prime agricultural land or other land of statewide importance for agriculture.

With these soils, special care should be taken during construction and excavation. Due to slopes, stoniness and cutbank caving, excavations can be a cause for concern.

SOILS MAP

Scale 1" = 1320'

Approximate Site Boundary



5. SOIL RESOURCE COMMENTS

Storm Drainage

The engineering firm has submitted preliminary storm drainage calculations. A rough approximation of the drainage area characteristics was used to derive the curve numbers and was used for the basis of the calculations. Although the proposed development does not contribute significantly to the overall increase in storm water in the watershed, the present undeveloped conditions of the drainage system is grossly inadequate. The significant contributing factor to the storm water management concerns is the size of the watershed. The watershed to pond ratio is approximately 167:1, whereas a safe maximum ratio is typically <100:1. The computations were using the 3 - 3' x 10' box culverts proposed at the low point on Farm Lake Drive. Under these conditions, the two year storm well overtop the spillway at 306.8, elevation with 925 cfs flow. It is recommended that the developer revamp the existing undersized and failing weir with a concrete weir approximately 200' long and 4' deep to accommodate the calculated 4,958 cfs flows for a 100 year storm.

Dam Safety

A State of Connecticut DEP dam safety permit is required. A detailed survey and hydrology study showing all elevations will be necessary to meet state dam safety criteria.

Phasing

The plan narrative discusses phasing of the project. The USDA-Soil Conservation Service New London County advocates phasing on a project of this size. All disturbed areas should be adequately stabilized before continuing to next phase. The plan should specify which areas are in each phase. House lots as well as roadways should be divided for phasing.

The narrative states disturbances will be kept to a minimum. This area should be delineated on the site plan. Cleared material should be stockpiled or properly disposed of and these areas should be located on the site plan and discussed in the narrative. Proper erosion control devices should be employed.

Grading proposed on house lots should be on the site plan.

It may be necessary to provide extra protection directly around wetland areas which are downslope from house lots. If the slope is steep or long or if the soils are particularly susceptible to excessive erosion, extra protection will be needed.

6. HYDROLOGY

Except for +33 acres in the eastern limits, the proposed subdivision site lies within the Bartlett Brook drainage area. The eastern limits of the site drain either to Goshen Brook or an unnamed tributary both of which are tributary to the Yantic River. At is intersection with Route 616 (Savin Lake Dam), Bartlett Brook drains an area of 14.5 square miles or 9,280 acres.

As mentioned earlier, the major surface water bodies on the site include Savin Lake, ±56 acres in size and North and South Ponds approximately 10 and 3 acres, respectively. The latter two have no outlets. It appears that the water level in each water body is coincident with the local water table in the area. Because of the permeable nature of the sand and gravel in the vicinity of the water bodies, they are probably hydraulically connected subsurfacely. All were created by intercepting the water table during sand and gravel mining operations. It is not known if there is any bathymetric data for the surface water bodies. Any attempt to remove the sand and gravel dikes that separate the water bodies, should be carefully studied and completely understood from an ecologic and biologic standpoint before they are disturbed.

The watershed areas for Bartlett and Sherman Brook are relatively lightly developed. Agricultural land uses are scattered throughout both watersheds.

Precipitation falling on the Savin Property, which takes the form of runoff, flows (mainly in the till covered areas) across the surface of the land until it reaches a brook or other surface water bodies. Precipitation is absorbed by the sandy, gravelly soils, which cover the remainder of the site, into the ground. Once absorbed, the water may either be returned to the atmosphere through evaporation and plant transpiration, or it may percolate downward to the water table and eventually become part of the groundwater. Once the water reaches the groundwater table, it moves downslope by the force of gravity, ultimately discharging to the surface in the form of a spring, wetland area, stream or directly into a lake or pond. To a large extent, groundwater flow on the property parallels the surface flow pattern.

According to Connecticut Water Quality Standards and Criteria for the Lower Thames River Basin which the Savin Property encompasses, surface water quality is variable on the site. Groundwater within the Savin Property is classified as GA, which means that it is suitable for private drinking water supplies without treatment.

Surface water quality for Bartlett Brook, below its confluence with Exeter Brook, including Savin Lake is classified as B/A. A B/A classification means that surface water has been degraded (due to an inactive mixed waste/industrial landfill near the Exeter section of Lebanon). The water quality goal is a fishable, swimmable condition. The State's long term goal is to restore the surface waters to a class 'A' through cleaning actions. A class 'A' surface water body is known or presumed to meet water quality criteria, which supports potential drinking water supply. Other than the surface water bodies mentioned above, the remaining streams and ponds on the Savin Property presently meet the class 'A' standards.

Converting the wooded land and open fields on the site to a residential subdivision would be expected to increase the amount of runoff shed from the site. Increased runoff would result from soil compaction, removal of vegetation, and placement of impervious surface rooftops, roads, and driveways over pervious soils for the most part.

A hydrologic study, which addresses stormwater management for the proposed subdivision was not available on the review day. In order to clearly understand the impacts of post-development runoff, the applicant should be required to develop a detailed stormwater management plan which includes pre- and post-development runoff conditions. Connecticut's Guidelines for Erosion and Sediment Control should be closely followed with regard to stormwater management on the site. The final report and analysis submitted for review by the town shall consist of a narrative, summary table and supporting calculations.

Present plans indicate that stormwater arising from new roads and some driveways will be artificially collected in catch basins and piped to various outlet points near streamcourses, ponds, and/or wetland areas. It is not known if roof leaders, footing drains or curtain drains will be tied into the stormwater drainage system. Because these waters would be clean for the most part and because the permeable soils covering most of the site have the ability to absorb the water collected mentioned in the preceding sentence, every effort should be made to encourage infiltration to groundwater on the site. Since road runoff can be a source of pollutants e.g. road sand, hydrocarbons, etc., final discharge points which must be approved by the town should not be discharged directly to watercourses, ponds or wetlands on the site. The stormwater management system should consider reducing runoff by maximizing travel times by using grass or rock-lined channels in lieu of stormwater sewers.

Another concern with increased runoff is the potential for erosion and siltation problems to arise. In any well run activity of this type, containment and filtration of the disturbed water is necessary to avoid environmental damage and complaints from neighbors. The Connecticut Soil Erosion and Sediment Control Act (P.A. No. 83-388) requires that a thorough erosion sediment control plan be developed and enforced by the town. Every effort should be made to protect Savin Lake, North Pond, South Pond, wetlands and streamcourses on the site from unwanted sediments.

The proposed subdivision calls for three wetland road crossings; one along Deer Run on the east side of Savin Lake between Lots 3 and 21, and two along Farm Lake Drive on the west side of Savin near Lots 66 and 67. Farm Lake Drive is aligned with an existing driveway/road that serves an existing dwelling on Lot 62. As a result, two of the proposed wetland road crossings will occur in areas of previous wetland disturbances.

All wetland road crossings will require a permit and ultimate approval by the Lebanon Inland Wetlands Commission. In reviewing a proposal, the Commission needs to determine the impact that the proposed activity will have on the wetlands. If the Commission determines that the wetland is serving an important hydrological or ecological function and that the impact of the proposed activity will be significant, they may deny the activity altogether, or at least require measures that would minimize the impacts. The following information should be supplied to Commission members on the site plan for each wetland driveway crossing: (1) amount of fill to be placed on regulated soil; (2) the extent of fill lines; (3) type of fill material to be used; and (4) the texture of the wetland soils and whether or note they will need to be removed and replaced. This information will help Commission members greatly in their decision making process.

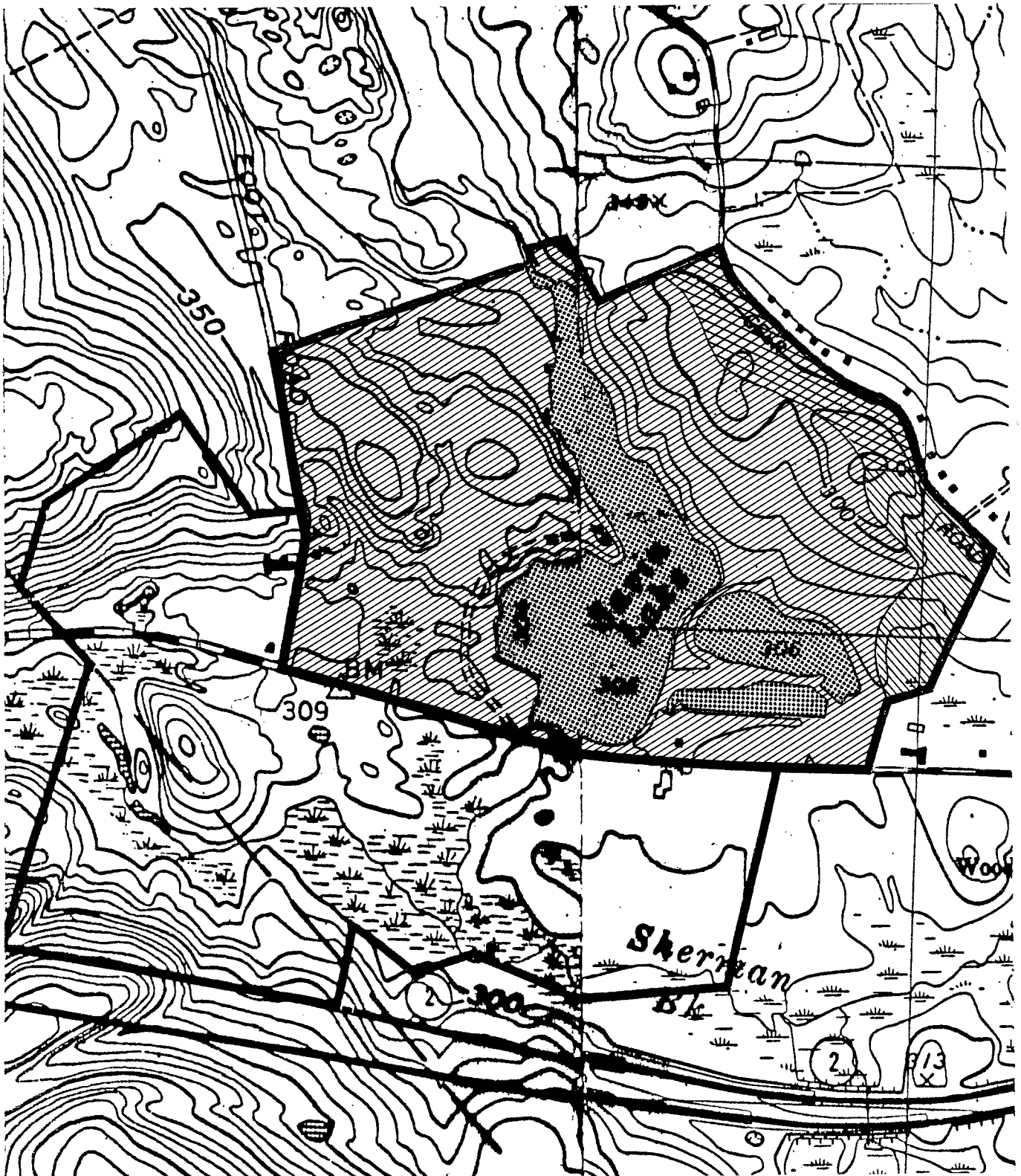
Wetland road crossings are feasible, provided they are properly engineered. Provisions should be made for removing unstable material beneath the roadbed, backfilling with a permeable road base fill material and installing properly sized culverts as necessary. When crossing any wetland, the roads should be at least 1.5 feet and preferable 2 feet above the surface elevation of wetlands. This will allow for better drainage and will decrease the frost heaving potential of the roads. Provisions should include an effective erosion and sediment control plan. If wetland crossings are permitted, every effort should be made to restrict the crossing activity to the dry time of year, when water tables are low. This should minimize the chance for erosion and sedimentation problems.

A storm sewer pipe is proposed to outlet to wetlands between Lots 2 and 3. Terminating the pipe about 40 feet from the edge of Deer Run Road would eliminate a sizeable wetland disturbance while maintaining a setback of +20 feet from the wetlands.

SITE WATERSHED BOUNDARY MAP

Scale 1" = 1000'

Portion of site that drains to Bartlett Brook drainage area
Portion of site that drains to an unnamed Yantic River tributary
Portion of site that drains to Goshen Brook



7. LAKE MANAGEMENT

The property included in the proposed Lake Farms Subdivision holds three surface waterbodies, Savin Lake and two unnamed man made ponds (North and South Ponds). Reportedly these ponds are the result of excavation activities which removed material below the water table.

Savin Lake is a 56 acre impoundment of Bartlett Brook. The watershed of Savin Lake includes the above section of Bartlett Brook and the entire Exeter Brook watershed. Savin lake is privately owned and therefore little water quality data is available in DEP - Water Compliance files.

Currently the water quality classification of the lake is B/A. This indicates that the waterbody has been impaired by historical contamination, but DEP's goal is "A". The classification of "A" means that the waterbody is designated for fish and wildlife habitat and recreation use. All water quality management decisions are based on allowable uses for class "A" waterbodies. Therefore, the lake and its tributaries are not suitable for discharges of treated wastewater. The "B" classification is the result of landfill leachate and manure storage within the Exeter Brook watershed. The classification of "B" does not prevent Savin Lake from being used for swimming, fishing, and other forms of recreation.

The lake has a watershed area to lake surface area ratio of 167 to 1 (9344 acre watershed, 56 acre lake surface area). This indicates a high potential for natural fertilization of the lake from water draining through the watershed. Along with the fertilization of the lake from the watershed, the lake receives nutrients from the Canada geese which frequent the lake. DEP file information reports that the lake is home for about 100 birds and around 2000 migrant birds visit the lake each year. The extent of nutrient loading is difficult to ascertain without a complete nutrient budget of the entire lake. However, it is apparent that with these two sources of nutrients, Savin Lake is a very biologically productive ecosystem.

The proposed Lake Farm subdivision comprises approximately 3.3% of the Savin Lake drainage basin. A development that changes land use from wooded to residential is considered unfavorable when water quality is an issue. Septic systems, fertilizers, and other nutrient sources from residential areas increase phosphorus loading which augments plant productivity (eutrophication). Additionally, runoff from stormwater sewers carries sand, silt, salt, and oil into a waterbody resulting in the polluting for many ponds. The extent of degradation can be controlled by proper planning and maintenance of the subdivision.

A benefit which will be derived from this change in land use is converting the dairy farm on Foote Road to housing. This particular change in land use will eliminate the current agricultural operation which is adding nutrients to the lake.

The plans provided to the Team are lacking in information pertaining to stormwater structures, maintenance, and flows. In addition to the drawings which were provided, a stormwater management plan which outlines and explains the flow volume and treatment systems for stormwater should have been included. A stormwater management plan is usually broken down by individual watersheds of each drainage system. The stormwater management plan should be in a format which can be clearly understood by commission members. If commission members feel they do not have the expertise to evaluate the stormwater management plan, professional guidance should be sought from the town engineer, New London County Soil Conservation District, or a consulting engineer with experience in this area. The cost of this service will be justified if it will prevent a costly lake restoration program.

Review of the information which was provided indicates that the existing ponds to the east will receive the majority of the stormwater. This will increase the overall flow of these ponds and may produce a flooding problem. The plan indicates a 24 inch reinforced concrete pipe will be installed to connect this pond to Savin Lake. This will introduce the water quality problems of Savin Lake into the smaller existing ponds. Therefore, the feasibility of draining all the stormwater directly into Savin Lake should be studied. If the stormwater can be routed to Savin Lake, the water quality of the smaller ponds will not be compromised. This may allow the home owners association to use the smaller existing ponds for bathing.

The approval process for the stormwater plan should also review all points of stormwater discharge. The plan proposes to use a number of natural wetlands as discharge points. This will benefit water quality, but may harm the wetlands by increasing flows and depositing sediments. Therefore, there should be a clear understanding of the impacts which could occur within the wetlands before approval is granted.

A stormwater drainage system should be developed with consideration of physical suitability, peak discharges, and targeted pollutants to be removed. Physical restrictions include topography, water table depth, depth to bedrock, proximity to foundations, space consumption, land use, sediment input, and

thermal impacts. Peak discharge is calculated by the amount of precipitation during a storm with a statistical occurrence interval of a given number of years. This is then calculated for the area which will receive the precipitation and structures should be designed accordingly. Pollutant removal should be based on the waterbody which is receiving the stormwater, in this case Savin Lake. Pollutants that impair lake water quality include phosphorus, nitrogen, trash, debris, and sediments.

Methods of treating stormwater include wet ponds, infiltration trenches, infiltration basins, porous pavement, grass swales, and wetlands. Once the water leaves the treatment system, a non-erosive drainage system should be used. This may be a riprap channel, underground pipe, or grass swale. Each system is referred to as a best management practice or BMP when it is designed and maintained correctly.

BMPs may also include various types of catch basins. If a catch basin is properly placed and maintained it will enhance the effectiveness of the previously described treatment systems. Catch basins can have sumps which allow solids to settle and skimming mechanism to remove road oil. The Lake Farms Subdivision proposes to use sump catch basins as indicated on the subdivision plans. The need to upgrade these catch basins further should be addressed by commission members.

Other areas of concern are impervious surfaces. Driveways should be constructed at a grade that will allow the use of gravel instead of pavement. This will decrease the stormwater runoff from impervious surfaces. Reducing the impervious surfaces will decrease the volume of water draining through surface drainage systems and thus decrease the potential of soil erosion.

More information on stormwater management can be found in **Controlling Urban Runoff: A Practical Manual For Planning and Designing Urban BMPs.** Metropolitan Washington Council of Governments.

The Lebanon Inland Wetlands Commission should maintain close contact with the development during construction phases. If soil erosion problems do occur, corrective measures should be taken immediately. Soil erosion from poorly managed construction activities have filled in sections of many lakes. Although construction is short in duration, disturbed and exposed soils are highly susceptible to erosion. These filled areas become suitable habitat for aquatic weeds by increasing shallow areas and providing a nutrient rich substrate.

Turbidity levels will increase if particulate size is sufficiently small. Small particles or colloids do not settle as quickly as larger particles such as sand. These fine particulates will remain suspended in the water column resulting in higher than background turbidity headings. This may be detrimental to aquatic organism such as fish and zooplankton.

In addition to regulatory enforcement, the Kelly Development Corporation should consider establishing restrictions which must be adopted by the home owners association. These restrictions should be designed to protect the water resources of the property through cooperative land and lake management.

The home owners association may wish to develop a sub-committee whose specific responsibilities are to manage the lake. This committee could seek the assistance of the Department of Environmental Protection, Lake Management Section for technical assistance.

The following are suggested restrictions which will assure protection and enhance recreational use of the lake.

- Natural color houses such as shades of brown, blue, and green should be considered. This will give Savin Lake the appearance of being undeveloped.

- Septic systems should be pumped once every two years.

- Cleared land usually adds more phosphorus to a waterbody than land covered by natural vegetation. Therefore, a restriction controlling the percentage a lot can be cleared would be beneficial to the water quality of the lake.

- Waste disposal procedures should be outlined so that lawn or garden debris is not discarded near the lake or its tributaries.

- Development setbacks or buffers zones should be included. A recommended buffer zone of 150 feet will help prevent soil and phosphorus from reaching the lake. Within this buffer zone no natural vegetation or leaf litter should be disturbed. These buffer zones should include the lake and its tributaries.

- If the buffer zone recommendation is considered too restrictive then a viewing corridor of 25 - 50 feet wide could be allowed. Although this would not be

as effective as a complete buffer strip, it would allow property owners access to the lake.

- Fertilization of lawns within the Lake Farm Subdivision should be discouraged. If fertilization of lawns is permitted soil analysis of each lawn should be conducted to determine the ratio of phosphorus to nitrogen to potassium needed given the intended use.

- As mentioned previously, the use of porous material for driveway construction should be promoted. This will reduce the amount of impervious surface within the watershed which reduces surface runoff. Consideration should also be given to a restriction of driveway size which would help accomplish the same objective.

- Any proposal to alter the shoreline or the lake bottom should be brought before the Lebanon Inland Wetlands Commission. These activities may be regulated by the commission and residents should be aware of this.

Restrictive agreements can be a valuable tool to manage development in lake watersheds. With restriction similar to the ones outlined, property owners will enjoy increased property values due to the proper management of the lakes watershed.

Recently the Town of Lebanon hired an engineering firm to develop lake area zoning recommendations. This report has many assumptions which may be misunderstood by non-technical people. Essentially the model is simplified to be applicable to all lake situations. Unfortunately all lakes function differently and therefore this model should not be used as an example of proposed lake zoning. If the Town of Lebanon would like technical assistance on this matter, a representative from the town should contact DEP - Water Compliance at 566-6691.

When a community is involved in lake management a number of legal and technical issues can develop which will affect all members using the lake. The current plan does not address ownership of the lake or its bottom. If possible, arrangements should be made to allow the association to purchase the flowage rights and the bottom of the lake. This will allow less complication when analyzing lake management decisions.

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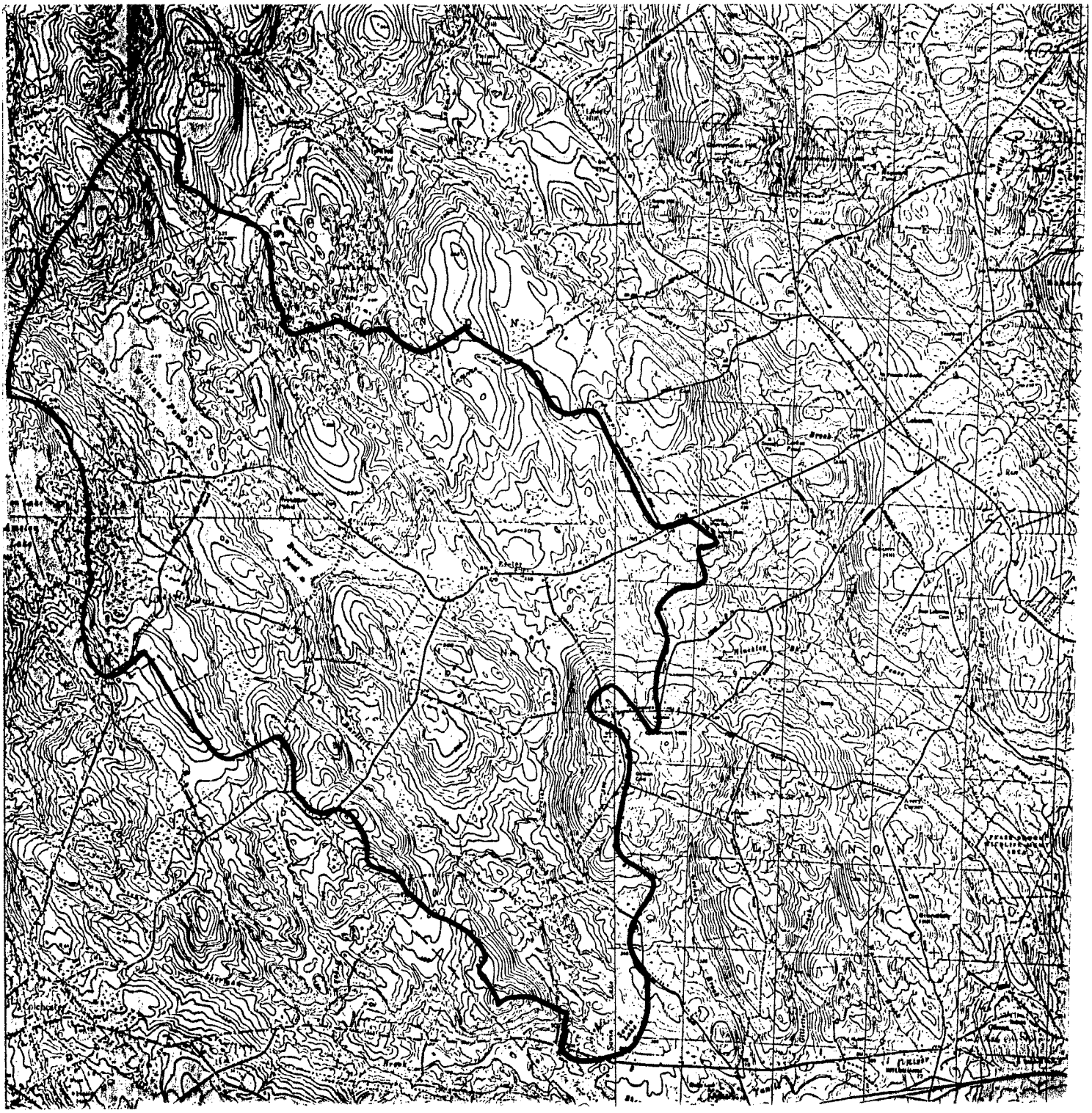
SAVIN LAKE DRAINAGE BASIN MAP

No Scale



8. WATER SUPPLY

The two principal aquifers on the Savin Property include the crystalline, metamorphic bedrock and the sand and gravel.

As mentioned earlier in the report, preliminary ground water exploration in the unconsolidated deposits has been conducted on the Savin Property by the applicant. Test wells drilled thus far indicate that large scale development of ground water on the site may not be favorable. Nevertheless, it seems likely that the underlying crystalline metamorphic rock would be the most favorable aquifer to serve the proposed subdivision. This would be accomplished by drilling a six inch diameter well, properly cased with steel pipe into the underlying bedrock and completed as an open bore hole in the crystalline metamorphic rock.

Bedrock transmits water by means of an interconnected system of fractures or seams. The amount and natural quality of water withdrawn from a bedrock well depends upon the numbers of water bearing fractures or seams it intersects and on the mineralogy of the rock formation through which the fractures pass.

The schist and gneisses underlying the Savin Property are usually capable of yielding three gallons per minute or more without penetrating much more than 300 feet of bedrock. Based on a survey of bedrock wells completed in the lower Thames River basin, approximately 90% of the wells could supply three gallons per minute (GPM) or 4,320 gallons per day.

The natural quality of the water supply should be good. However, there is a chance the underlying bedrock, particularly the Brimfield Schist may be mineralized with iron, iron sulfide and/or manganese. If the concentrations of these minerals are high, the well water may need to be treated with a suitable method of filtration. Water high in iron, iron sulfides and/or manganese may impart a metallic taste to the water, have a rotten egg odor, be rusty colored, and may stain fixtures or white laundry red (iron) or black (Manganese).

Groundwater in the area is classified by the Department of Environmental Protection (DEP) as GA, which means that it is suitable for private drinking water supplies without treatment.

Using some basic assumptions, the Team's geologist evaluated available recharge and predicted water use of the subdivision to estimate the potential impact on the bedrock aquifer. These calculations assume that the underlying bedrock is fractured and capable of transmitting water to wells. Specifically, recharge calculations show that the amount of water available to the site each day

is about 176,000 gallons. This is based on groundwater recharge amounts of 8 inches per year for an upland, mostly till-covered site and 295.5 pervious acres (less +10 acres for impervious surfaces such as roads and rooftops) allowing for infiltration. (Since much of the site is covered by permeable sand and gravel, recharge rates would be expected to be much higher, but 8 inches per year was used for conservative approach.) Predicted water use at the site is estimated at 23,100 gallons per day. This is based on a 75 gallons per day per capita water usage. An assumption of 4 persons per single family residence (77 lots) was used.

Based on the above figures, it is estimated that the planned subdivision will receive about 7.5 times the recharge as is necessary to balance water demand. In addition, induced recharge by properly renovated septic system effluent (about 95%) plays an important role in the groundwater budget. The latter stresses the need for properly designed and installed septic systems.

It must be kept in mind that the computations in the preceding paragraphs assumes that the underlying bedrock is fractured and is capable of transmitting usable amounts of water to the proposed wells. This cannot be determined exactly without first drilling the well.

Since each lot is 2 acres or more in size, a spacing distance of 200 feet or more should be easily accomplished. This separating distance would provide about one acre of direct discharge to each well. This will help to minimize the chances of mutual interference between pumping wells.

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

9. SEWAGE DISPOSAL

As mentioned earlier, single family homes in the proposed subdivision would be served by individual septic systems. Although incomplete, exploration for subsurface sewage disposal, consisting of at least one deep test hole per lot (some lots have two), has been performed for the purpose of subdivision approval. Further testing (minimum of two test holes per lot), which includes percolation tests will be required on each lot.

Based on soil mapping data and deep test hole information supplied by the applicant, the stratified drift and till soils covering the site appear favorable for the installation of on-site sewage disposal systems. However, there is a concern that sandy/gravelly soils, which are known for having rapid seepage, may not have the ability to provide good filtration and renovation of septic effluent or other types of pollutants. Natural dilution by infiltrating precipitation in the permeable sands and gravels should help.

If highly permeable soils (percolation rates faster than 1 inch per minute) characterize certain lots in the subdivision, the installation of sewage disposal systems in these soils may require special design considerations so that they do not pollute wells and ground and surface waters. **(NOTE: Percolation tests have not been conducted to date - 6/20/89.)** For example, separating distances between septic systems and well and/or surface water and the ground water table may need to be increased or the design of leaching systems modified to reduce possible pollution, e.g. limit the number of bedrooms to four. Septic systems installed in areas characterized by "hardpan" will probably require special engineered designs. Also footing drains should be considered for homes in the areas, which will hopefully help to protect basements from getting wet. Development of the subdivision should proceed within the limits of acceptable density as to the capacity of the soil.

Present plans indicate that of the 30 lots that have frontage on Savin Lake or North Lake, leaching system areas (primary and/or reserve areas) for 90% of the lots are 100 feet or greater from the high water mark of the surface water bodies. The proposed leaching system area for three lots have setback distances from the surface water bodies ranging between 80-90 feet. Maintaining these setbacks will help protect Savin Lake and North Pond from partially treated wastewater. The State Public Health Code requires a 100 foot and 50 foot setback from a public water

supply reservoir and any open water course or body, respectively. Neither Savin Lake nor North Pond are public water supply reservoirs.

Before subdivision approval, the applicant's engineering firm must first demonstrate 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's Public Health Code.

The process should be a coordinated effort between the design engineer and the town's sanitarian. The presence of a shallow mottling zone or water table in several deep tests indicate that some 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 well water supply) on these lots 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 town sanitarian is assured of the feasibility of each lot meeting all of the State Health Code Requirements. In order to protect the natural attributes and environmental health of the water bodies on the site, consideration should be given to a conservation easement around their perimeter. The easement would limit the amount of vegetation cleared in the area, building construction, lawn area, fertilizers, septic systems, etc., thereby protecting water quality entering the Lake and preserving views.

10. THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the study area have been reviewed. According to the information, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Special Concern" occurring at the site in question. However, the wetland south of Savin Lake, referred to as the Sherman Brook Marshes, has been identified by DEP Fisheries Unit as a significant finfish habitat and essential in maintaining low-flow stability in the Yantic River. This proposal should be forwarded to the Fisheries Unit for their review to determine the potential impact of development. (See **FISH RESOURCES** section)

Natural Diversity Data Base information includes all information regarding critical biologic resources available at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultation with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

11. VEGETATION DESCRIPTION

Section A

Area #A-1 - this is a gently sloping ridge topped with a slow growing oak stand, typically most of the oak is scarlet with some white and black oaks. There are a few red maple as well as some pignut hickory. The understory is mostly maple leaf and other Viburnum, some azalea and seedlings of the over story trees. Although the soil appears droughty and probably shallow to bedrock, little blow down was evidenced. Tree health was good for this site.

Area #A-2 - this was a rather steep, rocky slope with some bedrock exposed. The over story trees were black oak with some scarlet and white oak, pignut hickory, black birch and red maple. The understory was mostly maple leaf Viburnum, greenbriar and black birch. There was some blow-down evident and some mortality of the larger black oak especially in pockets. There was some seasonal water entrapment between the rock outcrops.

Area #A-3 - Mid and lower slopes. These areas had good stands of mixed hardwood dominated by red oak with some white oaks and scarlet oaks. Shagbark and mockernut hickory, black birch and red maple. Some of the area is quite open and in other areas there is a fairly dense understory. Understory species include azalea, Viburnum, witchhazel, blackberries and most of the overstory species as seedling/saplings. There is some sugar maples in both the overstory and understory at the bottom of the slope adjacent to the pasture land. There are some holes where trees were blown over in the 1985 hurricane. Oak mortality is fairly general throughout the area although, there are pockets of dead standing trees. For the summer and fall of 1989 many of these trees are still salvageable for lumber. If this area is to be developed in the near future lt would be advisable to have this area marked by a professional forester for a thinning and then logged. This will remove the hazardous trees and if marked properly will not be detrimental to future development values.

Area #A-4 - Open field - presently being used for pasture. Only tree cover is a fringe of brush and mixed hardwoods around the perimeter.

Section B

Area #B-1 - Open field, presently being used for pasture. The only woody plant cover is some speckled Alder along the intermittent stream course.

Area #B-2 - Mostly open fields, there is brush and trees especially along the stone walls and hedge rows. The trees are usually scarlet or white oaks with a few hickories and red maples. There was one poorly drained area around a small farm pond where some swamp white oaks were noted. The hedge rows are usually maples, hickory or black cherry. There is also usually a good ground cover of poison ivy or woodbine covering the walls and lower tree boles.

Area #B-3 - Red Maple low lands this is the swampy area at the upper end of Savln Lake. Some of the area was pasture and some of the area was too wet to ever be used for permanent pasture. Most of the trees are small pole size red maples with a few oak and black gum around the drier edges. There is a heavy understory of sweet pepperbush, splce bush, greenbriar and in what used to be open area, multiflora rose.

Area #B-4 - this is a small ridge of dryer soils that supports a stand of black - scarlet oaks and white oak. There is minimum undergrowth except where lt joins the bottom land and there the undergrowth is heavy as described for area 8-3.

Section C

Area C-l - These are open lots of either corn or hay. The area around the small ponds were artificially leveled during the process of the ground excavation.

Area C-2 - this is the woody fringe along the pond that has grown in an area that is too wet to be managed for crop land. Red maple is the dominant tree species with some black gum and swamp white oaks. In the areas with little or no tree cover there is a tangle of silky dogwood, arrowood and Nannyberry, speckled alder and woodbine. In areas where the trees dominate these species are replaced by spicebush and sweet pepperbush.

Area C-3 - Upper slope, polesized oak stand. Most of the oaks are black or scarlet with some white oak, red maple and pignut hickory. The stand is in a good growing condition for the site but there is some tree mortality due to the gypsy moth defoliation complex. The mortality is not extensive and most of the dead trees are small enough that they won't pose a threat to development. The

understory is fairly light in most areas. Species include maple leaf Viburnum, oak and birch reproduction and some blackberry.

Area C-4 - this is the main part of the woodlot. The overstory trees include black, red and white oaks, mochernut and shagbark hickories, red maple and black birch. The understory includes seedling of all of the above plus viburnums, spicebush, highbush blueberries and blackberries in some of the openings.

Most of this areas was thinned some ten to fifteen years ago so stand density is pretty good.

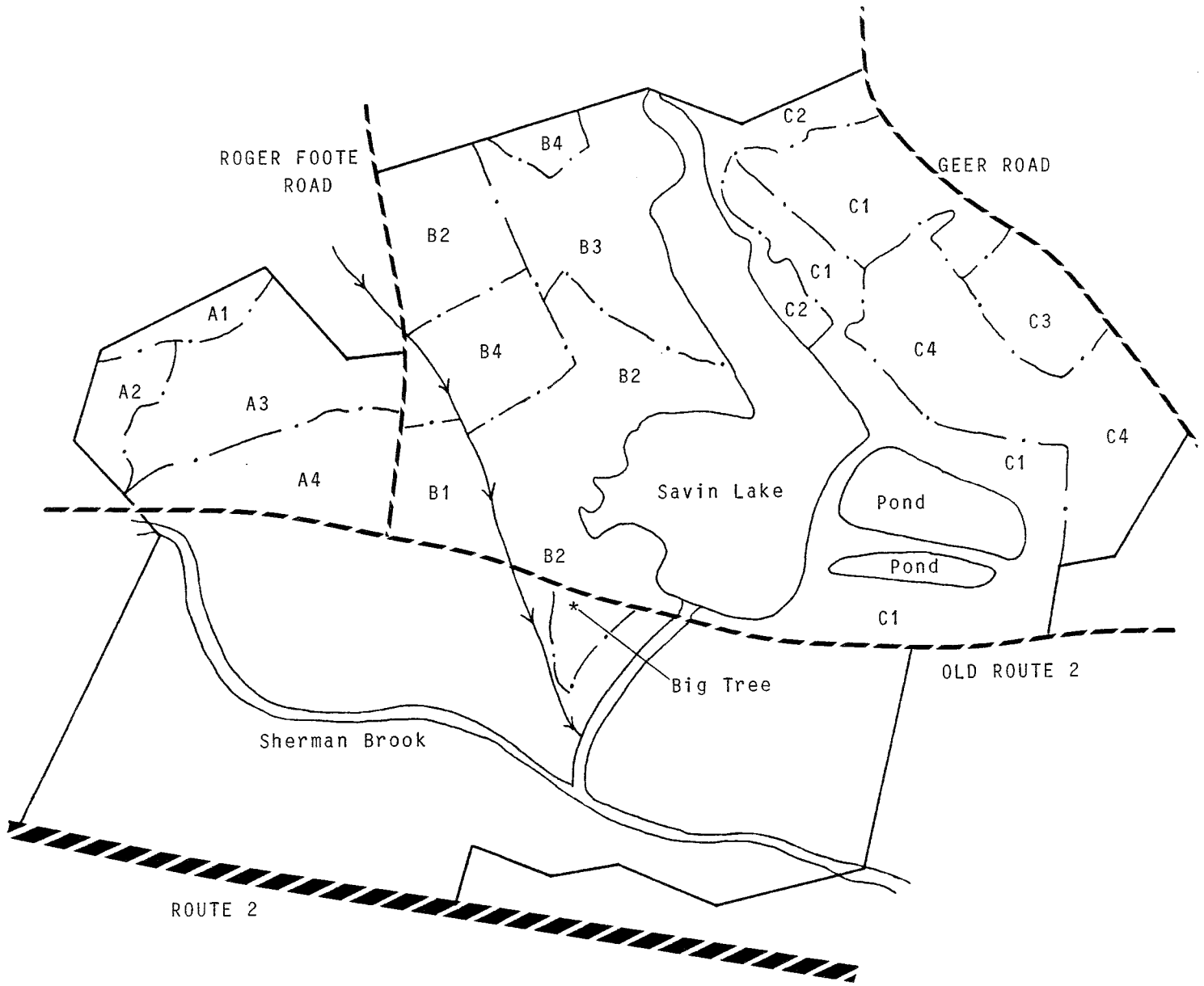
Not much blow-down was noted so the stand is reasonably wind firm. There was one area in the middle of the lot that appeared to have a seasonal high water table which would contribute to shallow roots and therefore this area would be more vulnerable. The most notable problem in this area is the significant number of dead and dying trees. These will be a real detriment to development and will have to be removed before or during the development phase. The most desirable way to handle this situation would be to have a light timbrt sale in the area in the near future. If this is done in conjunction with a supervised harvest in Section A' a liability can be turned into an asset and a viable wood product can be put to useful purpose rather than wasting lt as decaying material on the ground.

There are two major factors to be considered in developing the wooded portions of this property. The first is the hazard tree removal which is covered in the harvesting suggestions. The second is the danger of wind-throw especially in Section A-3 and
C-4 where the trees are larger and there are local high water levels that only show up on the maps as Merrimac or Sutton soils.

One item of note is the large white oak that stands in the small field on the south side of Old Route 2 just west of the stream that flows from Savln Lake. Although this is not a record class tree lt is well up in the record point system. It is over 6 feet in diameter.

VEGETATION MAP

Scale 1" = 1000'



12. WILDLIFE RESOURCES

Habitat Type Descriptions

The habitat types found on this property include tilled field, old field, mixed hardwood forest, wooded and shrub swamp, marsh, wet meadow, open water and riparian zones. This mosaic of habitat types provides for the needs of a diversified wildlife population.

Old Field: Open field habitat is very beneficial to wildlife. Vegetation provides food as well as structural diversity, creating cover for a great array of wildlife ranging from mice and shrews to deer. Fields also attract numerous insects, a major food item of various wildlife species such as birds and small mammals including bats. Another important feature of fields is the edge created where fields meet forest. This valuable zone for food and cover consists of dense berries, shrubs and grasses.

Agricultural fields and pastures provide many of the same benefits. Although vegetation is not as diverse, these fields provide a food source of insects and the hedgerows dividing the fields provide additional edge habitat. The cedars and junipers dispersed throughout the fields provide valuable perching sites and cover.

Wildlife utilizing old field habitat include deer, woodcock, woodchuck, fox, raccoon, skunk, mourning dove, blue and goldenwinged warblers, robins, kestrels, red-tailed hawks, eastern screech owls and cottontail rabbits.

Mixed Hardwood Forest: This habitat consists of a variety of hardwood species including red maple, beech, red oak, elm, hickory, white oak and scattered white pine and cedar. Understory vegetation includes witchhazel, elderberry, multiflora rose, grape, blackberry and hardwood regeneration.

Wildlife frequenting such habitat types include deer, fox, raccoon, gray squirrel, woodpeckers (pileated, hairy and downy), ovenbirds, scarlet tanangers, black-throated blue and green warblers, barred owls, broad-winged hawks and various non-game species such as porcupines, shrews, voles and snakes.

Wetland/Riparian Zone: This habitat type consists of one large and two smaller open water bodies, wooded and shrub swamp, marsh and streams. Associated vegetation includes red maple, birch, alder, cattails, dogwood, jewel-weed, spicebush, sweet pepper bush, skunk cabbage, false helbore, ferns,

duckweed and various grasses and sedges.

Wildlife using such sites include deer, fox, raccoon, skunk, muskrat, mink, swallows, red-wings blackbirds, grackles, kingbirds, cedar waxwings, hooded and wilson's warblers, titmice, woodpeckers, wood ducks and numerous amphibians and reptiles including water and garter snakes, salamanders, newts and spotted and painted turtles. In addition the open water bodies attract a variety of waterfowl including Canada geese and mallard and black ducks.

Effects of Proposed Development on Wildlife

As the demand for land increases and land is developed, there will be an immediate and lasting negative impact on wildlife. The primary impact is the direct loss of habitat due to buildings, roads, driveways, parking areas, walkways, recreational facilities and other structures. Loss of habitat also occurs where cover is cleared for lawns and landscaping. Additional impact occurs with increased human presence, vehicular traffic and the number of free roaming cats and dogs.

The diversified habitats at this site provide for the needs of a wide variety of wildlife species that inhabit the general area. Development of this site will result in fragmentation and elimination of habitat types which will in turn reduce species diversity and richness. Species that are sensitive to human disturbance will be forced to emigrate to adjacent habitat, resulting in competition with species already occupying the area and a decline in species richness. Many species will also be forced to inhabit less desirable habitat, decreasing their ability to survive. Species more tolerant of humans such as starlings, robins, house sparrows and raccoons may increase in number and become a nuisance.

Wetland/Riparian Zones

Wetlands support a high diversity of wildlife due to the complexity of the vegetative structure, high productivity and abundant food supply which allow for a high carrying capacity (Brown et. al. 1978). There are many species that require access to streams or water body margins for survival even though they may spend much of their time in other habitats (Milligan and Raedeke 1986). Part of the food supply for many vertebrates is the high abundance and diversity of insect populations that are typical of wetland ecosystems (Brown et al. 1978).

Wetlands presently provide important habitat for a variety of wildlife species

and function as areas for absorption of natural runoff. Any planned diversion of stormwater into wetlands will increase water flow, sedimentation and pollution. This will alter the present ecological structure of the wetland and reduce species diversity. Even though stormwater retention and filtration plans may alleviate some of these problems, the long term effects of stormwater diversion into wetlands tend to be negative. Retention and filtration systems may still allow fine silt and pollutants to enter.

Not only are wetlands important to wildlife, they are also important to humans. Various functions of wetlands include flood control, ecological integrity, fish and wildlife habitat, nutrient and sedimentation trappings, educational potential, visual/esthetic quality, recreation, groundwater use potential and botanical sites. There are usually inherent limitations in developing wetlands due to poorly drained and unstable soil types.

Vegetation removal in wetlands may have severe impacts on wildlife, especially reptiles and amphibians. One or several of the cover, food, breeding habitat, and hibernation areas may be altered. Species dependent on specialized habitat are eliminated and more adaptable species are reduced in numbers (Campbell 1973). Barriers, such as roads, to seasonal movement and population dispersal are also serious threats (Campbell 1973). To minimize impact maintain a 100 foot wide buffer zone of vegetation around wetland/riparian areas. This buffer zone will help filter and trap silt and sediments, provide excellent wildlife cover and be an aesthetic and educational asset to the community.

Upland Wooded Areas/Open Spaces:

Fragmentation of habitat may lead to a decline in species diversity and richness. Sensitive, interior species that require large tracts of undisturbed forest, such as wild turkey, ruffed grouse, veeries, ovenbirds and scarlet tanangers, will no longer occupy the area.

Set aside open space areas contiguous with buffer zones and that encompass other areas of vegetation so as not to create small isolated islands.

Mitigation of Disturbances

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

1. Make use of natural landscaping techniques (avoid and/or minimize lawns and chemical applications) to lessen acreage of lost habitat and possible wetland contamination.

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

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

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

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

b. Leave 3-5 snag/den trees per acre as they are used by many birds and mammals for nesting, roosting and feeding.

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

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

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

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

5. Implementation of backyard wildlife habitat management practices should be encouraged. Such activities involve providing food, water, cover and nesting areas.

On small acreages with many buildings, landscaping can do a great deal to provide habitat and make an area attractive to wildlife. First, leave as many trees as possible around the buildings. This will not only benefit wildlife by providing food, cover and nesting sites (i.e. especially for songbirds), but will also be more aesthetically pleasing for the residents of the development. Plant trees and shrubs which are useful to wildlife and landscaping. Large expanses of lawn

with no trees or shrubs present should be discouraged.

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

6. Although Canada geese are usually aesthetically pleasing they can become a serious nuisance problem. If problems exist or develop consider these suggestions:

a. Create undesirable edge habitat around ponds (i.e. abrupt drop off, not grass zone such as gravel or ships).

b. Fencing of ponds.

c. Educate local residents on nuisance problems to discourage feeding.

d. Do not crate and/or maintain islands within ponds, Often these serve as nesting sites.

e. Plant vegetation other than grass which will be aesthetically and environmentally acceptable (i.e. shrubs, pachysandra, honeysuckle, ground juniper, Virginia creeper).

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13. FISH RESOURCES

Site Description

Proposed Development Location - The proposed subdivision will be constructed on each side of Savin Lake, the primary surface hydrological feature of fisheries concern in the immediate area. A total of 77 building lots, minimum size 60,000 square feet, are proposed. All residential lots will be served by on-site water suppl;y wells and sewage disposal. Surface drainage from the adjacent sloping lands that characterize this property will ultimately drain into the lake and other aquatic habitats located on this property. Consequently, development at this location will have to be carefully planned to avert man-induced water pollution inputs to the Savin Lake, North and South Ponds and surrounding streams which comprise Bartlett and Sherman Brooks.

Savin Lake - Savin Lake, approximately 56 acres in size, is an impoundment of Bartlett Brook. The lake's watershed is characterized by agricultural and forest lands. No detailed limnological data exists for this water body. Surface waters of the lake are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses. The lake appears to be shallow with a maximum depth of approximately 15 feet. The littoral zone which is the shallow interface between land and open water of lakes appears to contain minimal amounts of rooted aquatic vegetation. Bottom type is a sand/gravel mixture.

North and South Ponds - Both of these ponds were created by gravel excavation. Maximum water depth was estimated to be approximately 20 feet. Very minimal amounts of rooted aquatic vegetation was observed in littoral zones. Water quality was excellent in North Pond, while algae blooms were evident in South Pond. Dominant shoreline vegetation along the ponds is comprised of speckled alder, cottonwood, and willow.

Sherman and Bartlett Brooks - Both of these streams in the southern portion of the property are slow moving, low gradient watercourses which eventually empty into the Yantic River. Fish habitat is mainly in the form of pools which serve as resting and hiding locations for resident fishes. Streamside (riparian) zones are comprised of marshy wetland vegetation. Surface waters of

Bartlett and Sherman Brooks are both classified as "B/A", except for the stretch of Sherman Brook north of its confluence with Bartlett Brook which is classified as "Class A" water.

Fish Population

Savin Lake's fish population has not been sampled, but the lake would be expected to support a variety of warmwater fish species including largemouth bass, chain pickerel, calico bass, yellow perch, brown bullhead, bluegill sunfish, pumpkinseed sunfish and golden shiner. Both North and South ponds likely support a warmwater fish population complex similar in nature to Savin Lake. In the past, these ponds had been stocked with trout species.

Bartlett and Sherman Brook likely support populations of native brook trout, blacknose dace, white sucker, fallfish and possibly warmwater species that have emigrated from Savin Lake. Additionally, Bartlett Brook is stocked by Bureau of Fisheries with over 300 yearling (6-8") brook trout.

Impacts

The following impacts of the subdivision on Savin Lake and watercourse can be expected if proper mitigation measures are not implemented:

1. Construction site soil erosion and sedimentation of the lake and watercourses through increased runoff from unvegetated areas : devegetation of sloped land that drains into the lake presents a situation conducive to the development of serious soil erosion problems. Erosion and sedimentation due to residential housing construction has long been regarded as a major stimulus in the lake eutrophication or aging process. Lake eutrophication or aging can be accelerated by excessive erosion and sedimentation and seriously impact resident fishes, water quality, and overall lake recreational value. In particular, excessive siltation of Savin Lake will:

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

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

* Reduce aquatic insect production - sediment-free water is also required for successful aquatic insect egg respiration and hatching. Aquatic insects are the primary food source of young and adult fishes. Reduced insect levels will adversely affect fish growth during their early growth period. Ultimately, this will lead to reduced growth rates and negatively impact fish survival.

* Reduce water depth within the lake - this occurrence will result in a further reduction of usable fish habitat.

* Contribute to the depletion of oxygen (CTDEP 1989) - organic matter associated with soil particles is decomposed by microorganisms contributing to the depletion of oxygen in waters overlying sediments.

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

* Encourage the growth and survival of rooted aquatic plants along the lake shoreline and precipitate dense "algae blooms" (CTDEP 1989) - eroded soils contain plant nutrients such as nitrates and phosphates. Although these plants require nutrients for growth, most lakes and streams contain very limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into aquatic habitats resulting in accelerated plant growth. Extensive algae blooms may turn the water a pea-soup or soupy brown color. At present, algae blooms are quite common within Savin Lake, conversely, the lake's shoreline contains minimal amounts of rooted aquatic vegetation. Fish kills due to oxygen depletion in the summer called "summerkill" may occur in lakes when algae populations die. Dead algae are rapidly decomposed by bacteria in the summer sometimes causing low oxygen levels. Unfortunately, summer lake dissolved oxygen levels are naturally at their lowest and the introduction of nutrients can only serve to make a bad situation critical.

2. Percolation of septic effluent into the lake : a failure of individual septic systems to operate properly is potentially dangerous to aquatic habitats. Nutrients and assorted chemicals that may be placed in septic systems could enter surface waters in the event of a failure or possible infiltrate groundwater, especially when water tables are seasonally close to the surface. The introduction of septic effluent could result in a major threat to fish, public health, and overall water quality conditions. Effluent will stimulate the growth of rooted nuisance aquatic weeds

along a lake shoreline and stimulate nuisance unicellular algae blooms. Septic tank leachate can rapidly accelerate the lake eutrophication or aging process.

3. Water quality and habitat degradation due to the influx of stormwater drainage from nearby residential housing : stormwaters can contain a variety of pollutants that are detrimental to aquatic organisms and their habitat. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Once introduced into the lake, stormwater runoff will accelerate the lake eutrophication process and lead to degraded water quality. Spilled petroleum based chemicals or other toxicants can precipitate partial or complete fishkills.

4. Transport of lawn fertilizers and chemicals to the lake : runoff and leaching of nutrients from fertilizers placed on lawns can stimulate nuisance aquatic weed growth and help precipitate algae blooms. The introduction of nutrients will accelerate the lake eutrophication process. Introduction of lawn chemicals may result in fish kills and water quality degradation.

Recommendations

Impacts on Savin Lake and local watercourses may be somewhat reduced by implementing the following recommendations:

1. Discourage residential development on Lot Number 52 : The proposed residence will be surrounded by wetlands. It is recommended that the lot be converted to open space.

2. Maintain at the minimum a 100 foot open space buffer zone along the wetland edge of Savin Lake, local streams and all wetlands located within the proposed development location : no construction or alteration of natural vegetative habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to aquatic 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 and aquatic habitats.

3. Install and maintain proper erosion and sedimentation controls during site construction activities : this includes such mitigative measures as silt fences and staked hay bales. Only small areas of soil should be exposed at one time and these areas should be reseeded as soon as possible (see **SOIL RESOURCE COMMENTS** section for specific recommendations). If this development is approved, the Town of Lebanon should have an appointed official that would be responsible for inspecting this development on a daily basis to ensure that contractors have complied with all stipulated mitigation devices. Past lake 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.

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, placement, and maintenance of catch basins. Stormwaters should be routed away from direct discharge into Savin Lake. Stormwaters should be only outletted into non-wetland habitat; thus, avoiding initial and direct contact with wetlands, streams, and lakes. Maintenance of catch basins is very critical. Roadway catch basins should be regularly maintained to minimize adverse impacts to lake and wetland habitats. The use of road salt to deice roads should be prohibited.

5. Properly design and locate individual septic systems (refer to SEWAGE DISPOSAL section for specific recommendations) : the addition of septic effluent to Savin Lake can lead to accelerated eutrophication. 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.

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

7. Limit liming, fertilization, and the introduction of chemicals to subdivision lawns : this will help abate the amount of additional nutrients to the lake and stream environments. Nonphosphorus lawn fertilizers are currently available from various lawn care distribution centers.

References

CTDEP (Connecticut Department of Environmental Protection) 1989. Non Point Source Pollution: An Assessment and Management Plan. CTDEP, Hartford.

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

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

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

14. PLANNING CONCERNS

Consistency with State and Regional Plans

State Plan

The State Policies Plan for the Conservation and Development of Connecticut includes parts of the Savin property in three different classifications. The lake itself and the swamps associated with the Yantic River and Sherman Brook are recommended in the plan as "Preservation" areas. These swamps make up the land between the Norwich/Colchester Turnpike (Old Route 2) and Route 2. No development is planned for this land.

Two areas, the land on the east side of Savin Lake down to the wetlands of the Yantic River and Conservation Brook and the land to the southwest of the lake, are recommended for "Conservation" areas by virtue of the fact that they were in active agricultural use in 1980 when the State plan was developed. There is still an active dairy farm to the west of the lake; this use would be eliminated by the development.

The remainder of the parcel is categorized as "Rural", suitable for single family housing units with on-site septic and water systems as proposed by the development plan.

The proposed development would be more consistent with the State Plan if it preserved public access to the lake for recreational purposes and if it did not involve the loss of active agricultural land.

Regional Plan

The Regional Growth and Preservation Guide Plan classifies the Savin property as within the "Low Density Rural" land use category which recommends two acre lot sizes for single family homes, at minimum. Cluster residential developments are recommended to preserve open space and rural character. The proposed two-acre lots are consistent with recommended policies for such land although a clustered plan preserving large amounts of open space would be preferred. The Guide Plan, however, also encourages the preservation of agricultural land and operations and suggests that opportunities to develop recreational facilities of regional significance should be exploited. The proposed Savin Lake Farms development plan would preclude public recreational use of the lake, and will cause an existing dairy farm to be replaced with homes.

Transportation Plans

The Regional Transportation Plan includes no priority highway improvement projects near the proposed Savin Lake development. The closest priority project is the upgrading of the intersection of Routes 87 and 289, several miles to the north.

The 1989 State Master Transportation Plan includes the upgrading of Route 2 between the eastern end of the Founders Bridge connecting Hartford and East Hartford and Route 169 to the east of Norwich. Improvements to the eastbound lanes between East Hartford and Marlborough are currently underway, but the construction may be expected to continue for the next decade.

The Savin Lake properly lies close to the western border of Lebanon, and the only access to Route 2 in the town is at its eastern border. Residents of the Savin Lake development would therefore be unlikely to use Route 2 through Lebanon, but would be expected to travel via Old Route 2, the Norwich Colchester Road (State Route 616) to Colchester, to commute to Hartford via Route 2, or at the Lebanon/Bozrah town line, to commute to Norwich. They therefore may be affected by the ongoing construction and would eventually benefit from the improved expressway.

Consistency with Town Zoning

The Savin Lake property includes land in the Rural Agricultural Residence (RA), Lake (L), Business (B), Light Industry (I) and Special Flood Hazard Area (SFH) zoning districts in Lebanon. The proposed 77 lot subdivision encompasses only a portion of the total property, primarily the land north of Old Route 2, west of Roger Foote Road and east of Green Road, including land in the RA, L, B and SFH districts with only a small area within the I - zone.

Single family homes are permitted on 2 acre lots in all of these zones, except the I - zone. A small portion of the rear of proposed Lots 1, 2 and 3 lie within the I - zone. Re-zoning, variances, or modification of the proposed rear lot lines may be necessary.

This subdivision plan, with lots of 2 acres or more, along with open space to be dedicated to the town and to be transferred to a home owner's association, however, is generally in compliance with the town's overall zoning scheme. A

few lots may need to be modified or the number of lots proposed reduced by one or two lots, to meet the specific dimensional requirements of the regulations.

Population Impacts

There are 77 single family homes proposed for this development. Using average multipliers for such housing, the population increase resulting from the development would be expected to approximate 256 people, assuming a blend of two, three, four, and five-bedroom homes. This represents a 4.5% increase over the town's 1988 population of 5,740 as estimated by the Department of Health Services.

Lebanon currently has 644 children in grades K-6 and 446 in grades 7-12. Again, using average multipliers for the New England Region, the town might expect 65 additional school children - 41 in grades K-6 (a 6.4% increase) and 25 in grades 7-12 (a 5.4% increase), to result from this development.

New population projections recently released by the CT Office of Policy and Management (attached) indicate that if the growth trends Lebanon has experienced between 1980 and 1987 continue, the town's population will reach 6,950 in 1990 and by the year 2000 the town's population will number 9,600, or more than twice the 1980 U.S. Census count of 4,762 in only 20 years.

Traffic Impacts

Based on the average single family dwelling unit generating an average of 10.6 vehicle trips/dwelling/day,** the 77 units in this development would be expected to generate 816 vehicle trips per day. Ultimately the number of vehicle trips actually generated will depend upon the sizes and prices of the homes constructed, the type, age, and economic class of resident families, and the number of vehicles they own. Most of this traffic would enter and leave the development to and from the Norwich/Colchester Turnpike (Old Route 2, also called Route 616). ConnDOT's 1987 average daily traffic volume (ADT) estimate was 1,400 for the segment of this road between the Colchester-Lebanon town line and the point at which it makes a right angle turn just before the Lebanon-Bozrah town line. An additional 816 trips per day would represent an increase of 58% over the above noted level, with an estimated volume/capacity ratio of .14 (provided by ConnDOT staff), this road should be able to accommodate the increase in

traffic with little difficulty. However, a review by the State Traffic Commission (STC) will be necessary. It is understood that a traffic analysis is currently be prepared for the the STC.

Coordination with ConnDOT's District II Office in Norwich is necessary to determine permit requirements for encroacbment onto the State right-of-way.

The developer should further consider changes to the vertical and horizontal alignment of Lake Farm Drive to lessen the potential for seasonal flooding of the roadway.

Surrounding Land Use

Land surrounding the proposed development is comprised of undeveloped woodland, active agricultural uses and low density residential development.

While development of this parcel as a standard subdivision should not be incompatible with surrounding uses, a sensitive cluster design could have resulted in a design more compatible with surrounding uses. Lebanon does not currently, however, have regulations which would allow clustering.

Project Design

A Master Plan Development study was prepared by Johnson and Richter, Landscape Architects, which included a comprehensive analysis of the site, it's attributes and development constraints. Four development scenarios resulted from this study: one a conventional development utilizing 12,000 square foot lake zone seasonal lots and 2 acre lots in other areas; second, a conventional subdivision with two acre lots throughout; third, a 9 hole and 18 hole golf course occupying the entire property; and fourth, a plan combining an 18 hole golf course with a cluster residential development of 3/4 acre lots.

The developer felt the golf course alone would not be financially feasible; the town recommended against the plan with seasonal lots; the conventional and cluster plans are both feasible, but since the town has no cluster zoning provisions the developer has proceeded with the conventional plan proposed.

Given that a 'conventional' plan of 2 acre single family house lots is proposed, under these circumstances, and that the existing farm use will not be continued, the plan, as proposed is adequate and generally complies with the town's zoning and subdivision regulations. The lot layout is a feasible one, lots

should be livable and indeed pleasant, with solar access possible on most lots with open space nearby.

The plan could have been made better with a sensitive cluster design, providing more usable open space.

Without a cluster approach, however, the only major design change which would improve the plan would be to plan for an open space area surrounding the lake, with no lots having direct water frontage.

A greenbelt ringing Savin Lake, to which all the residents in the subdivision had access, incorporating a jogging trail, beach and recreation areas, would make the lake an amenity available to all the homeowners in the subdivision, instead of only to those 26 property owners who have waterfront lots as in the proposed plan.

The current plan does not detail the recreational amenities planned, but should.

The plan to allow water from Savin Lake to flow over Farm Lake Drive, as it currently does over the existing driveway is not appropriate, since in flood events this road would need to be closed. A box culvert spanning the existing spillway would be appropriate.

The plan does not propose any improvements to Roger Foote Road, which is currently unpaved beyond the farm buildings at the corner of Old Route 2.

Widening of this existing road along with drainage improvements is necessary. Paving, at least to the intersection of the proposed Farm Lake Drive, should be considered.

Services to Support Development

On-site wells and septic systems are proposed for the development. Sewer and water lines in Colchester are more than 2 1/2 miles away. The Norwich water company's pumping station and filtration plant is less than a mile from the site in the southern most section of Lebanon.

Lebanon's landfill has an estimated life of 20 years at 1988 use rate. With mandatory recycling required by the state in 1991, Lebanon's landfill should have adequate capacity to accommodate the waste generated by the 77 new households proposed in this plan. The capacity of Lebanon's schools to accommodate more students, however, hinges on the fate of current plans to build a new junior high school.

While this subdivision is in Lebanon, the nearest commercial center with shopping, post office, banking and other services is in Colchester, some 2 1/2 miles away. Since Willimantic and Norwich are each about 10 miles away, it would be reasonable to assume most residents of Savin Lake Farms will travel to Colchester for services.

Footnotes to Planning Comments

* Calculated using regional demographic multipliers for standard housing types from the U.S. Census of Population and Housing (Public Use Sample) 1980, summarized in Burchell, Listokin, and Dolphin, The New Practitioners Guide to Fiscal Impact Analysis, 1989.

** Source: Trip Generation Study of Various Land Uses, Israel Zevin, ConnDOT, 1974. An alternative estimate of 10.0 vehicle trips/dwelling unit/weekday is suggested in Trip Generation, 3rd edition, Institute of Transportation Engineers, 1983.

POPULATION PROJECTIONS

Connecticut Population Projections by Age and Sex Series 89.1

LEBANON Page H - 73

	U.S. Census	OPM Estimate	OPM Projected Populations				
	1980	1985	1990	1995	2000	2005	2010
TOTAL	4,762	5,500	6,950	8,600	9,600	10,450	11,300
0 - 4	300	420	450	560	500	440	460
5 - 9	406	350	550	570	630	560	490
10 - 14	512	450	450	700	640	710	630
15 - 19	436	460	430	440	690	630	700
20 - 24	339	360	400	410	420	660	610
25 - 29	449	530	620	550	480	500	780
30 - 34	489	590	750	820	640	550	570
35 - 39	385	560	760	950	930	710	610
40 - 44	292	410	730	970	1,080	1,050	810
45 - 49	217	280	460	820	1,020	1,140	1,100
50 - 54	208	210	300	490	840	1,050	1,170
55 - 59	210	230	260	360	530	910	1,130
60 - 64	180	210	250	280	370	540	930
65 - 69	139	190	220	270	280	370	530
70 - 74	84	110	170	200	240	260	330
75 - 79	52	70	90	140	170	200	210
80 - 84	41	40	50	70	100	130	150
85 and over	23	30	30	40	40	50	70
65 and over	340	430	560	710	830	1,000	1,300
Median Age	29.3	31.5	33.9	36.4	39.3	42.2	44.9
FEMALES	2,377	2,750	3,550	4,400	4,900	5,300	5,750
0 - 4	147	230	230	290	260	220	240
5 - 9	213	170	300	300	330	290	250
10 - 14	252	230	230	380	340	370	330
15 - 19	223	210	210	210	360	330	360
20 - 24	168	170	190	180	190	340	310
25 - 29	237	290	350	270	220	240	410
30 - 34	237	260	390	450	310	250	270
35 - 39	187	300	360	510	520	360	290
40 - 44	142	190	390	460	570	590	400
45 - 49	104	150	210	430	490	610	620
50 - 54	96	100	150	220	440	500	620
55 - 59	106	100	120	190	240	480	540
60 - 64	89	100	100	130	190	240	480
65 - 69	66	100	120	120	130	190	250
70 - 74	44	60	90	100	110	120	180
75 - 79	28	40	50	80	90	90	100
80 - 84	24	20	40	40	70	80	80
85 and over	14	20	20	30	30	40	40
Median Age	28.9	31.2	33.4	36.1	39.1	42.3	45.3
MALES	2,385	2,750	3,450	4,250	4,700	5,100	5,550
0 - 4	153	200	210	270	250	220	230
5 - 9	193	170	250	270	300	270	240
10 - 14	260	230	230	320	300	340	310
15 - 19	213	240	230	230	320	310	340
20 - 24	171	190	210	220	230	320	300
25 - 29	212	240	280	280	250	260	370
30 - 34	252	330	370	370	320	290	310
35 - 39	198	270	400	450	410	360	330
40 - 44	150	220	350	510	500	460	400
45 - 49	113	130	250	390	530	530	480
50 - 54	112	110	150	270	400	560	550
55 - 59	104	130	130	170	280	430	590
60 - 64	91	110	150	160	180	300	450
65 - 69	73	80	110	150	150	170	280
70 - 74	40	50	70	100	140	130	150
75 - 79	24	30	40	60	80	110	110
80 - 84	17	10	20	30	40	50	70
85 and over	9	10	10	10	10	20	30
Median Age	29.8	31.7	34.3	36.8	39.6	42.1	44.3

Prepared by: Office of Policy and Management (OPM), Connecticut Census Data Center, 80 Washington St., Hartford, CT 06106, (203) 566-8285, June 1989.

Note: Due to rounding, numbers may not add to their totals.

15. ARCHAEOLOGICAL REVIEW

The State of Connecticut Archaeological Site Files and Maps show no prehistoric or historic archaeological sites in the project area. Even though Savin Lake is clearly a man-made lake, the natural swamps and wetlands would suggest a moderate to high sensitivity for prehistoric archaeological resources. State files indicate a series of prehistoric occupations along brook systems similar to Goshen, Sherman and Gillette Brooks. For example, in Lebanon a number of archaeological sites exist adjacent to the Susquetonscut Brook.

On-site inspection located no above-ground structures of historical significance. However, this survey method is extremely limited and subsurface testing may very well reveal evidence of prehistoric and historic settlements. The proposed residential development would have an adverse effect on such cultural resources which might exist in the project area. The predicted archaeological sites would be very shallow, probably within the upper three feet of soil. As a result, any landscaping or foundation construction would impact the sites.

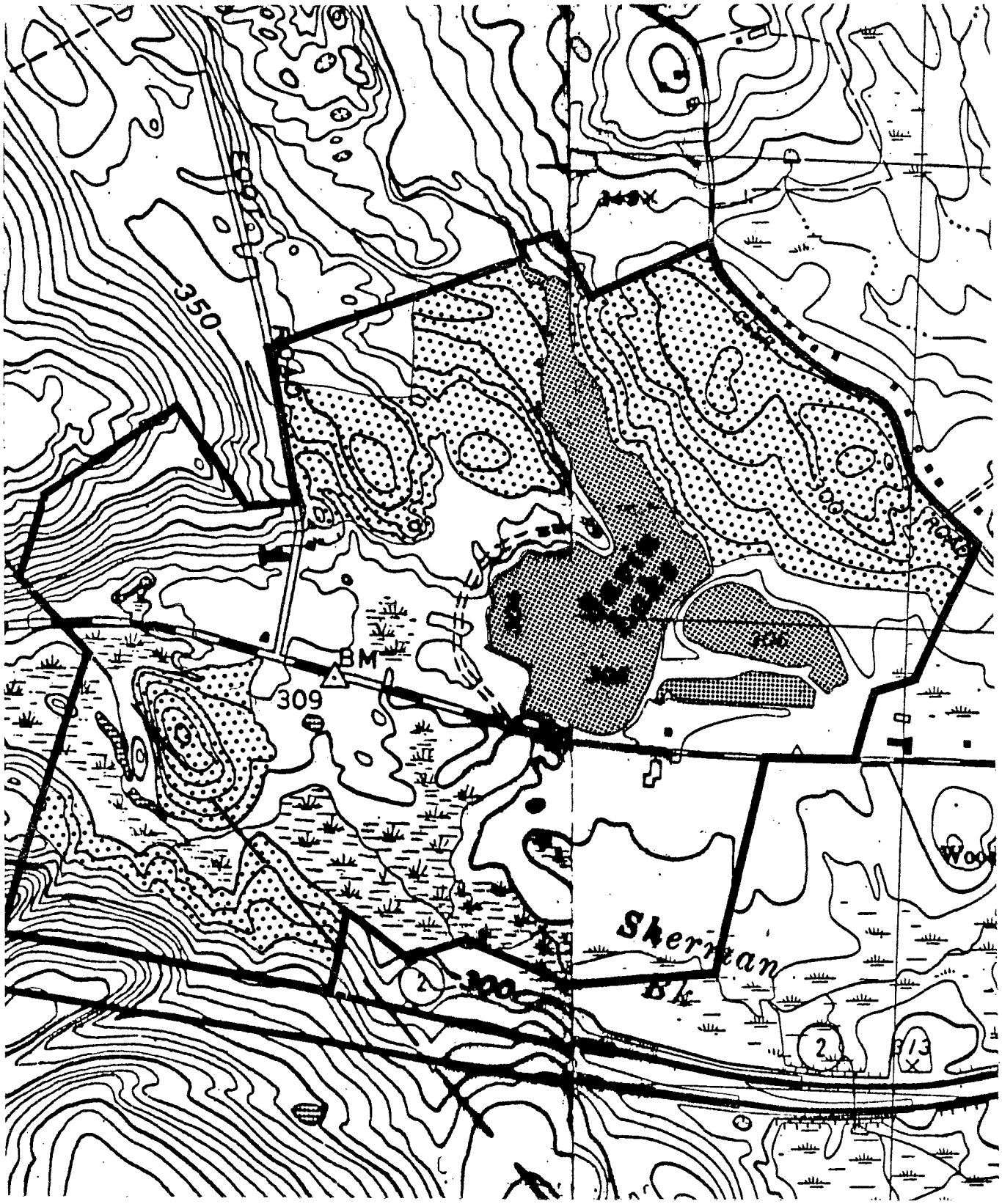
A professional archaeological reconnaissance survey is recommended for the areas shaded in the enclosed project map in order to locate and identify all prehistoric and historic resources. All archaeological studies should be undertaken in accordance with the Connecticut Historical Commission's **Environmental Review Primer for Connecticut's Archaeological Resources.**

In summary, the project area is located in a critical area of importance to prehistoric Indian lifeways. It is recommended that all feasible efforts be undertaken to identify and ensure the preservation and conservation of the cultural resources in the area. An archaeological survey of highly sensitive areas should be conducted.

RECOMMENDED AREAS FOR SURVEY

Scale 1" = 1000'

Survey recommended for shade areas



16. SOILS DESCRIPTIONS

LAKE FARMS ERT

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. These soils 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.

AfB - Agawam fine sandy loam, 3 - 8 percent slopes

This gently sloping, well drained soil is on stream terraces and outwash plains. Permeability of the Agawam soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is medium. This soil warms up and dries out rapidly in the spring. Unless limed, the soil is strongly acid or medium acid. This soil is well suited to cultivate crops. The hazard of erosion is moderate. This soil is suited to trees.

This soil is in capability class IIe.

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.

CcB - Canton and Charlton very stony fine sandy loams, 3 - 8 percent slopes

These gently sloping, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 1 - 8 percent of the surface. 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 of these soils is moderate. Runoff is medium. These soils warm up and dry out rapidly in the spring. The soil is strongly acid or medium acid. These soils are not suited to cultivated crops. These soils are suited to trees.

These soils are in capability subclass VIs.

CcC - Canton and Charlton very stony fine sandy loams, 8 - 15 percent slopes

These sloping, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 1 - 8 percent of the surface. 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 of these soils is moderate. Runoff is rapid. These soils warm up and dry out rapidly in the spring. It is strongly acid or medium acid. These soils are not suited to cultivated crops. These soils are suited to trees. Steepness of slope is a major limiting factor for community development.

These soils are in capability subclass VIs.

CdD - Canton and Charlton extremely stony fine sandy loams, 15 - 35 percent slopes

These moderately steep to steep, well drained soils are on glacial till upland hills, plains, and ridges. Stones and boulders cover 8 - 25 percent of the surface. 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 of these soils is moderate. 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 hazard of erosion is severe. These soils are suited to trees. Sttepness of slope is a major limitation for community development.

These soils are in capability subclass VIIs.

Ce - Carlisle muck

This nearly level, very poorly drained soil is in pockets and depressions of flood plains, stream terraces, outwash plains, and glacial till uplands. The Carlisle soil has a high water table near or above the surface for most of the year. Permeability is moderately rapid. The available water capacity is high. Runoff is slow. The soil is strongly acid through slightly acid. This soil is not suited to cultivated crops. This soil is poorly suited to trees. Windthrow is common because of the shallow rooting depth above the high water table. This soil is generally not suited to community development.

This soil is in capability subclass VIw.

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. The hazard of erosion is moderate. This soil is suited to trees.

This soil is in capability subclass IIs.

HkA - Hinckley gravelly sandy loam, 0 - 3 percent slopes

This nearly level, excessively drained soil is on stream terraces and outwash plains. Permeability of the Hinckley soil is rapid in the surface layer and subsoil and very rapid in the substratum. The available water capacity is low. Runoff is slow. Hinckley soil warms up and dries out rapidly in the spring. Unless limed, it is strongly acid or medium acid. This soil is suited to cultivated crops. It is droughty and irrigation is needed. The hazard of erosion is slight. This soil is suited to trees.

This soil is in capability subclass IIIs.

HkC - Hinckley gravelly sandy loam, 3 - 15 percent slopes

This gently sloping and sloping, excessively drained soil is on stream terraces, outwash plains, kames, and eskers. Permeability of the Hinckley soil is rapid in the surface layer and subsoil and very rapid in the substratum. The available water capacity is low. Runoff is medium or rapid. Hinckley soil warms up and dries out rapidly in the spring. Unless limed, it is strongly acid or medium acid. This soil is suited to cultivated crops. Hinckley soil is droughty, and irrigation is needed. The hazard of erosion is moderate or severe. This soil is suited to trees.

This soil is in capability subclass IVs.

MyB - Merrimac sandy loam, 3 - 8 percent slopes

This gently sloping, somewhat excessively drained soil is on stream terraces, outwash plains, kames, and eskers. Permeability of the Merrimac soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is medium. Merrimac soil warms up and dries out rapidly in the spring. Unless limed, it is strongly acid or medium acid. This soil is well suited to cultivated crops. It is droughtly during the drier periods in summer. The hazard of erosion is moderate. This soil is suited to trees.

This soil is in capability subclass IIs.

MyC - Merrimac sandy loam, 8 - 15 percent slopes

This sloping, somewhat excessively drained soil is on stream terraces, outwash plains, kames, and eskers. Permeability of the Merrimac soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is rapid. Merrimac soil warms up and dries out rapidly in the spring. Unless limed, it is strongly acid or medium acid. This soil is suited to cultivated crops. The hazard of erosion is severe. The soil is droughty during the summer. This soil is suited to trees.

This soil is in capability subclass IIIe.

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.

Sg - Sudbury sandy loam

This nearly level to gently sloping, moderately well drained soil is on outwash plains and stream terraces. The Sudbury soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is slow or medium. Sudbury soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid. This soil is well suited to cultivated crops. The hazard of erosion is slight. This soil is suited to trees. The major limiting factor for community development is the seasonal high water table.

This soil is in capability subclass IIw.

SvB - Sutton fine sandy loam, 3 - 8 percent slopes

This gently sloping, moderately well drained soil is on upland glacial till plains, hills, and ridges. 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 medium. Sutton soil warms up and dries out slowly in the spring. Unless limed, it is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is well suited to cultivated crops. The hazard of erosion is 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 IIw.

SwB - Sutton very 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 1 - 8 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 VIs.

Ud - Udorthents-Urban land complex

This complex consists of excessively drained to moderately well drained soils that have been disturbed by cutting or filling, and areas that are covered by buildings or pavement. Urban land consists maily of areas of houses, small commercial buildings, schools, streets, parking lots, roads, and highways. Permeability of the Udorthents is slow to very rapid. The available water capacity and runoff are variable.

This complex is not assigned to a capability subclass.

Wd - Walpole fine sandy loam

This nearly level, poorly drained soil is on stream terraces and outwash plains. The Walpole soil has a seasonal high water table at a depth of about 6 inches. Permeability is moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. The available water capacity is moderate. Runoff is slow. Walpole soil warms up and dries out slowly in the spring. It is very strongly acid or medium acid. This soil is suited to cultivated crops. The hazard of erosion is slight. 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 the seasonal high water table.

This soil is in capability subclass IIIw.

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

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

This soil is in capability subclass VIs.

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.**