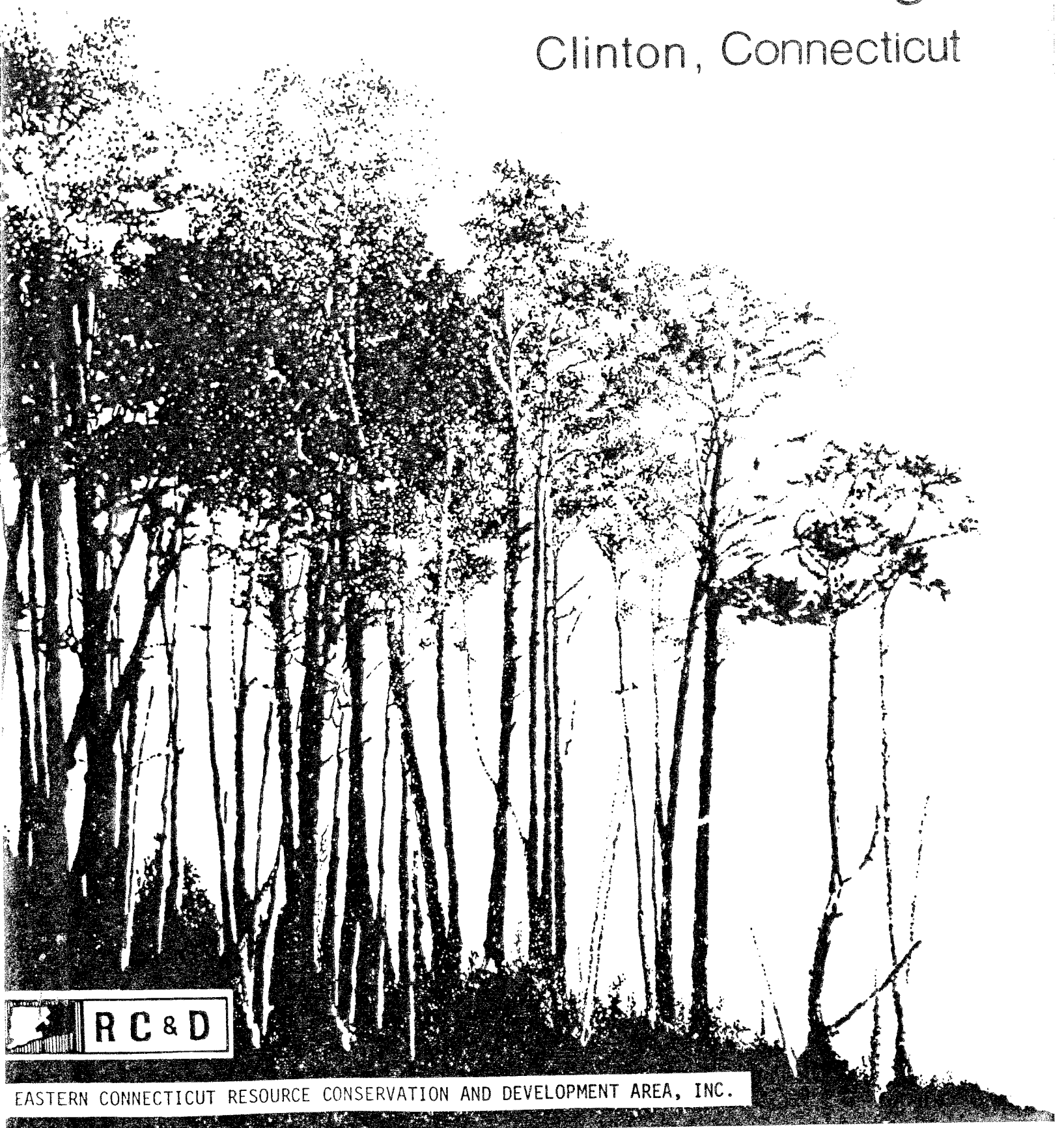
Environmental Review Team Report

Autumn Ridge

Clinton, Connecticut



R C&D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team Report

Autumn Ridge

Clinton, Connecticut

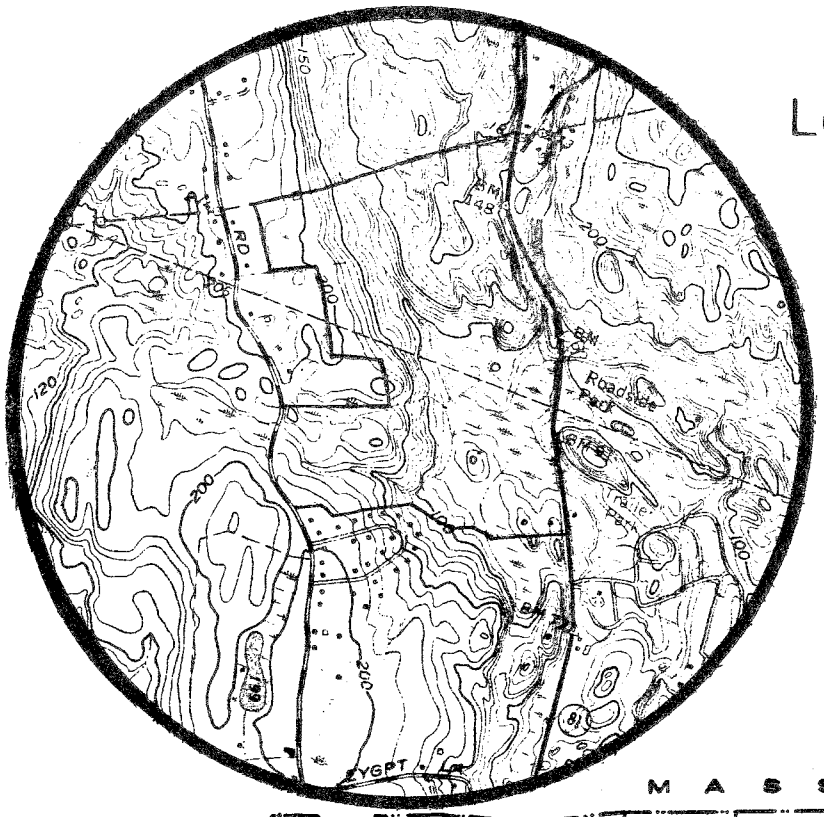
January 1985

Eastern Connecticut Resource Conservation & Development Area

Environmental Review Team
PO Box 198
Brooklyn, Connecticut 06234

Location of Study Site

AUTUMN RIDGE
CLINTON, CONNECTICUT



ENVIRONMENTAL REVIEW TEAM REPORT
ON
AUTUMN RIDGE
CLINTON, CONNECTICUT

This report is an outgrowth of a request from the Clinton Planning and Zoning Commission, to the Middlesex County Soil and Water Conservation District (S&WCD). The S&WCD referred this request to the Eastern Connecticut Resource, Conservation, and Development (RC&D) Area Executive Committee for their consideration and approval as a project measure. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The soils of the site were mapped by a soil scientist of the United States Department of Agriculture(USDA), Soil Conservation Service (SCS). Reproductions of the soil survey map as well as a topographic map of the site were distributed to all ERT participants prior to their field review of the site.

The ERT that field-checked the site consisted of the following personnel: Pat Scanlon, District Conservationist, SCS; Bill Warzecha, Geologist, Connecticut Department of Environmental Protection (DEP); Marc Beroz, Soil Specialist (SCS); Judy Wilson, Wildlife Biologist, (DEP); Emery Gluck, Forester, (DEP); Don Capellaro, Sanitarian, State Department of Health; Richard Joly, Planner, Connecticut River Estuary Regional Planning Agency; and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

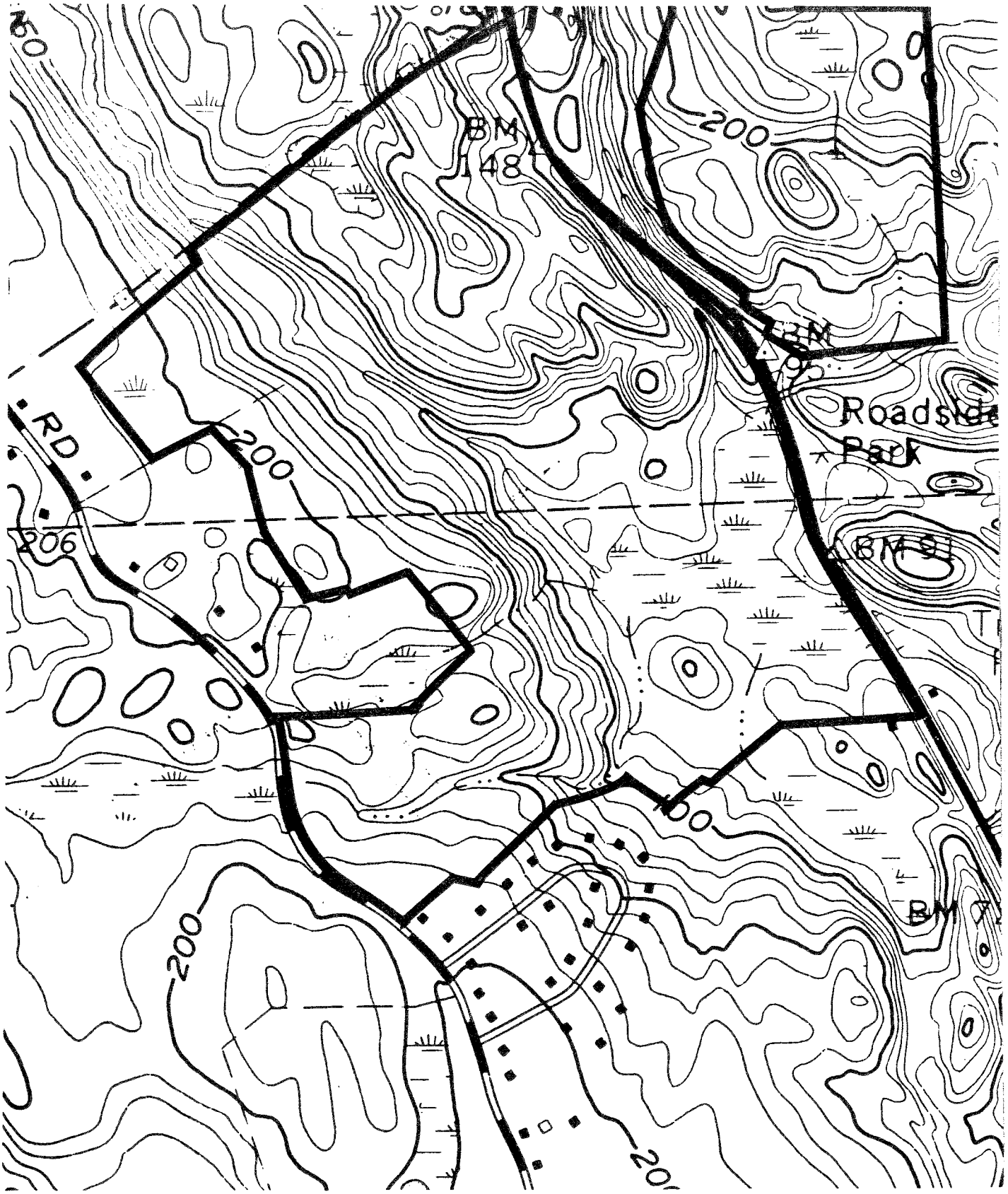
The Team met and field-checked the site on Tuesday, December 4, 1984. Reports from each Team member were sent to the ERT Coordinator for review and summarization for the final report.

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. 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 of Clinton. The results of this Team action are oriented toward the development of a better environmental quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Area Committee hopes you will find this report of value and assistance in making your decisions on this particular site.

If you require any additional information, please contact Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, P.O. Box 198, Brooklyn, CT 06234, 774-1253.

Topography	Site Boundary	0 660' scale	N



INTRODUCTION

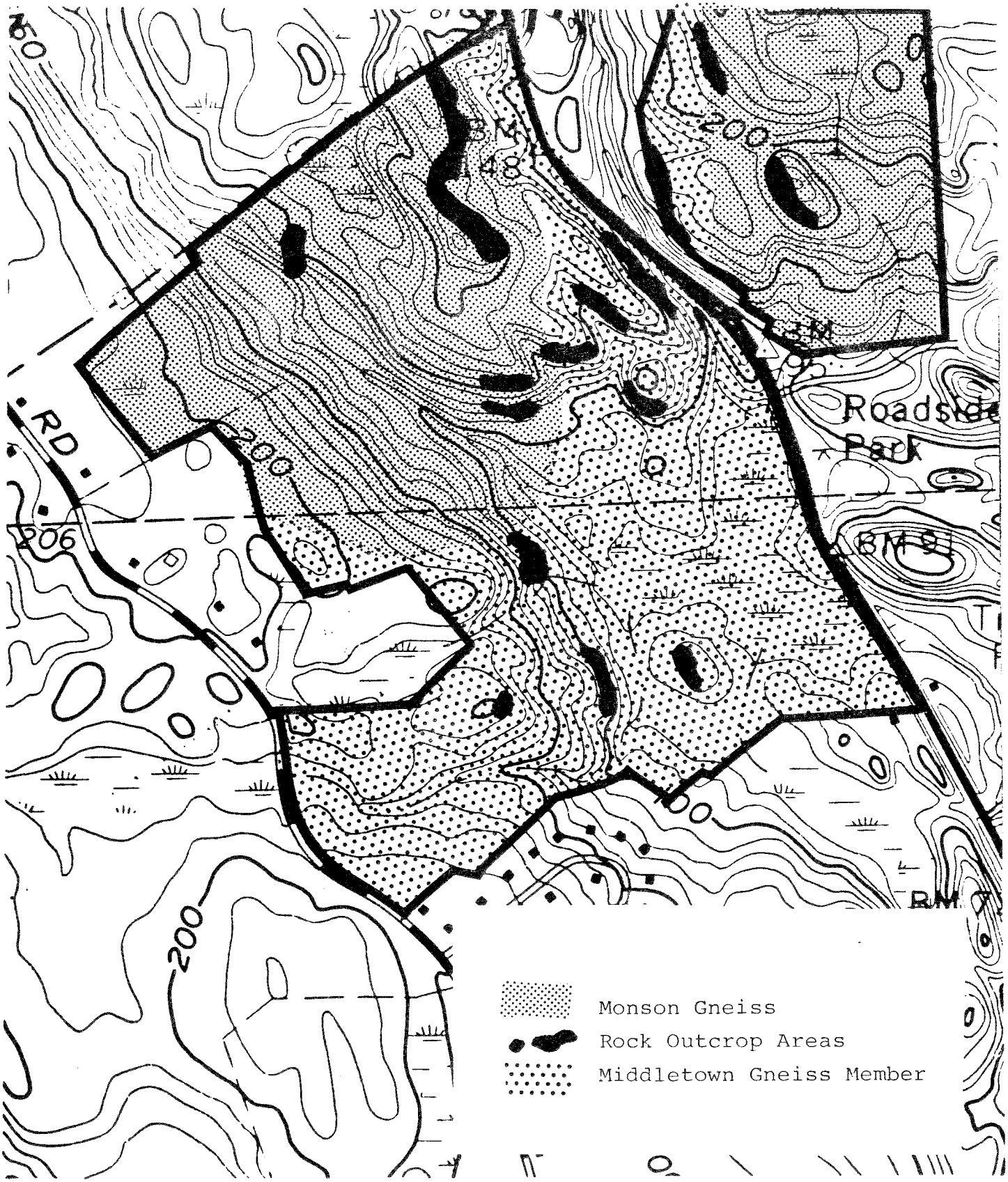
The Eastern Connecticut Environmental Review Team was asked to prepare an environmental assessment for a proposed subdivision in the Town of Clinton. The site is approximately 200 acres in size and is located on the east side of Cow Hill Road, bounded by the Connecticut Light and Power right-of-way on the north and Route 81 on the west. Additional acreage on Roast Meat Hill Road will also be developed as a later phase of the subdivision. The project is known as "Autumn Ridge." Preliminary plans have been prepared by Kenny and Stevens, a Madison, Connecticut engineering firm.

Preliminary plans for Phase I of the development are currently under consideration by the planning and inland wetland commissions. These plans show 21 lots, ranging from 1.8 acres to 7.2 acres in size. Approximately 7 acres of open space will be dedicated to the Town with this proposal. Each lot will be served by on-site wells and on-site septic systems. Silver Birch Lane will extend eastward into the site from Cow Hill Road to provide access to interior lots. Three lots will have frontage on Route 81, and four lots will have frontage on Cow Hill Road.

The site is entirely forested at present, except in the Connecticut Light and Power right-of-way which bisects the site. Portions of the site are moderately to steeply sloped. A large wetland area is found in the southeastern section of the site in the area of proposed lots 19, 20, and 21.

The Team is concerned with the effect of this proposal on the natural resource base of this site. Although many severe limitations to development can be overcome with proper engineering techniques, these measures can become costly, making a project financially unfeasible for a developer. The following sections of this report discuss the Team members' concerns in detail for Section I of this proposal. Section II and the parcel, located off Roast Meat Hill Road, are discussed in general terms. The Team hopes that this report will help the Town of Clinton to make informed decisions concerning this proposal.

Bedrock Geology



ENVIRONMENTAL ASSESSMENT

TOPOGRAPHY

The subject parcel is located in northern Clinton. It is bounded on the west by Cow Hill Road, Route 81 on the east and on the north by the Killingworth-Clinton town line. A future section of the development, which was also examined during the field review, is located on the east side of Route 81. It comprises approximately 51 acres within the Town of Clinton. Access to this section is proposed from Roast Meat Hill Road in Killingworth.

Topography of the site varies from gently rolling to steeply sloping. The steeper slopes are associated with rock outcrop areas within the property. They predominate throughout the northern half of the site. A relatively large wetland area comprises the southeast corner of the property, wetlands also parallel the stream courses within the site. Major stream courses, as well as several intermittent drainage channels on the site empty into the large wetland area mentioned above and ultimately become part of the Indian River system. The Indian River flows through the wetlands in the eastern part of the site.

Maximum and minimum elevations on the site are approximately 260 feet and 70 feet above mean sea level. The highest point is located just south of the town line on the land east of Route 81. The lower elevations are located throughout the swampy area in the southeast corner.

GEOLOGY

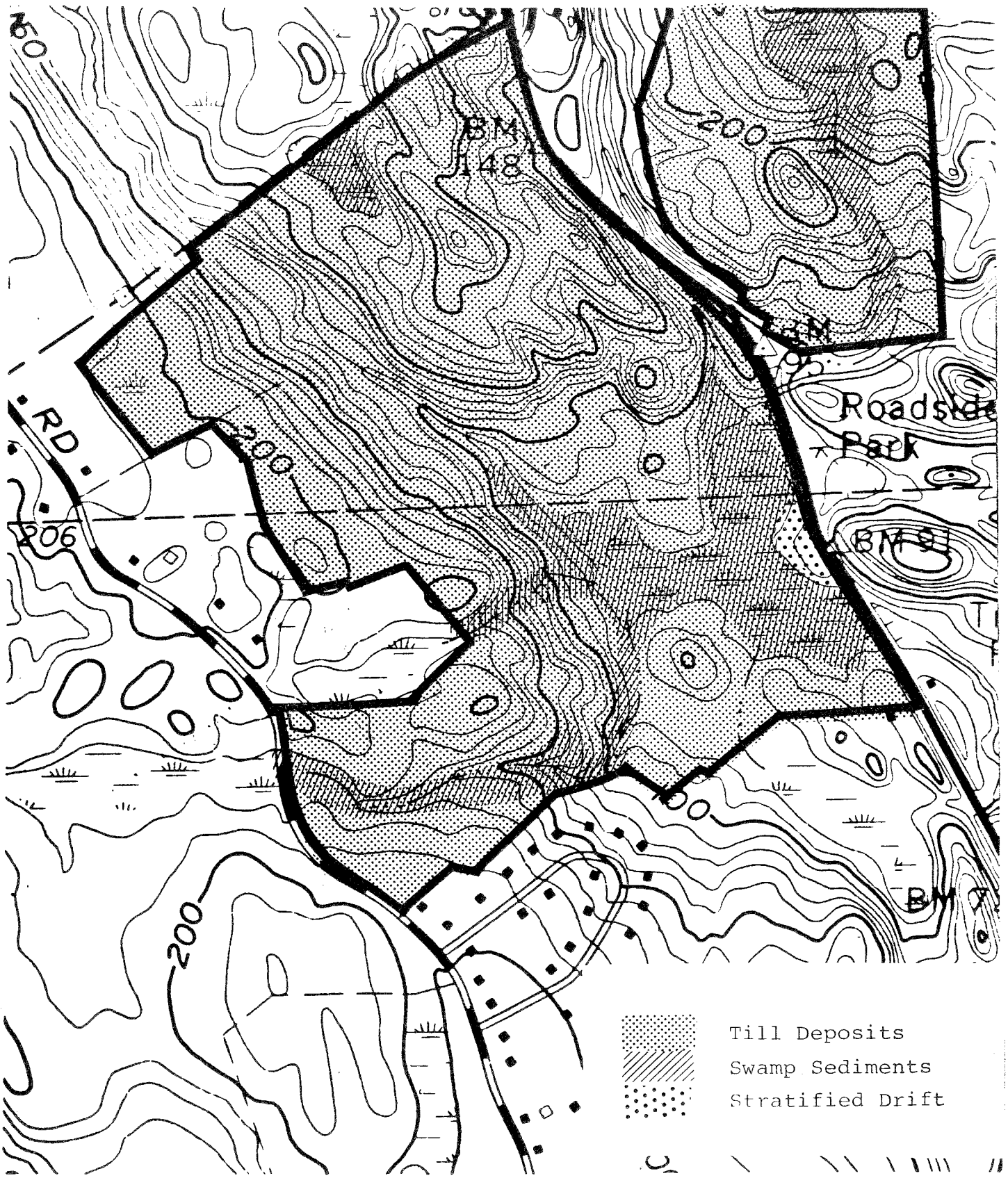
The property lies within the Clinton topographic quadrangle. Bedrock and surficial geologic maps have been published by the Connecticut Geological and Natural History Survey(Map QR-29 by L. Lundgren, Jr. and Robert Thurrell and Map QR-28, by Richard Foster Flint).

Numerous bedrock outcrops are scattered throughout the parcel. Map QR-28 identifies two rock types which underlie or outcrop within the parcel. They include Monson Gneiss and a member of the Middletown Gneiss formation.

The Middletown Gneiss member underlies and/or outcrops in the southern half of the site and along the eastern border. Middletown Gneiss underlies or outcrops throughout the western half of the parcel east of Route 81. Bedrock for remaining land within the area reviewed is comprised of Monson Gneiss.

Map QR-29 describes the Middletown Gneiss member as an interbedded amphibolite (amphibole bearing rock) and rust stained plagioclase gneiss. Monson Gneiss is described as a light to dark gray gneiss composed of the minerals biotite, plagioclase with some black amphibolite layers. The terms "gneiss" refers to crystalline, metamorphic rocks (rocks geologically altered by great heat and pressure) which are relatively thin bands of elongate minerals alternate with band of minerals having a rounder or blockier shape.

Surficial Geology



Areas where bedrock is at or near ground surface are delineated by the symbols HpE (Hollis-Charlton) and HSE (Hollis rock outcrop complex) on the accompanying soils map. Based on deep test hole information, depth to bedrock throughout the property is quite variable, probably not exceeding 10 feet in most places.

The "Autumn Ridge" site is covered by a relatively thin blanket of glacial sediment called till. Till is a nonsorted, nonstratified assortment of rock particles of various shapes and sizes. The particles were scraped, broken, or otherwise removed from preglacial soils or bedrock outcrops by a moving ice sheet. Because of differences in source area for the particles and in modes of deposition, the texture of the till is highly variable.

It may vary from sandy, stony and relatively loose, to silty nonstony and compact. Generally speaking, the compact layers are encountered at some depth below the looser variety. The parcel contains both types of till.

Another type of glacial sediment covering the site is stratified drift. These sediments cover relatively small areas along the eastern parts of the parcel new Route 81. "Stratified drift" consists of sand, gravel, silt and clay which were deposited by meltwater streams emanating from the glacier. According to Flint's map, the stratified drift deposits found on the site were laid down in close relation to melting glacier ice and, therefore, are coarser grained.

Swamp sediments overlie till and/or stratified drift throughout the southern half of the site. They consist of silt, sand and clay mixed with varying amounts of organic matter in poorly drained areas. In addition, there are seasonally wet areas, which parallel stream courses on the site. These soils are regulated inland wetland soils under Public Act 155, therefore, any wetland disturbances, fillings or modifications, will require a permit from the town Inland-Wetland Commission. Development in inland-wetland areas should be avoided where possible.

Development Concerns

Based on visual inspection, deep test hole information and available surficial, bedrock and soil mapping, some geological limitations that may pose constraints with respect to the proposed subdivision includes: (1) areas where bedrock is at or near the surface of the ground (see attached surficial geologic map); (2) areas where slopes are moderately steep; (3) the presence of some till-based soils on the site which may have a tendency to be either stony, seasonally wet or have slow percolation rates; and (4) the presence of regulated inland-wetland soils. These geologic constraints will weigh heaviest in the installation of sewage disposal systems which will be required on each lot, foundation placement, and road/driveway construction. However, with good engineering practices and proper planning, it is possible to surmount many of the constraints. Also, because lot sizes for Section I of the subdivision range from 1.8 acres to 7.2 acres, the developer will have greater flexibility when searching for favorable leaching field areas and on-site well locations. The project engineer should address any of the above mentioned constraints if encountered and provide additional information so an accurate assessment of the suitability of the proposed lots for sewage disposal can be made.

Based on present plans for "Section I" of "Autumn Ridge," the project calls for three wetland road crossings of ±200 feet (to Lot 21), ±30 feet (Silver Birch Lane), and ± to Lot 12). It may also be necessary to cross wetlands in order to gain access to the rear portions of Lot 8. Wetland road crossings are feasible, provided they are properly engineered and implemented. Provision should be made for removing unstable material beneath the roadbed and backfilling with a permeable road base fill material. When crossing any wetlands, the roads should be installed adequately above (preferably 2 feet) the surface elevation of the wetlands. This will allow for better drainage of the road. It will also decrease the frost heaving potential of the road. Road construction through wetlands should preferably be done during the dry time of the year and should include provisions for effective erosion and sediment control.

It appears that blasting will be necessary in order to construct a portion of Silver Birch Lane between Lots 4 and 18. Because of the steep slopes which predominate throughout this area, it is most important that judicious erosion and sediment control measures are used.

HYDROLOGY

With the exception of about 71 acres located in the northwest corner, the land field checked on the review day lies within the Indian River watershed. Indian River flows through the eastern part of Section I and ultimately empties into Clinton Harbor. Surface runoff emanating from the ±71 acres in the northwest corner drains to an unnamed stream traversing that part of the property. The unnamed stream empties into the wetland area in the southern portions of the site.

The surface water and groundwater on the property flow generally downslope toward local discharge areas such as stream courses, intermittent streams, wetland areas and springs. The water is then transported via these discharge points toward Indian River or the unnamed stream course flowing through the northwest corner of the site.

Construction of the subdivision as planned can be expected to lead to increass in runoff from the site and to increased peak flows in the local streams. These increases would be caused by removal of vegetation, compaction of soil during the construction phase, and creation of impervious surfaces such as roof tops, driveways and access roads. In general, the most important factor would be the amount of new impervious surfaces, i.e., roof tops and paved roads that will be placed on each lot.

In this regard, it is recommended that the applicant be required to submit detailed hydrological information on pre- and post-development runoff volumes and peak flows from the site, prior to subdivision approval. Estimates should be provided for a 10, 25, 50 and 100 year design storm. Detailed design specifications for all stormwater control facilities (if considered) should also be submitted. All storm drain outlets should include an energy dissipator

Drainage Areas

0 2000'
Scale

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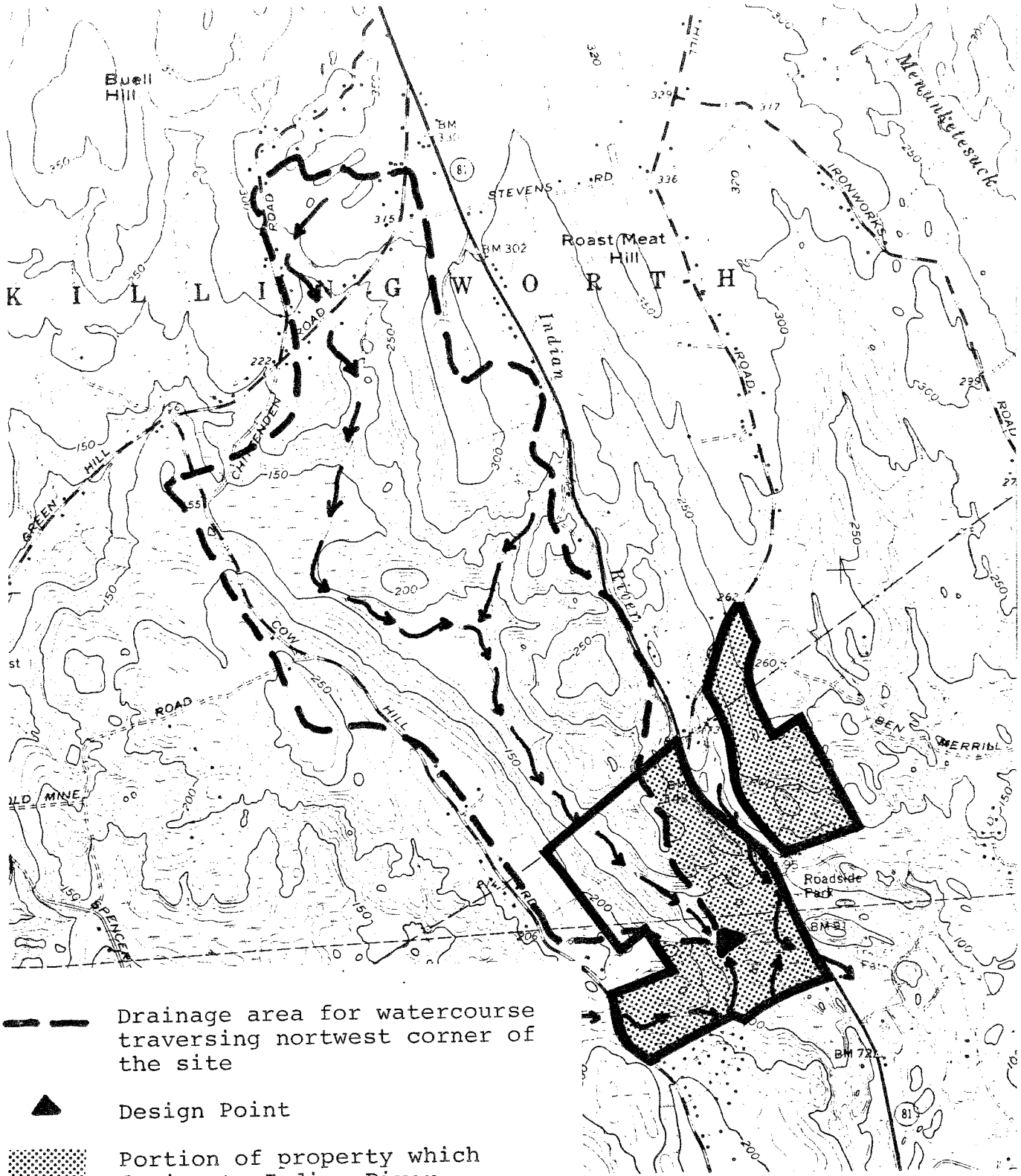


Drainage area for watercourse traversing nortwest corner of the site

Design Point

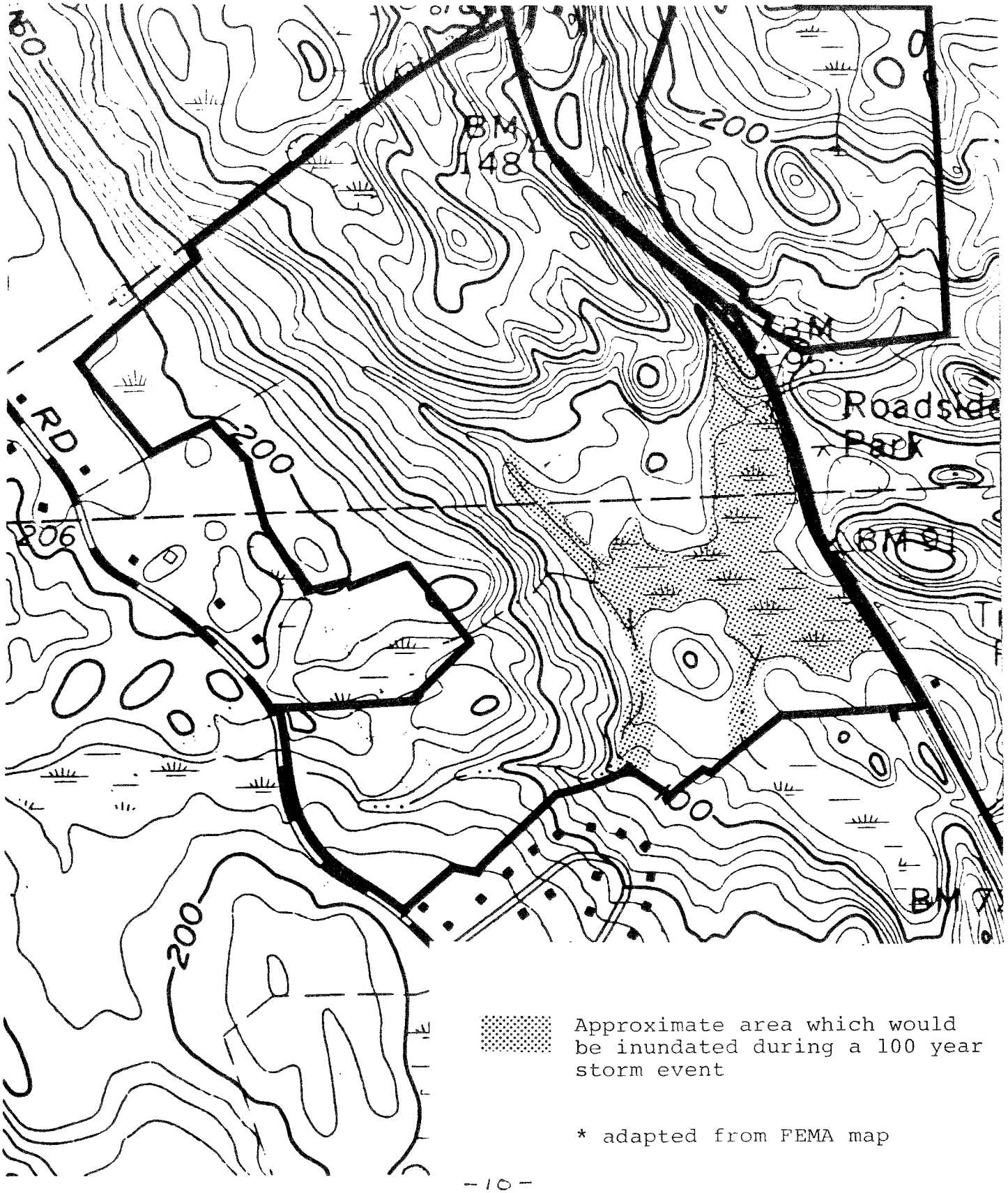
Portion of property which drains to Indian River

Watercourse - showing direction of flow

Flood Boundary

0 660'
scale

N



Approximate area which would be inundated during a 100 year storm event

* adapted from FEMA map

to help protect areas below the outlet from gullying. A conscientious erosion and sediment control plan should accompany the stormwater management plan for each section of the development. Close examination of culverts passing under Route 81 is strongly recommended to ensure that flooding conditions at these points do not arise following completion of the development.

It should be pointed out that a flood boundary and floodway map has been produced for the Town of Clinton by the Federal Emergency Management Agency. Based on this map, the southeast corner of the site, which is comprised predominately of wetlands lies within the 100-year flood boundary. The boundary also parallels Indian River and several of its tributaries in this part of the site. If development occurs in this area, compliance with all applicable federal, state and local regulations in regard to flooding is imperative. However, every effort should be made to avoid these areas during development.

SOILS

The accompanying soil survey map is a revision of data contained in the Soil Survey of Middlesex County, Connecticut. The symbols on the map identify map units. Each map unit has a unique composition of soils. Areas with the same symbol have the same composition.

Wetland Soils

The wetlands occur on nearly level surfaces of 0 to 3 percent slope. They provide natural flood protection to downstream areas. During large storms, floodwaters are detained in the wetlands. Extensive disturbance of the wetlands may result in downstream flooding. The wetland boundaries of Section I are recorded on the site plan dated October 4, 1984. The delineation of these areas are substantially correct.

Map Units Aa and Ce - The soils in these map units are very deep and very poorly drained. Typically, they have organic surface layers 16 to greater than 50 inches thick overlying sand and gravel to a depth of 60 inches or more. These soils have a water table at or near the surface for most of the year.

These map units are poorly suited for homesite development. The organic layers of these soils have poor bearing strength. Any structures or road crossings require careful design and construction.

Map Units Lg and Wd - The soils in these map units are very deep and poorly drained. Typically, they have fine sandy loam texture which may overlie sand to a depth of 60 inches or more. These soils have a seasonal high water table within 1.5 feet of the soil surface for much of the year.

These soils are poorly suited for roads or buildings due to their high water tables.

Soils

0 660'
scale

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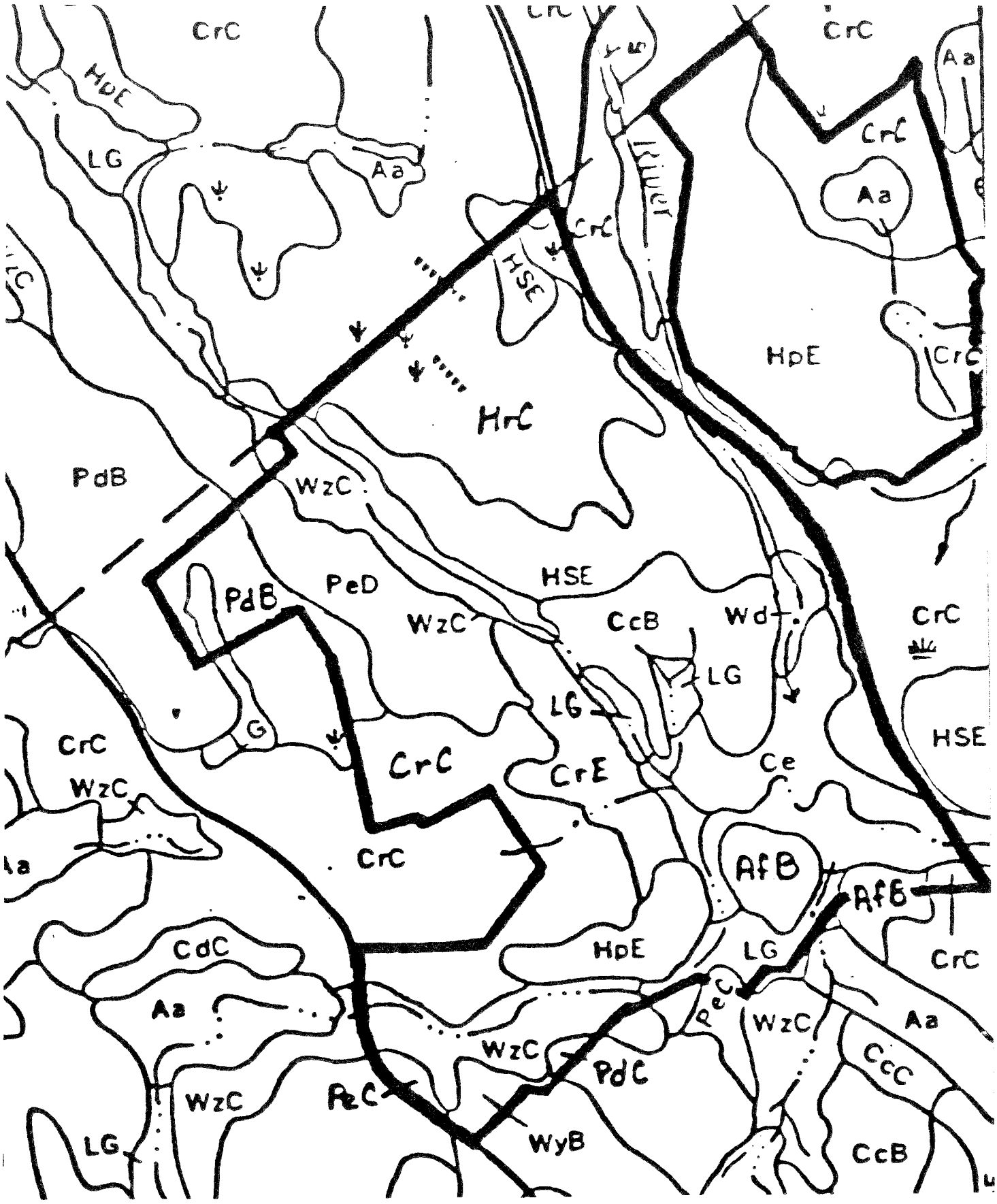


Non-Wetland Soils

Map Unit AfB - This map unit is composed of Agawam soils on 3 to 8 percent slopes. Agawam soils are very deep and well drained. Typically, they have fine sandy loam textures overlying sand and gravel to a depth of 60 inches or more.

These soils have fair potential for homesite development. The very permeable sand and gravel layers of these soils may not adequately renovate septic effluent. This problem is generally overcome by doubling the horizontal separating distances between wells and leach fields.

Map Unit CcB - This map unit is composed primarily of Charlton soils on 3 to 8 percent slopes. Charlton soils are very deep and well drained. Typically, they have fine sandy loam textures to a depth of 60 inches or more.

These soils have good potential for homesite development. Generally there are no costly obstacles to be overcome when building on these soils.

Map Units PdB and PdC - These map units are composed primarily of Paxton and Montauk soils. Both soils are very deep and well drained. Typically, they have fine sandy loam textures to a depth of 60 inches or more. The Montauk soils also have some strata of loamy fine sand. Stones and boulders cover up to 3 percent of the soil surface.

Both soils have a consolidated layer called hardpan with its upper surface between 18 and 30 inches deep. The hardpan has slow permeability. Water that enters the soil and reaches the hardpan layer, tends to flow laterally over the hardpan surface. This causes a brief perched water table during the wettest periods of the year. Map unit PdB has slopes of 3 to 8 percent and PdC has slopes of 8 to 15 percent.

The soils in these map units have fair potential for septic tank absorption fields. The slow permeability of the hardpan will interfere with the dispersal of septic effluent from the leaching trenches. In addition, septic effluent may seep out of the ground on the steeper slopes. This could happen if the effluent moves over the top of the hardpan and is not fully renovated by the soil. These problems can be overcome with careful design and installation of the leaching fields.

Map Units PeC and PeD - These map units are composed primarily of Paxton soils. These soils are very deep and well drained. Typically, they have fine sandy loam textures to a depth of 60 inches or more. These soils have a hardpan with its upper surface between 18 and 30 inches. Up to 15 percent of the soil surface is covered by stones and boulders.

The PeC map unit has slopes of 3 to 15 percent and the PeD map unit has slopes of 15 to 35 percent.

These soils have fair potential for septic tank absorption fields. The slow permeability of the hardpan will interfere with the dispersal of septic effluent from the leaching trenches. Slopes greater than 15 percent pose an

additional problem since septic effluent may breakout downslope before it is full renovated by the soil. The probability of breakout increases as the slope steepens. These problems can be overcome with careful design and installation.

Map Units WyB and WzC - These map units are composed primarily of Woodbridge soils. The Woodbridge soils are very deep and moderately well drained. Typically, they have fine sandy loam textures to a depth of 60 inches or more. Woodbridge soils have a hardpan and seasonal perched water table. The water table is present during the months of November through May. Depth to the water table is 1.5 to 2.5 feet.

The WyB map unit has 3 to 8 percent slopes. Up to 3 percent of this map unit is covered by stones and boulders.

The WzC map unit has 3 to 15 percent slopes. Up to 15 percent of this map unit is covered by stones and boulders.

The Woodbridge soils are poorly suited for septic tank absorption fields due to the slow permeability of the hardpan and the seasonal high water table. Septic effluent may seep out of the ground on the steeper slopes. This could happen if the effluent moves over the top of the hardpan layer and is not fully renovated by the soil.

Map Units CrC, CrE and HpE - These map units are composed of two soils that are so intermingled on the ground that they could not be separated on the map. One soil is named Charlton. Charlton soils are very deep and well drained. Typically, they have fine sandy loam textures to a depth of 60 inches or more.

The other soil is named Hollis. Hollis soils are shallow and somewhat excessively drained. Typically, they have fine sandy loam textures overlying hard bedrock at a depth of 10 to 20 inches.

The CrC and CrE map units are dominated by the deep Charlton soils. The CrC map unit is on 3 to 15 percent slopes and the CrE map unit is on 15 to 45 percent slopes. Stones and boulders cover up to 15 percent of the soil surface of both these map units.

The HpE map unit is dominated by the shallow Hollis soils and associate rock outcrops. This map unit is on 15 to 40 percent slopes. Stones and boulders cover up to 5 percent of the soil surface.

The Hollis soils are poorly suited for building site development due to their shalow depth to bedrock.

The Charlton soils are well suited for building site development except on slopes greater than 15 percent. As slopes steepen, construction costs increase. In addition, septic effluent from leaching fields may surface downslope before it is fully renovated by the soil.

Map Units HrC and HSE - These map units are composed of Hollis soils and rock outcrops that are so intermingled on the ground that they could not be

separated on the map. The Hollis soils are the same as those described above in the CrC, CrE and HpE description.

The rock outcrops consist of consolidated schist bedrock.

The HrC and HSE map units are both dominated by the shallow Hollis soils. The HrC map unit is on slopes of 3 to 15 percent. The HSE map unit is on slopes of 15 to 40 percent. Stones and boulders cover up to 25 percent of the soil surface of both these map units.

The Hollis soils are poorly suited for building site development due to their shallow depth to bedrock.

Sediment and Erosion Control Measures

The Autumn Ridge subdivision will eventually encompass 257 acres of land in Clinton. The plan proposes that it be built in three phases for a total of 91 house lots. This averages under three acres per house lot, although the actual sizes vary.

Because of the magnitude of this development, a detailed sediment and erosion control plan should be developed and implemented. The two main components of these plans would include a map and a narrative. The plan map should show:

1. Topography, with contours at an interval and scale that will adequately describe the area.

2. Soils information, including test pit locations, profile descriptions, and excavation dates.

3. Property boundaries, acreages, and existing streets, highways, and structures.

4. Critical environmental areas such as wetlands and watercourses, floodlains, bedrock outcrops and major groundwater aquifers.

5. Proposed area alterations.

6. Cleared and graded areas.

7. Limits of major construction stages.

8. Location(s) of earth material stockpiles.

9. Location of, and detailed information concerning sediment and erosion control measures and facilities.

An accompanying narrative provides further detail, and it should include, but not be limited to, the following descriptions:

1. The project, including a starting date and expected date of final stabilization.

2. The schedule of major activities on the land, including the sequence and staging of land clearing operations, removal and stockpiling of topsoil, major earthmoving and grading operations.

3. The application of conservation practices.

4. Design criteria for sediment and erosion control facilities, including runoff calculations for stormwater structures.

5. Construction details for sediment and erosion control facilities.

6. A contingency plan for winter shutdown.

7. A maintenance program for sediment and erosion control facilities.

8. Assignments of responsibility for the implementation and maintenance of conservation practices.

A site plan should be developed for each of the three sections and be reviewed and approved prior to permit approval.

To minimize erosion and sedimentation problems, emphasis should be placed on retaining existing vegetative cover and keeping areas, devoid of cover, exposed for the shortest practical period of time. Permanent roads should be installed as early as possible. Temporary seeding and mulching will be necessary if development becomes extended. Sediment basins, stone-lined channels, diversions and other structural measures should be considered in controlling sediment and reducing the erosive effect of runoff water.

The use of fabric silt fencing is recommended for placement along wetlands (where needed) and at the toe of slopes. This fencing, when properly installed, is more effective in trapping and retaining sediment than hay bales. It is also reusable, thus it can be reinstalled in new areas as phases are completed and stabilized. Hay bales are best suited for short periods in small areas less than one acre in size, and they ideally should be placed to trap and retain sediment on the individual house lots or around catch basins. Neither hay bales nor silt fence are very effective in drainageways with concentrated flows. Rather, the major emphasis should be to trap and retain sediment on-site and prevent it from entering any drainageways, streams, or wetlands.

This type of development can be expected to increase runoff. Provisions could be considered for accommodating the additional runoff without causing harmful effects on property within the watershed's downstream area.

A subdivision of this size needs to be done in phases to minimize damage from large exposed areas. The commissions responsible for granting permits necessary for development may consider requiring separate permits for each phase. In granting these permits, consideration should be given to the performance of the developer during construction of the previous phases.

VEGETATION

The vegetation of the property is representative of the central hardwood zone that is present in southern Connecticut. The woodlot can be divided into eleven forest types. They include six mixed hardwood types, two softwood/hardwod types, an old field type, a hardwood swamp type and an open area type (power line right-of-way). The acres were estimated from aerial photographs and, therefore, should only be considered approximates.

Vegetation Type Description

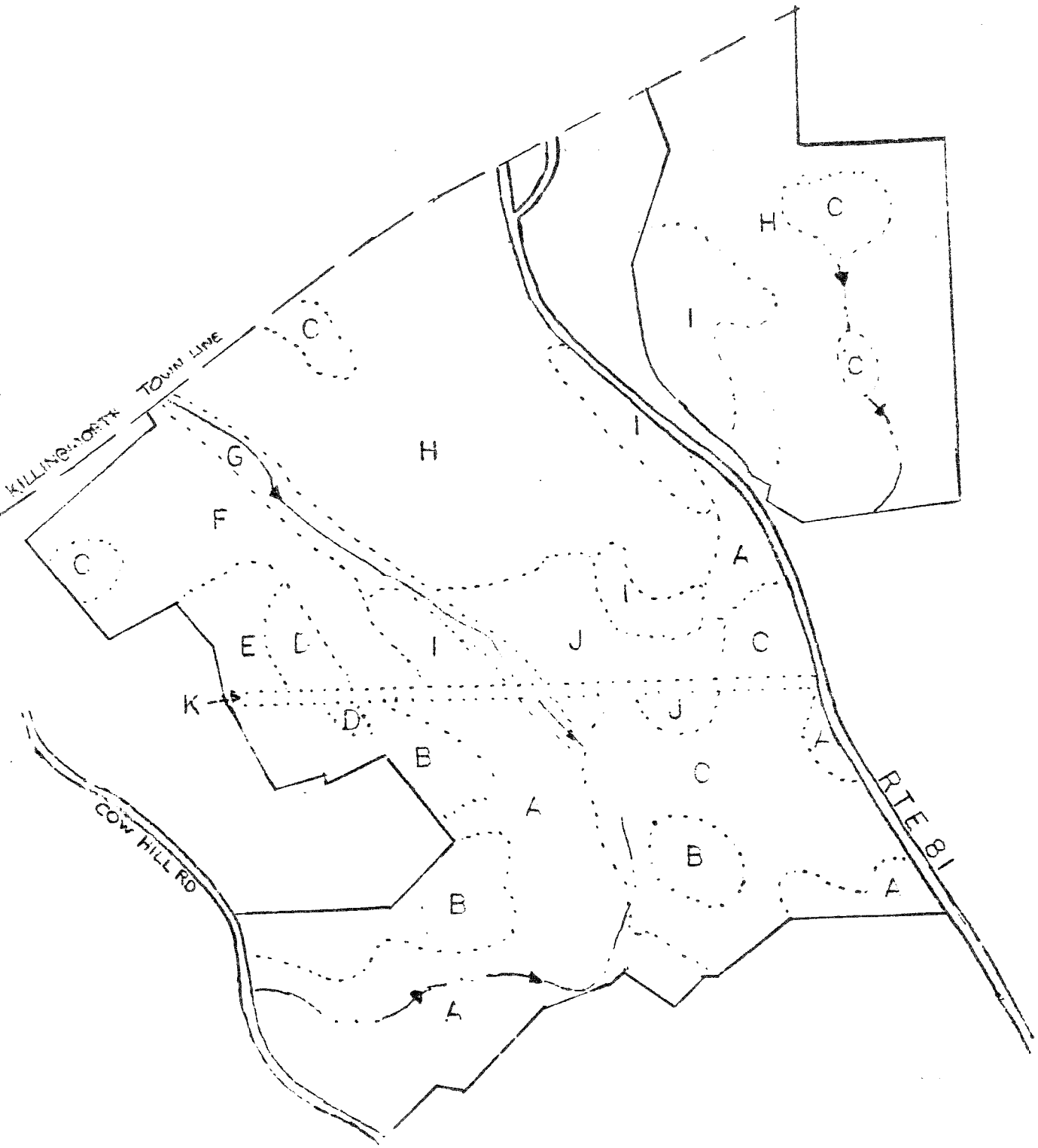
Type A (Mixed Hardwood) - This 38 acre fully stocked stand is comprised of medium and high quality sawtimber (trees 11.1" dbh--diameter at breast height--and larger) and poles (trees 6.1" to 11" dbh). The overstory is composed of white oak, red oak, black oak, tulip poplar, hickory, red maple, white ash, and sugar maple. The understory is made up of sugar maple, black birch, yellow birch, white ash, red maple, flowering dogwood, spicebush and blue beech. Christmas fern, wood aster, barberry, raspberry, maple-leaf viburnum, and green briar comprise the ground cover. Oak and hickory are more abundant along the upper and mid-slopes, while sugar maple, red maple, yellow birch, tulip poplar, and white ash are more abundant along the lower slopes and drainages. The stand is located on an average site for growing quality hardwood sawtimber.

Type B (Mixed Hardwood) - This fully stocked sawtimber stand (14 acres) is composed of medium and poor quality trees. Black oak, white oak, scarlet oak, red oak, black birch, hickory, pitch pine, and white pine are the tree species present. The white pine is present in the understory and occasionally in the overstory. The shrub layer is composed of flowering dogwood, mountain laurel, greenbriar, witch hazel, huckleberry, and lowbush blueberry. The stand is located in an area that varies from a poor to an average hardwood growing site. Most of the hardwoods are approximately 80 to 100 years old and should be considered mature. The stand is understocked with healthy trees. This is largely due to crown dieback that a large percent of the oak is experiencing.

Type C (Hardwood Swamp) - This 32 acre poor quality pole (trees 6.1" to 11" dbh) is comprised of red maple, yellow birch, white ash, yellow poplar, and black gum. The understory includes witch hazel, cinnamon fern, club moss, spicebush, spagnum moss, deciduous holly, grapes, evergreen wood fern, skunk cabbage, sweet pepperbush, American hornbeam, and false hellabore. The area represents a poor growing site due to the excessively high water table.

Type D (Softwood/Hardwood) - This fully stocked stand (3 acres) consists of poor to medium quality poles and saplings (trees 1.1" to 6.1" dbh). White pine, black birch, gray birch, flowering dogwood, and red cedar are present. The poorly formed white pine and the presence of red cedar and gray birch indicates that this stand originated from an abandoned pasture. The multiple stems of white pine indicate that the white pine weevils damaged the trees at

Vegetation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KILLINGWORTH TOWN LINE
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an early age by killing the tree's main leader. The stand should be considered immature.

Type E (Old Field) - This 4 acre stand consists of predominately sapling and seedlings (trees 1" dbh and less). Red cedar, white pine, red maple and white oak are the tree species. The understory includes old field juniper, maleberry, spirea, flowering dogwood, barberry, multiflora rose, reindeer lichen, sweet fern, haircap moss, and lowbush blueberry. Pasturing was recently abandoned in this area.

Type F (Mixed Hardwoods) - This fully stocked stand (17 acres) contains medium quality sawtimber. Red oak, white oak, black oak, white pine, black birch, sassafras, white ash, hickory, yellow birch, and tulip poplar are present. The understory includes hornbeam, hophornbeam, Christmas fern, Pennsylvania sedge, witch hazel, and maple leaf viburnum. The stand is understocked with acceptable trees.

Type G (Mixed Hardwoods) - This 6 acre sawtimber stand is fully stocked and contains poor to medium quality material. The overstory is made up of American beech, white ash, tulip poplar, yellow birch, white pine, red maple, and red oak. American beech, sugar maple, sassafras, mountain laurel, and sweet pepperbush are present in the understory. This stand is understocked with healthy trees.

Type H (Mixed Hardwoods) - This fully stocked pole stand (93 acres) is made up of poor quality trees. White oak, scarlet oak, black oak, white pine, hickory, black birch, sassafras and red maple and hemlock are present. The understory includes greenbriars, mountain laurel, huckleberry, lowbush blueberries, and striped pipsissewa. The stand is located on a poor hardwood growing site and is understocked with healthy trees.

Type I (Softwood/Hardwoods) - This fully stocked stand (16 acres) contains medium quality poles and sawtimber. Hemlock, scarlet oak, red oak, white oak, black birch, yellow birch, and red maple are present. Hemlock appears in the understory and the overstory. The understory includes mountain laurel and low bush blueberry. This stand is located on an average site for growing conifers and hardwoods.

Type J (Mixed Hardwoods) - This is a poor quality sawtimber stand (10 acres) that is fully stocked. The tree species include white oak, black oak, scarlet oak, red maple, American beech, red cedar, and sugar maple. The understory includes hornbeam, flowering dogwood, and partridge berry. The stand is composed of large sawtimber trees that originated around the time when pasturing was abandoned. Many of these trees are defective and the stand in general is understocked with healthy trees. This area represents an average growing site.

Type K (Open area/Power lines) - 8 acres.

Aesthetic Conditions

This forested parcel of land offers many of the rural amenities in which prospective homeowners are interested. The large size of the proposed houselots will allow the possibility of leaving much of the forest intact. A continuous forest would offer good screening effect and privacy between houselots. Also, a forested parcel gives the appearance of being larger than an open lot of the same size.

Large, healthy trees are usually considered aesthetically pleasing. The retention of these trees could add a considerable amount of aesthetic and shade value to the residential area. Hemlock, white pine, red oak, white oak, American beech, sugar maple, and tulip poplar would be the best species to retain for aesthetic purposes. Vegetation Type A contains the healthiest tree species. This area has the potential to grow the largest trees. A good portion of the dominant trees in Type A should be able to grow 20" to 26" in diameter.

Construction activities should be planned and conducted to minimize disturbances around the individual trees and in sections of the forest that are to be saved. Road building, filling, excavation, and soil compaction (from heavy machine use) may adversely affect the moisture and aeration balance within the soil (a considerable amount of cut and fill activity may be needed to put in driveways and roads that traverse the slopes). This could lead to the decline in tree health and vigor and may eventually lead to the death of affected trees within three to five years. Physical damage to the root system and trunk of the tree by machinery may also result in the decline of individual trees.

The removal of a large percent of the trees may have an adverse effect on the remaining trees. The sudden shock of being left in the open may be too much for a tree grown in the forest all its life. White oak, in particular, has a high mortality rate once it suddenly experiences total exposure. Oak will sprout unslightly epicormic branches along its trunk when the trunk is exposed to direct sunlight. Trees in the open are also more susceptible to damage from ice storms that may cause considerable crown breakage. Windthrow is also more prevalent in areas where a large percent of the trees have been removed.

Most of this woodland tract is particularly susceptible to infestation by gypsy moth because of its large component of oak and location on a dry ridge. There are numerous hemlocks in vegetation Types H and I that have succumbed as a result of recent gypsy moth defoliations. The defoliation has also been a factor that contributed to the crown dieback of oak. Moisture stress, defoliation, and adverse environmental factors may lead to oak decline. Favoring trees that the gypsy moth does not like to feed upon would make the area less susceptible to defoliation. Black birch, sugar maple, pignut hickory, yellow birch, red maple and tulip are some of these species that are not readily defoliated.

The streams are an excellent asset to the aesthetic quality of the property. Much of the area surrounding the stream should be left in its forested state.

Flowering dogwood and mountain laurel are the major flowering shrubs. These species should be retained for their aesthetic value. Where these species are present, some of the overtopping trees should be removed to allow more sunlight to reach the understory. This will stimulate the flowering of these shrubs.

Limiting Conditions/Potential Hazards

The overall condition of the trees on this property is acceptable. There are only a few trees that show signs of advanced decay or other potential hazard. Some of the black birch is affected with nectria canker; the formation of cankers on the trunk of these trees structurally weakens the trees and makes them susceptible to breakage. Hemlock and oak mortality will probably continue to follow major gypsy moth defoliations; oak may succumb a few years after being defoliated. The dead trees could be a potential hazard, particularly when near houses and powerlines. Mature black oak that is under stress has a high mortality rate after defoliation. Vegetation Type B and H are expected to have high oak mortality.

Windthrow is a potential hazard in vegetation Type C, G and I. Tree root depth is restricted by saturated soils. Saturated soils are more pliable. Shallow root systems and saturated soils make wetlands very susceptible to windthrow. Heavy harvesting of trees thath produce openings in the forest canopy should be avoided in areas with saturated soils since trees rely on each other for support.

Construction activities within wetlands which impede the natural drainage and raise water tables may have adverse effects on the forest vegetation. Trees will decline in health and may eventually die if the water table is raised substantially. Adequately sized and placed culverts should be installed where the proposed road and driveways cross any drainageway.

Management Considerations

The maintenance of healthy and vigorous trees should be a major concern in managing the vegetation of this property. Unhealthy trees are more susceptible to insect and disease problems, and are more apt to succumb than healthy trees. Forest stands that are experiencing stress from crowded conditions or lack of moisture may decline in health.

Currently, only vegetation Type H is experiencing excessive crowding. Most of the other vegetation typs are only slightly to moderately crowded. Vegeation Types A, B, F, and I would benefit from a very light sawtimber thinning. Only undesirable trees that compete with healthy trees for growing space and those trees that will succumb in the immediate future should be harvested. This should include approximately one-quarter of the sawtimber trees in vegetation Type B and I, one-third of the sawtimber trees in vegetation Type F, and one-fifth of the sawtimber trees in Type A. The harvest

in vegetation Type I should concentrate on removing a portion of the oak component and the sawtimber sized hemlock that is greater than 50% defoliated. Steep terrain will limit harvest to only part of vegetation Type I.

The sawtimber thinning should be done in conjunction with the land clearing-logging operation which is needed for the proposed roads, driveways, and house sites. The skid roads for the thinning and land clearing should follow the route of the proposed roads and driveways in order to minimize disturbances in the forest.

Vegetation Type H should be managed for softwoods since the relatively shallow and infertile soils make for a poor growing site for nutrient-demanding hardwoods. Conifers, which have a lower nutrient requirement than hardwoods, would be under less stress and therefore healthier than a hardwood stand in this area. A gradual transition to a softwood stand could be made if white pine is underplanted on a 15' spacing after a heavy thinning removes one-third to one-half of the poorest hardwoods. Additional hardwoods should be removed over a period of time. Most of the hardwoods should be harvested within 25 years of the underplanting since white pine will loose its vigor if shaded for a long period of time. A good portion of the natural white pine occurring in the understory in Type B appears healthy enough to respond to a partial overstory removal. The parts of vegetatiion Type B that have healthy young white pine in the understory can be thinned slightly heavier than the rest of the vegetation types, in order to increse the growth of the white pine. The white pine in vegetation Type B has the potential to become the replacements of the unhealthy oak in the overstory.

Vegetation Types B, H, and I should be managed in a fashion that generally decreases the oak component and increases the softwood component. The purpose of this direction of management would be to reduce the forest's susceptibility to gypsy moth defoliation and the associated potential mortality among the existing conifers and hardwoods. In addition, the increased conifer component would increase the overall health of the forest by growing trees more suitable for the site.

WILDLIFE CONSIDERATIONS

The proposed development site is approximately 200 acres in size. It is located on the east side of Cow Hill Road, bounded by the Connecticut Light and Power right-of-way on the north and Route 81 on the west in the Town of Clinton. Of the 200 acres, most is wooded. The mid-portion of the property is somewhat sloped. There is a wetland area in the section that borders Route 81 Three small brooks run into the wetland area on the property.

Wetlands cover a small area of the proposed project site. Wetlands are absolutely essential areas for many species of wildlife and important to all, because they provide the habitat requirements needed for survival. Not only are they important to wildlife, they are important to man also. They act as water storage and absorption areas that help prevent flooding. There is

usually severe inherent limitations in developing wetlands due to poorly drained unstable soil types.

Wetland habitat provides a rich variety of food, cover, nesting and brood rearing sites for a great number of wildlife species. They provide breeding and nesting sites for waterfowl. More than 50 species of game and nongame species habitat including beaver, bobcat, fox, mink, muskrat, opossum, white-tailed deer, snowshoe hare. Because of previous development there is less wetlands available for use by wildlife. Developing any small area by building on it will leave the majority of the area unavailable for wildlife to use.

Development will decrease the amount of habitat simply because the land will be occupied by physical buildings. The quality of the habitat will be decreased because an undeveloped area of land will be broken up with buildings and human activity.

Some species which require larger undeveloped areas will probably be forced out or will reduce their use of the area. They may be able to move into adjacent undeveloped areas if there is suitable habitat available and the competition with other species already occupying the area is not too great. Other species which are more adaptable to man's presence will probably remain. Some new species may even be attracted to the area.

Management Recommendations

If desired, the following wildlife recommendations can help lessen the impact to some species using the area. Some animals will leave the area, but others may find it even more attractive after development.

Design of Development/Wetlands

The impact on wildlife of the area can be lessened to some degree if some thought is given to the development. Housing developments can be designed in two basic ways. Houses can be built on larger house lots or they can be built on small lots or in clusters, leaving open space areas. Both designs leave more open space for wildlife as opposed to having small lots and developing the entire acreage.

As proposed, a 7 acre open space is to be left. Probably none of the wetland areas should be developed due to the severe limitations caused by soil capabilities and the regulations governing their development. The wetland areas should be left as the space areas if possible.

A buffer area of uncut vegetation should be left along the entire length of the watercourse. This will provide food, cover and nesting sites for many species. Because the brook will remain shaded, water temperature will not rise, making the brook uninhabitable for some species.

Clearing

When the initial clearing for building is done, try to leave as many trees and shrubs as possible, especially those useful to wildlife. Some useful species include:

white oak (Quercus alba)
red oak (Quercus rubra)
black cherry (Prunus Serotina)
Quaking aspen (Populus tremuloides)
red-osier dogwood (Cornus Stolonifera)
apple (Malus spp.)

Landscaping

On small acreage 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 (especially for songbirds) but will also be more aesthetically pleasing for the residents of the development.

Leave as many snag trees (standing dead trees) and den trees (trees with holes) as possible. These trees are used by insect eating birds and cavity nesting birds and mammals.

Plant trees and shrubs which are useful to wildlife and landscaping such as:

Japanese Barberry (Berberis Vulgaris)
Flowering Dogwood (Cornus Florida)
Honeysuckle (Lonicera spp.)
Juniper (Juniperus spp.)
Bayberry (Myrica Pensylvanica)
Maple-leaved Virburnum (Birburnum acerifolium)
Red-Osier Dogwood (Cornus Stolonifera)
Alternate-Leaf Dogwood (Cornus Alternifolia)
American Holly (Ilex opaca)
American Mountain Ash (Sorbus americana)
Autumn-Olive (Elaegnus Umbellata)
Winterberry (Ilex Verticillata)
American Cranberrybush (Veburnum Trilobum)
Red Maple (Acer rubrum)
Chokecherry (Prunus Virginiana)

A variety of trees and shrubs should be used. Most species of wildlife need to have cover when they move from place to place. By leaving corridors of vegetation, this will allow wildlife to utilize the area and also have access to adjacent areas. Large expanses of lawn with no trees or shrubs present should be discouraged. These fctors will allow wildlife to better utilize the area and thus make it more attractive to wildlife.

WATER SUPPLY

At the present time, there is no public water supply line available to the property. Therefore, water supplies to homes in the proposed subdivision would likely be serviced by individual on-site wells. Since no extensive sand and gravel deposits appear to exist within the site, underlying bedrock would be the most likely aquifer to be tapped. If sand and gravel deposits are saturated, these formations can generally yield water at a high rate compared to wells tapping the crystalline bedrock. Nevertheless, bedrock wells can generally yield quantities of water adequate for most domestic uses. The exact yield of a bedrock-based well is a function of many hydrogeologic factors, including the number and size of fractures present in the bedrock. Without expensive geophysical exploration, it is extremely difficult to predict such yields.

An assessment of presently installed bedrock based wells has been conducted for the lower Connecticut River basin which includes the subject site (Source: Connecticut Resources Bulletin No. 31, Lower Connecticut River Basin). This assessment allows one to predict the chances for any new well to achieve certain minimum yields. According to Connecticut Water Resources Bulletin No. 31, bedrock-based wells are analyzed in the basin area. Results indicate that 80 percent of the wells tapping the type of rock underlying the site yield 3 gallons per minute (gpm) or more: 50 percent yielded about 6.5 gpm or more and only 10 percent yielded 18 gpm. A well yielding 3 gpm should adequately meet the needs of most domestic households.

A survey of well completion reports for bedrock-based wells serving homes along Cow Hill Road and Heritage Lane indicates yields which range between 8 gpm and 25 gpm at varying depths of 105 feet to 280 feet.

The water quality of the groundwater may be expected to be good. However, there is a chance that water produced from wells tapping the underlying bedrock, especially the Middletown Gneiss member, may be mineralized with elevated levels of iron and manganese. Elevated levels of iron in water is objectionable because it imparts a brownish color to laundered goods and may affect the taste of the water or beverages such as tea and coffee made with the water. For the most part, elevated manganese levels are objectionable for the same reasons as iron. The recommended limit for iron in water is 0.3 milligrams per liter or parts per million and .05 mg/1 ppm for manganese (Source: U.S. Environmental Protection Agency, Office of Drinking Water, "National Interim Primary Drinking Water Regulations"). Some methods or treatments used to eliminate or remove elevated iron and manganese levels include: (1) a combination of automatic chlorination and fine filtration, (2) aeration followed by filtration, (3) iron exchange with green sand and, (4) treatment with potassium permanganate followed by filtration.

Because of the proposed lot sizes (2 to 7 acres) for Section I of the development, there should be sufficient area to locate wells properly from on-site septic systems and other potential sources of contamination. Wells should be located on a relatively high portion of each lot and in a direction opposite the expected direction of groundwater movement. In this regard, extra caution should be taken when locating wells on land which is down gradient from

Silver Birch Lane, especially where slopes are moderately steep. Road drainage which may be laden with road salt during winter months may find its way into a particular well, rendering the water unacceptable for domestic purposes.

WASTE DISPOSAL

Sewage disposal for the proposed development would be by means of on-site subsurface sewage disposal systems. The engineer's test pit data and visual observations would indicate the major constraints for sewage disposal would be depth to bedrock, areas of rock outcrops and slope. A more limited portion would have some possible concern for elevated ground water.

In general, a minimum of four feet of original soil should be maintained between the bottom area of a leaching system and bedrock. In cases where bedrock is less than 5 feet below ground surface the lots would be in areas of special concern. Another factor of concern is where ground slopes exceed 25%. On lots with a combination of these features on-site sewage disposal systems would need to be carefully designed, located and installed in order to prevent partially treated or renovated sewage effluent from seeping or breaking out to the surface down gradient of the systems.

As the depth to bedrock can also be quite variable within a relatively limited area, it is quite important that a sufficient number of observation holes be dug over an area large enough to accommodate a leaching system of the size which would be needed for a particular lot. In this regard, submitted percolation test results, which were all satisfactory, were generally in the ranges requiring 165 or 225 square feet of effective leaching area per bedroom. There are a few noted exceptions, primarily for those lots closest to Route 81. Lots with the slower seepage rates and keeping leaching systems shallow and somewhat spread out would basically need an area some 55 or 75 feet long and 30 feet wide for installation purposes (3 bedroom house). Where there is less than 6 to 7 feet of existing soil over bedrock, placement of fill material becomes necessary. The more fill that is needed the more critical site improvements and construction become.

In general, considering the quantity of sewage generated and discharged by single family dwellings, the proposed lots should be large enough for both sewage disposal and water supply provided that a sufficient suitable area is available for subsurface leaching systems and that wells are properly located.

PLANNING CONCERNS

Compliance with Plans of Development/Zoning

The plans of Development of Clinton and the Connecticut River Estuary Regional Planning Agency call for low density development of this site. The regional plan of development designates this site as a natural resource area because of its environmental sensitivity to development. These environmental

problems for development are caused by the wetlands, shallow depth to bedrock and steep slopes that are found on this site. This proposed subdivision would be in accord with the Clinton plan of development but special care should be taken to insure that the design of this subdivision takes into account the environmental constraints described in the Regional Plan of Development. The zoning reflects the Clinton Plan of Development's recommendation for low density use by requiring a minimum of 80,000 square feet would be compatible with the surrounding land use which is also low density residential development.

Split Lots

There are three lots shown on this preliminary plan which are located in both Clinton and Killingworth. It is recommended that these lot lines be adjusted so that lots are not split by a town line. This makes the provision of public services and the application of property taxes easier for the towns to administer.

Roads/Traffic

The preliminary plan shows a road located along the Killingworth town line. This allows lots in Killingworth to have frontage on a road in Clinton, bringing about potential problems concerning responsibility for road maintenance and the provision of public services. It is recommended that this road be moved in a southerly direction so that building lots rather than a road are abuting the town line. The topography would not seem to preclude this change. A more southerly location would also improve the alignment of this road with Roast Meat Hill Road.

Extending out from this road is a cul-de-sac running up into Killingworth. The only access to this cul-de-sac, therefore, will be via a road in Clinton. This road in Clinton will have to be used by the Town of Killingworth to provide public services to the Killingworth residents located on this cul-de-sac. The developer should investigate the possibility of running this cul-de-sac in from the Killingworth side of the town line. This will simplify the administration of public services to these building lots by the Town of Killingworth.

The proposed roads have many sharp curves because of the topography of this site. The town should insure that the sight distance at curves are adequate. The driveways of lots near curves should also be located so that adequate sight distances are obtained.

The section of the subdivision located east of Route 81 has a road running in a southerly direction that passes over the top of a knoll. The field review indicated that the slope of this road would be very steep. The town should carefully review the final design for this section of the road to insure that grades are not too steep.

There are two road intersections in the vicinity of lot 25. The location of these roads should be adjusted so that they intersect at the same point

creating a four way intersection. This will be safer than the "jog" created by the two three-way intersections presently shown.

There are major difficulties with the location of the road in the vicinity of lots 17 and 18. The steepness of the slope in this area will create potential problems with access to building lots and erosion. A safer alignment for the road would be along the top of the hill. This would probably mean a reduction in the number of building lots, but this is justified by the steep terrain located in this area.

Some lots have frontage on either Route 81 or Cow Hill Road as well as having fontage on roads within the subdivision. In these cases, the development approvals should specify that driveway access be by roads within the subdivision. The roads within the subdivision would be safer for driveway access because of lower vehicle speeds and lower traffic volumes.

About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, archeologists, recreation specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area.

The Team is available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected officials of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the Chairman of your local Soil and Water Conservation District. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, and a statement identifying the specific areas of concern the Team should address. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information regarding the Environmental Review Team, please contact Jeanne Shelburn (774-1253), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, P.O. Box 198, Brooklyn, Connecticut 06234.