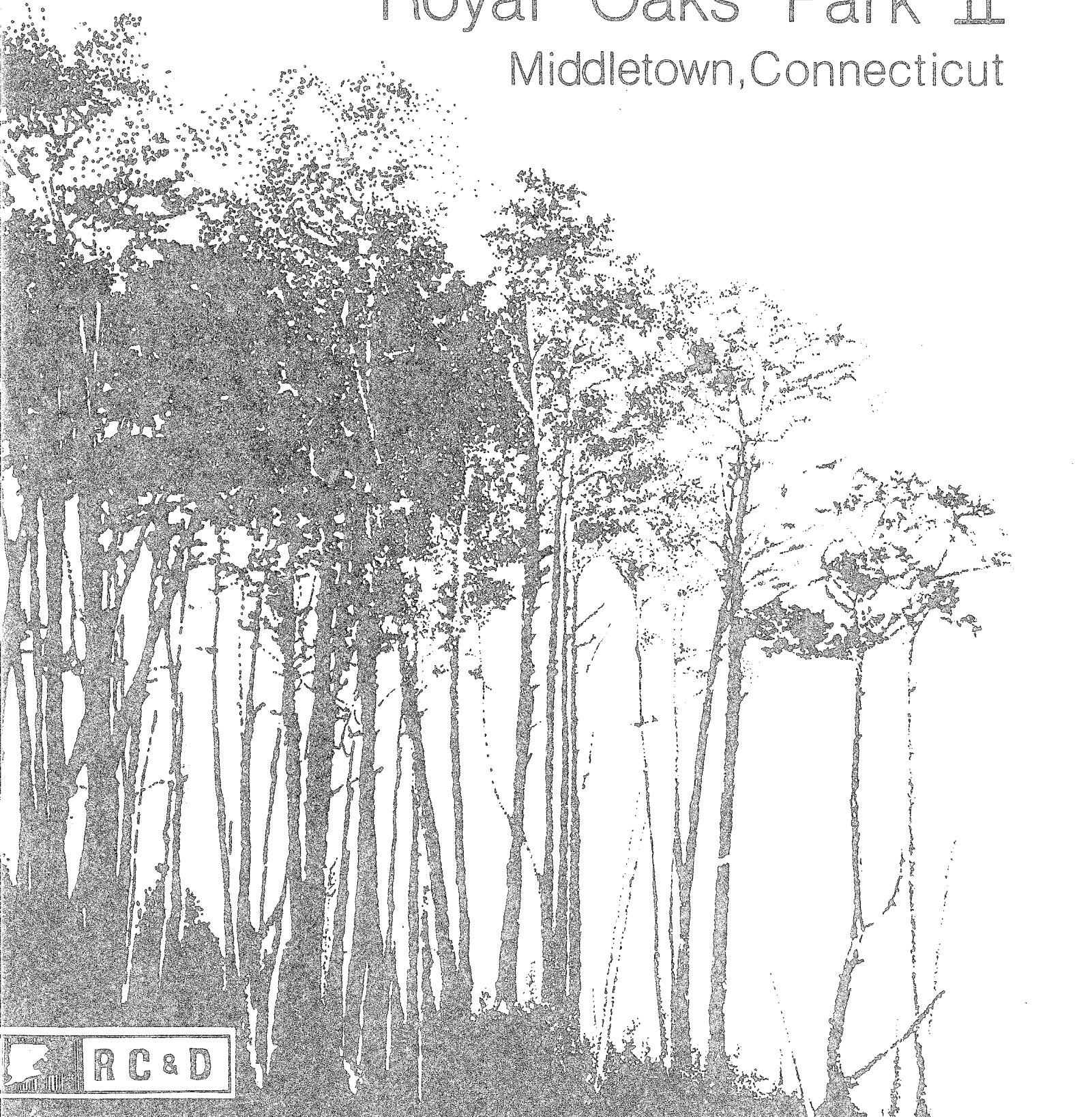


Environmental Review Team Report

# Royal Oaks Park II

Middletown, Connecticut



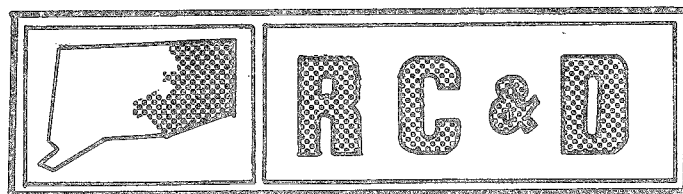
EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team  
Report  
on

Royal Oaks Park II

Middletown, Connecticut

July 1981

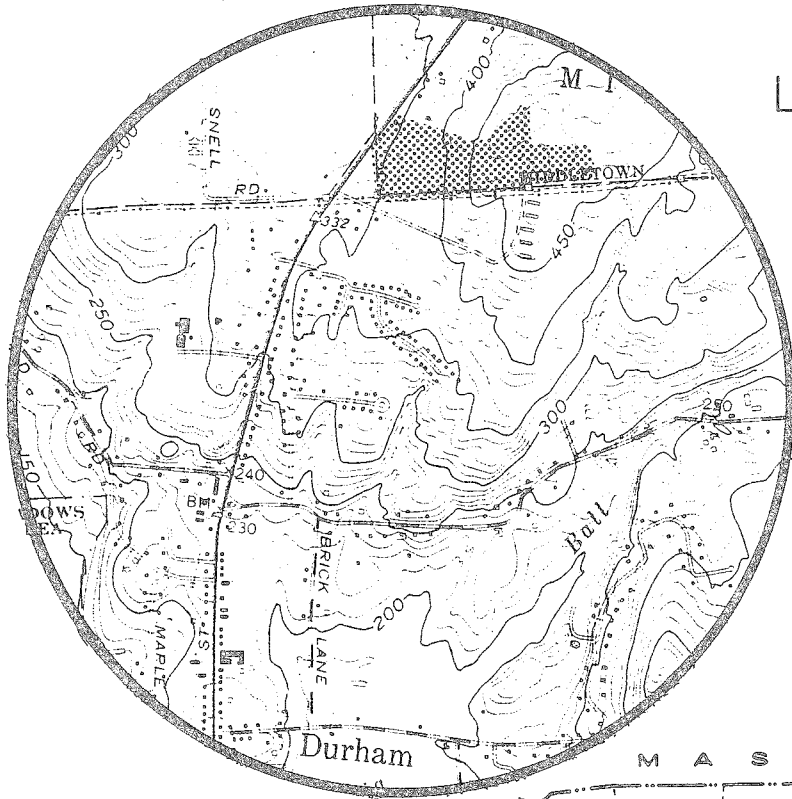


eastern connecticut resource conservation & development area

environmental review team  
139 boswell avenue  
norwich, connecticut 06360

# Location of Study Site

ROYAL OAKS PARK II  
MIDDLETOWN, CONNECTICUT



EASTERN CONNECTICUT  
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT  
ON  
ROYAL OAKS PARK II  
MIDDLETOWN, CONNECTICUT

This report is an outgrowth of a request from the Middletown Health Department 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. The request was approved by the RC&D Executive Committee and the measure was reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The soils of the site were mapped by a soil scientist from the United States Department of Agriculture, Soil Conservation Service (SCS). Reproductions of the soil survey map, a table of soils limitations for certain land uses and a topographic map showing property boundaries were distributed to all Team members.

The ERT that field-checked the site consisted of the following personnel: Barry Cavanna, District Conservationist (SCS); Mike Zizka, Geologist, Connecticut Department of Environmental Protection (DEP); Rob Rocks, Forester, DEP; Valerie Zampaglione, Engineer, Midstate Regional Planning Agency; Don Capellaro, Sanitarian, State Department of Health; and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

The Team met and field checked the site on Thursday, June 18, 1981. Reports from each contributing Team member were sent to the ERT Coordinator for review and summarization for the final report.

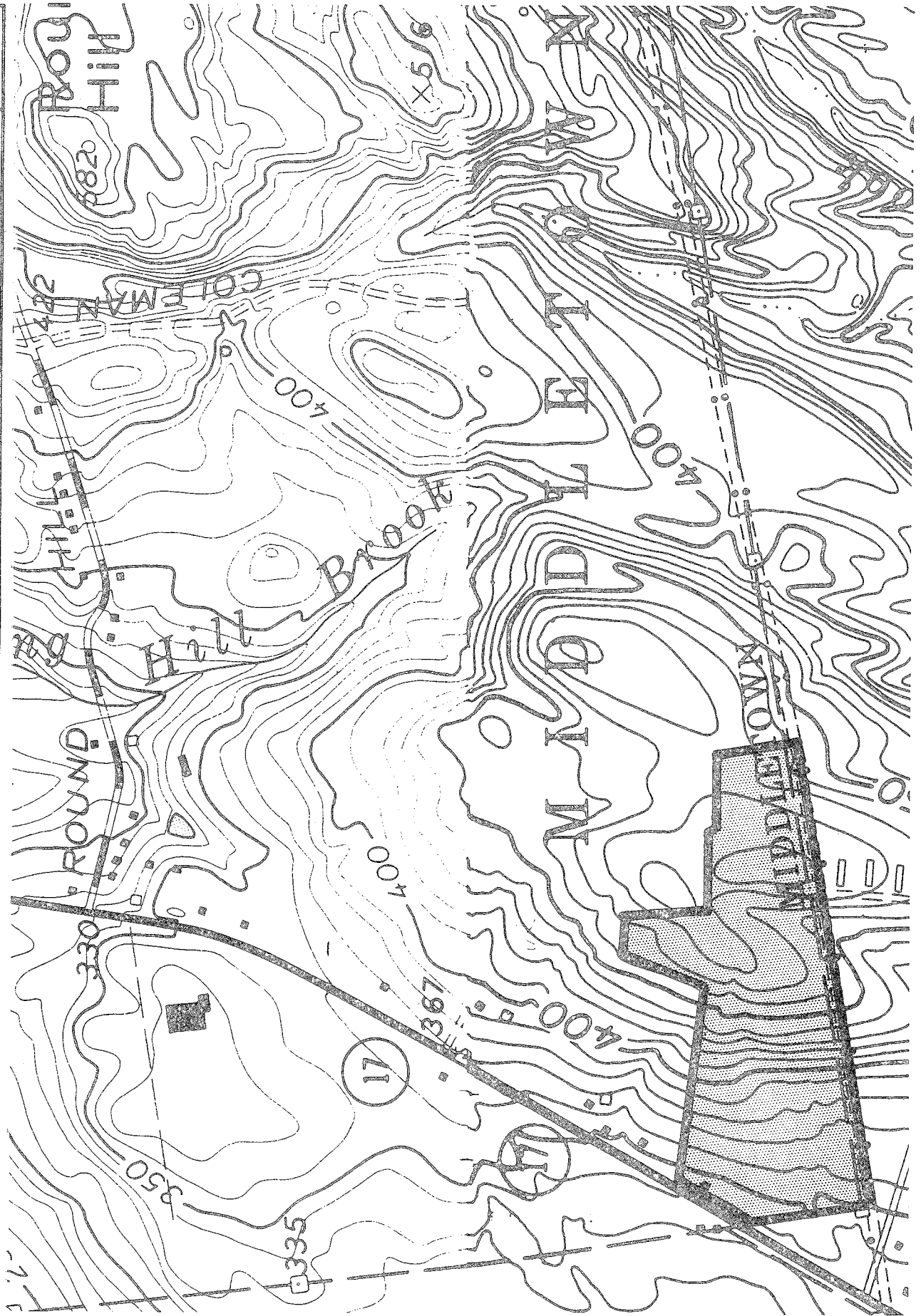
This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. This report identifies the existing resource base and evaluates its significance to the proposed development and also suggests considerations that should be of concern to the developer and the City of Middletown. 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 that this report will be of value and assistance in making any decisions regarding this particular site.

If you require any additional information, please contact: Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360, 889-2324.

# Topography

— Site Boundary



## INTRODUCTION

The Eastern Connecticut Environmental Review Team was asked to prepare an environmental assessment for the second phase of a single-family home development to be known as Royal Oaks Park II. The site is approximately 45 acres in size and is located in Middletown on the eastern side of Route 17 at the Middletown/Durham town line. The property is currently in the private ownership of Hyman and Anita Stollman, Colchester residents. J. Robert Pfanner and Associates has prepared preliminary plans for the development. The Environmental Review Team prepared a similar assessment for the first phase of this project which is located on an adjacent property in the town of Durham. The report was titled the "Stollman Property" and was completed in December 1979.

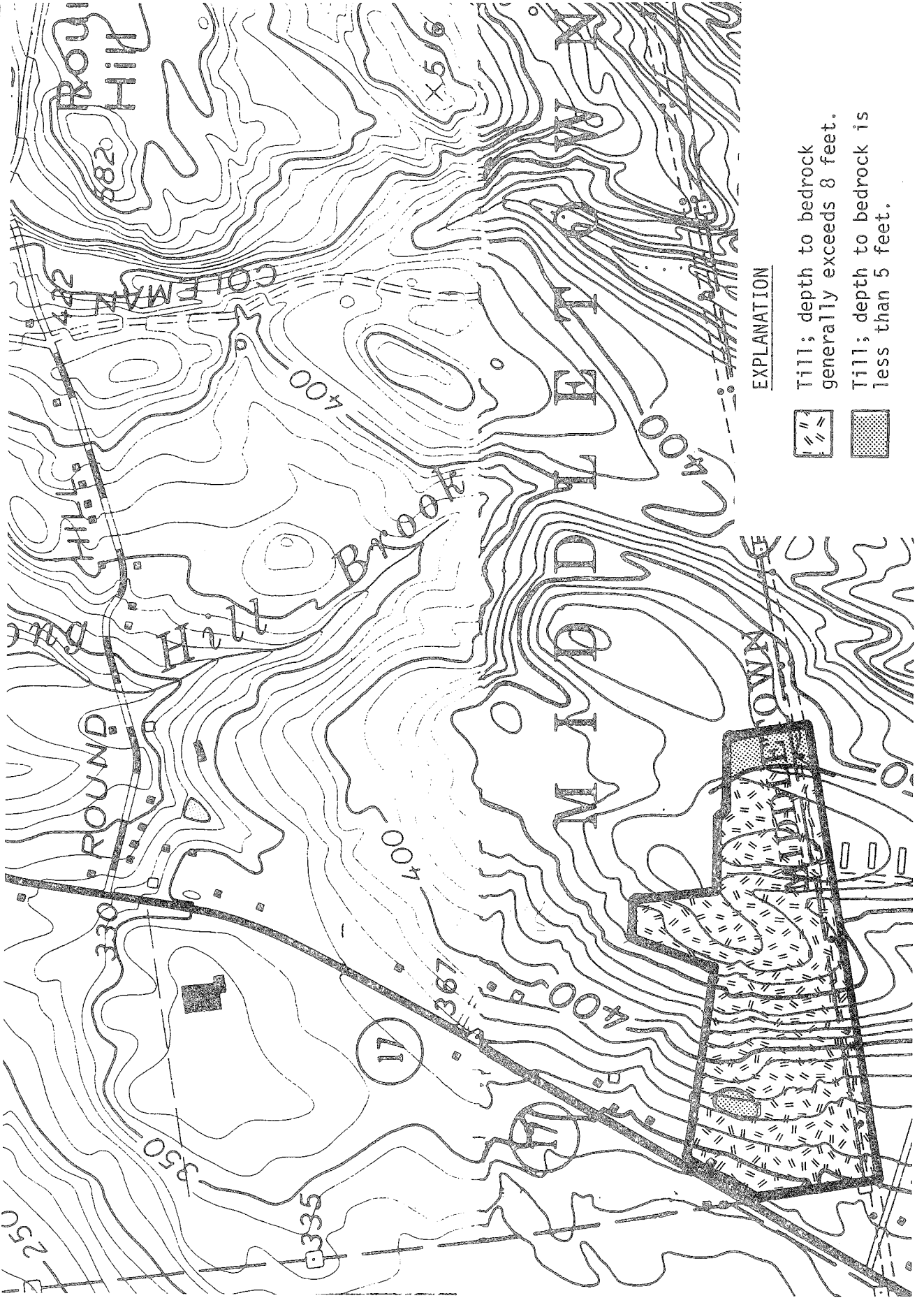
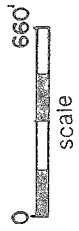
Proposed plans for "Royal Oaks Park II" show seventy lots, each being approximately one-half acre in size. All lots would be served by public water and individual on-site septic disposal systems. A single roadway extends east from Route 17 into the site, forming a loop and cul-de-sac to provide access to interior lots. A portion of this roadway will connect with adjacent subdivision streets in Royal Oaks Park I.

Notable features of the site include a large, gently sloping meadow in the western portion of the property, a steeply sloping, heavily wooded area in the central section of the property and a flat, forested area on the eastern side of the property. A small pond is located in the central section of the site. Given the variety of ornamental vegetation present and its planting pattern, it is possible that this site was formerly used as a nursery. Evidence of abandoned chicken coops was also found during the field review. Soil series typical of the site range from the Hartford series to the Ludlow and Wethersfield series. Over half of the proposed site lies within the watershed of Middletown's Laurel Brook public water supply reservoir.

The Team is concerned with the effect of this development 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. Severe limitations to development on this site are caused by the presence of slowly percolating soils, shallow depth of soils to underlying bedrock, and steep slopes. These natural limitations will cause problems when constructing foundations, roadways and septic systems as discussed in following sections of this report. The proposed plans appear to have a number of engineering inadequacies which are outlined in detail in the Soils, Storm Drainage, Ground Water Controls, and Road Design sections of this report.

Major Team concerns are centered on the proposed density of this subdivision and the ability of the site's resource base to sustain this density. After applying the Middletown subdivision regulations to this proposal, it is doubtful that there is ample space on each lot for a house and a septic system in areas of favorable soils. The site's location in the water supply watershed compounds the space problem as setback requirements determined by the State Department of Health are much more stringent in these areas.

# Surficial Geology



### EXPLANATION



Till; depth to bedrock generally exceeds 8 feet.



Till; depth to bedrock is less than 5 feet.

The Team suggests that the town examine this proposal very carefully for compliance with its subdivision regulations, that a thorough sediment and erosion control plan be included with the proposal for protection of water quality in this area and that all stormwater drainage and control measures be adequately sized to retain additional runoff on site, not causing additional flooding for downstream landowners in Durham.

## ENVIRONMENTAL ASSESSMENT

### GEOLOGY

Royal Oaks Park II lies within the Durham topographic quadrangle. A surficial geologic map of that quadrangle has been published by the U.S. Geological Survey (GQ-756, by H.E. Simpson, 1968). From that map, as well as from on-site inspection and logs of test holes supplied by the developer's engineer, the surficial geologic materials on the site (those consolidated materials overlying bedrock) are interpreted to consist of till. Till is a glacial sediment composed of rock particles and fragments which accumulated in an ice sheet as it spread over the land, and which were redeposited from the ice without having been sorted by meltwater. Because the ice sheet acted like a bulldozer in collecting and redepositing rock particles without regard to shape or size, the components of till run the gamut from clay to large boulders. Whereas the larger particles are often the most prominent feature of till, sand is generally the principal component. Most of the till on the site is fairly compact although the upper 2-3 feet are commonly looser. The depth to bedrock, as indicated by the logs of numerous test pits, generally exceeds eight feet. Two relatively restricted areas, shown on an accompanying illustration, had bedrock within five feet of the surface. These areas include proposed lots 10, 11, and 35-40. Engineered septic systems will probably be needed on these lots.

Although the bedrock geology of the Durham quadrangle has not yet been published, an open-file map is available for inspection at the Department of Environmental Protection's Natural Resources Center in Hartford. The bedrock is classified as Portland Arkose, a formation consisting of grayish red to reddish brown and pale brown, coarse- to fine-grained arkose (feldspar-rich sandstone) with interbedded arkose conglomerate (arkose containing pebbles and cobbles of different rock types), red and gray shale, mudstone, and grayish green, less feldspathic sandstone. No bedrock outcrops were observed on the site.

### HYDROLOGY

Surface drainage flows in four general directions on the site. About 24.5 acres of the property (the western two-thirds) drains westward by sheet flow; i.e., there is no well-defined watercourse. This portion of the site lies within the watershed of Laurel Brook Reservoir, which is located northwest of the property along the Middlefield - Middletown boundary. Approximately 6.5 acres near the center of the site drains to a swale that seasonally contains a southward

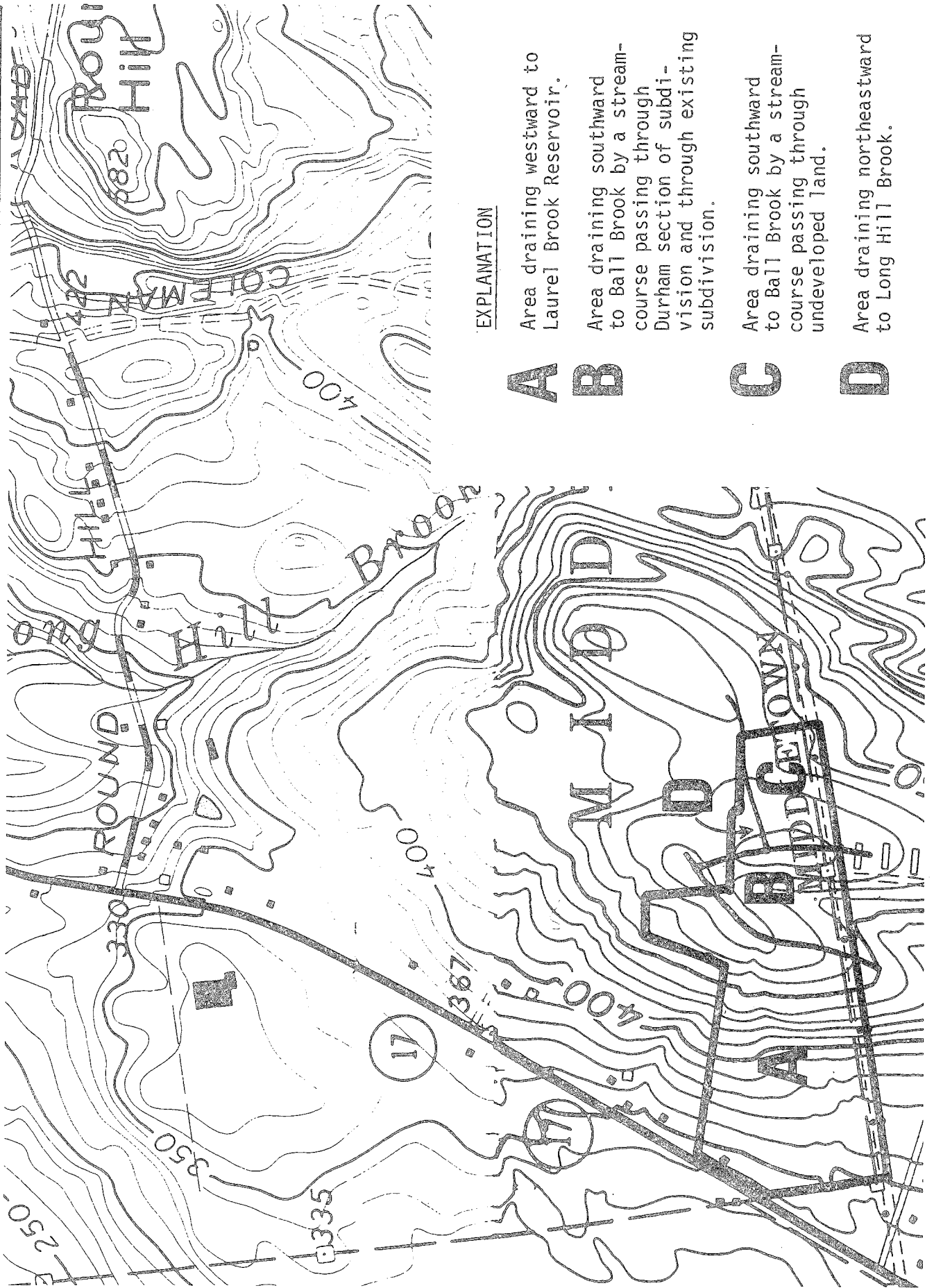


# DRAINAGE AREAS

— Site Boundary



A



## EXPLANATION

- A** Area draining westward to Laurel Brook Reservoir.
- B** Area draining southward to Ball Brook by a stream-course passing through Durham section of subdivision and through existing subdivision.
- C** Area draining southward to Ball Brook by a stream-course passing through undeveloped land.
- D** Area draining northeastward to Long Hill Brook.

flowing stream. About 5.2 acres at the eastern side of the parcel drains to a small valley that also carries seasonal flows to the south. Both south-flowing streams are tributary to Ball Brook, which, in turn, is tributary to Coginchaug River. A very small area of about 0.8 acres drains northeastward to Long Hill Brook, a north-flowing stream that feeds Dooley Pond in Middletown. The four drainage areas are shown in an accompanying illustration.

The development of the site as planned will lead to increases in surface runoff. The increases would result largely from the removal of vegetation and from the covering of pervious soils by impermeable surfaces, such as buildings or pavement. Half-acre development greatly reduces the absorptive ability of the land, so the runoff increases may be expected to be substantial. The table below gives estimates of both present and post-development runoff depths for significant storms. Rainfall estimates for the various storms are based upon data collected by the U.S. Geological Survey.

TABLE 1: Estimated Present and Post-Development Runoff Depths on the Site During Significant Storms.

	2-Year 24-Hour Storm	10-Year 24-Hour Storm	25-Year 24-Hour Storm	50-Year 24-Hour Storm	100-Year 24-Hour Storm
Rainfall	2.65 inches	4.35 inches	5.50 inches	6.50 inches	9.00 inches
Present runoff Depth	0.54 inches	1.58 inches	2.42 inches	3.21 inches	5.34 inches
Post-development runoff depths	1.00 inches	2.34 inches	3.34 inches	4.23 inches	6.57 inches
Percent increase	85%	48%	38%	32%	23%

Runoff increases from the central area of the site (Area B on the accompanying illustration) should be of the most concern. The intermittent watercourse that carries drainage from that area passes through the Durham section of the Stollman Property, which the Team reviewed in 1979, and which already has been approved for subdivision. The watercourse then continues southward, flowing by or through lots in an existing subdivision. The Team discussed the expected runoff and peak flow increases on the Durham section of the subdivision in its previous report. Peak flow increases in the stream near one residential lot were expected to range from 14 percent for a 100-year storm to 36 percent for a 2-year storm. The final form of the Durham section of the subdivision may be different from the plan that the

Team reviewed, and the expected runoff increases may no longer be the same as indicated in the earlier report. Nevertheless, the developer should assure that the additional runoff increases that would be generated by the Middletown section of the subdivision will not create or add to flooding or erosion problems in Durham.

The runoff increases anticipated on the other sections of the property should not cause any immediate problems for neighboring landowners since there are no residences that are both close to the site and downstream from those sections. However, all developments should be viewed in the context of the total potential for development in their drainage areas. The cumulative impact of a series of small developments may be substantial. For this reason, landowners should be encouraged to take steps to mitigate the flow of surface waters resulting from the development of their parcels. It is especially important on this site to consider measures that would reduce the flows from the largest drainage area (Area A). The eastern drainage area (Area C) is not so important, as it is quite small and relatively isolated from other easily developable areas.

## VEGETATION

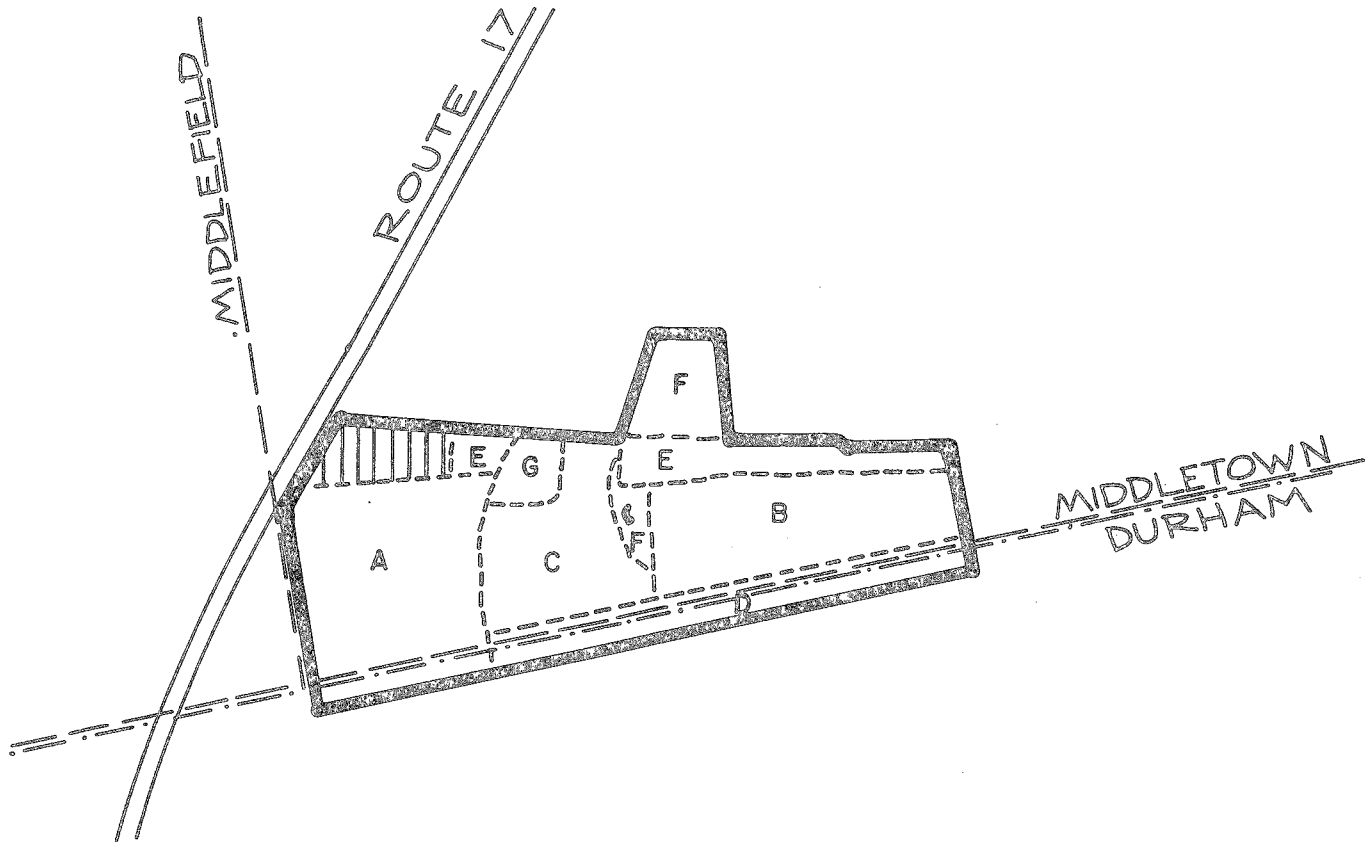
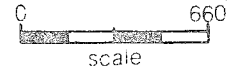
The property proposed for development of Royal Oaks Park II may be divided into seven vegetation types. These include three mixed hardwood areas which total 17 $\pm$  acres; open field, 11 $\pm$  acres; old field/powerline, 6 $\pm$  acres; old field, 4 $\pm$  acres; and a spruce plantation, 1 $\pm$  acre. (Please see the Vegetation Type map and Vegetation Type Descriptions.) Vine species which are causing damage to their supporting trees are abundant throughout this property. To improve the health and aesthetic quality of the trees on this site, these vines should be eradicated. Poison ivy represents a hazard to future owners of this property and should be eradicated prior to construction if at all possible. To avoid potential hazards, the spruce plantation should receive a light thinning prior to development in this area. If this is not desired, the entire plantation should be removed prior to development.

### Vegetation Type Descriptions

Type A. (Open Field) There are approximately 11 acres of open field present on this property. This field is vegetated with a variety of grasses, goldenrod, ragweed, cow vetch, daisy fleabane, ox-eye daisy, ground-nut, yarrow, hop clover, white clover, partridge-pea, black-eyed-Susans, and common cinquefoil. Woody vegetation has not yet become established.

Type B. (Mixed Hardwoods) This 8 $\pm$  acre area is in a transition from an old field area to a mixed hardwood stand. It is understocked with sapling to pole-size red cedar, gray birch, red maple, apple, big tooth aspen and occasional white ash, black cherry, and red oak. All of the trees in this stand are declining in health as a result of the vine species which they support. The shrub species which are present include spice bush, arrowwood, raspberry, staghorn sumac, smooth sumac, highbush blueberry, elderberry and graystemmed dogwood. Vine species including poison ivy, fox grape, summer grape, oriental bittersweet and whisteria are wide spread and using the trees which are present for support. Ground cover in this stand is made up of Virginia creeper, sensitive fern and violet.

# Vegetation



## LEGEND

- Road
- Property Boundary
- Vegetation Type Boundary
- Town Line
- Utility Line
- Residential Area 2 Acres
- Pond

## VEGETATION TYPE DESCRIPTIONS\*

- TYPE A. Open Field, 11 $\pm$  acres.
- TYPE B. Mixed Hardwoods, 8 $\pm$  acres.  
Under-stocked, sapling to pole size.
- TYPE C. Mixed Hardwoods, 6 $\pm$  acres.  
Fully to over-stocked, sapling to pole size.
- TYPE D. Old Field/Powerline 6 $\pm$  acres.  
Under-stocked, seedling to sapling size.
- TYPE E. Old Field, 4 $\pm$  acres.  
Under-stocked, seedling size.
- TYPE F. Mixed Hardwoods, 3 $\pm$  acres.  
Over-stocked, pole size.
- TYPE G. Plantation, 1 $\pm$  acres.  
Over-stocked, pole size.

\* Seedling-size = Trees 1 inch and smaller in diameter at 4 1/2 feet above the ground (d.b.h.)

Sapling-size = Trees 1 to 5 inches in d.b.h.

Pole-size = Trees 5 to 11 inches in d.b.h.

Type C. (Mixed Hardwoods) Sapling to pole-size scarlet oak, black cherry, red maple, sugar maple, shagbark hickory, apple, red cedar and gray birch are present in this 6± acre fully to overstocked stand. Included in this area's understory is highbush blueberry, spicebush, multiflora rose, and black cherry seedlings. Oriental bittersweet and wisteria vines are present in the overstory along with poison ivy. Virginia creeper, Solomon's seal and Canada mayflower form the ground cover in this area.

Type D. (Old Field/Powerline) Seedling to sapling size black oak, black cherry, gray birch, black birch and eastern red cedar are present in this 6± acre understocked area. Multiflora rose, smooth sumac, staghorn sumac, highbush blueberry, graystemmed dogwood, arrowwood, and bayberry are some of the shrub species which are present. Ground cover is made up of grasses, deertongue, raspberry, wild strawberry, dewberry, common cinquefoil, anjelica, milkweed, spirea, goldenrod, and poison ivy.

Type E. (Old Field) Approximately 4 acres of old field which are understocked with seedling size red maple, black cherry, eastern red cedar, privet, staghorn sumac and alder are present along the northern boundary of this property. Several rows of high quality pole-size Norway maple and red oak are established along the perimeter of the easternmost field. Ground cover in these fields consists of grasses, goldenrod, black-eyed-Susan and milkweed.

Type F. (Mixed Hardwoods) This 3± acre overstocked stand is made up of medium quality pole-size red maple with scattered white ash, black cherry and shagbark hickory. The understory is dominated by spicebush, highbush blueberry, arrowwood and the following vine species: poison ivy, Virginia creeper and wisteria. Skunk cabbage, Jack-in-the-pulpit, royal fern, marsh fern, cinnamon fern and evergreen woodfern form the ground cover in this stand.

Type G. (Plantation) Pole-size white spruce with occasional Norway spruce and black cherry are declining in health and vigor in this 1± acre overstocked stand. Seedling size black birch, black cherry and spicebush are also present. Poison ivy, Virginia creeper, marginal woodfern and raspberry form the ground cover in the more open areas.

The proposed intensive development of this property will necessitate extensive clearing of vegetation. This clearing could result in increased runoff and subsequent erosion during the construction period. A sediment and erosion control plan prepared for this proposal should take this vegetation removal into account.

The health and vigor of the trees present throughout this tract is being affected by the vine species which are so abundant. These vine species significantly stress their supporting trees through intense competition for sunlight, water and nutrients. Over time, this intense competition may result in mortality of the supporting trees.

If trees are to be retained on these lots for their aesthetic and shade value, the vines which are at present causing damage should be mechanically removed. These trees, if released from domination by vines, have the potential to respond by becoming healthier and more vigorous over time.

It should be noted that trees are sensitive to the condition of the soil within the entire area under their crowns. Development practices near trees such as excavating, filling and grading for construction of roadways, buildings, and septic systems may disturb the balance between soil aeration, soil moisture level and soil composition. These disturbances may cause a decline in tree health and vigor, potentially resulting in tree mortality within three to five years. Mechanical injury to trees may cause the same results.

Care should be taken during the construction period not to disturb the trees that are to be retained. In general, healthy, high vigor trees should be favored over unhealthy trees because they are more resistant to the environmental stresses brought about by construction practices.

The poison ivy which is widespread throughout this entire tract may be hazardous to the health and well being of lot owners if it is not controlled. As roadways and lots are developed, some of this poison ivy will be mechanically controlled. In some instances, development actions may, however, stimulate poison ivy growth by allowing direct sunlight to reach it. Given the possibility of this increase, effective eradication may be accomplished through the careful application of a federal and state approved herbicide, such as Amitrol-T or Ammate-X (AMS). When using these, or any herbicides, it is important to follow the label directions and precautions exactly. Ideally this treatment should take place prior to the actual subdivision of the tract and sale of individual lots. If this is not possible, it would be feasible for future lot owners to treat on an individual lot basis, however, this type of treatment would be more costly and less effective than large scale treatment.

The presence of spice bush as a major component of the understory in each of the three mixed hardwood stands indicates that the soils which are present have a reasonably high moisture holding capacity. This condition allows trees to have high growth potentials.

The spruce trees which are present in Vegetation Type G (Plantation) are extremely crowded. Many of these trees do not have enough live crown to sustain enough yearly growth for adequate health. Under these conditions, trees are very susceptible to weather, disease, and insect damage. As a result of their close proximity to each other, they provide support and stability to one another. Large openings made for house lots, septic systems or driveways may increase the potential for further damage by top breakage and windthrow. A light thinning in this stand removing no more than one-third of the total number of trees will help to gradually reduce the crowded condition, improving the health, vigor and stability of the residual trees. Several years after this thinning, the residual trees will be more stable and better able to survive the impact of clearing for development. If the retention of some of these trees is not important enough to hold off development in this area until several years after the proposed thinnings, then the entire stand should be removed all at once to avoid potential hazards.

The trees which are present in both Vegetation Types C and F (Mixed Hardwoods) are also declining in health and vigor due to their crowded condition. Clearing for the development of this property will provide more than adequate space for residual trees to grow. In fact, the intensive clearing may cause residual trees to produce excessive branching caused by abrupt exposure of these trees to direct sunlight.

If house lots are to be landscaped with plant material present on the site of Royal Oaks I (phase one of this proposal), please refer to the information on transplanting which was given in the Vegetation Section of the ERT Report "Stollman Property" Durham, Connecticut, December 1979.

## SOILS

A detailed soils map of this site is included in the Appendix to this report, accompanied by a chart which indicates soil limitations for various urban uses. As the soil map is an enlargement from the original 1,320 feet/inch scale to 660 feet/inch, the soil boundary lines should not be viewed as absolute boundaries, but as guidelines to the distribution of soil types on the site. The soil limitation chart indicates the probable limitations for each of the soils for on-site sewerage, buildings with basements, buildings without basements, streets and parking, and landscaping. However, limitations, even though severe, do not preclude the use of the land for development. If economics permit large expenditures for land development and the intended objective is consistent with the objectives of local and regional development, many soils and sites with difficult problems can be used. The soils map, with the publication Soil Survey, Middlesex County, Connecticut, can aid in the identification and interpretation of soils and their uses on this site. Know Your Land: Natural Soil Groups for Connecticut can also give insight to the development potentials of the soils and their relationship to the surficial geology of the site.

Soil series typical of this site are described as follows:

Ludlow silt loam. This gently sloping, moderately well drained soil is on drumlins and concave slopes of glaciated uplands. Areas are oblong or irregular in shape and range from 3 to 100 acres. Slopes are smooth and concave and 100 to 500 feet long.

Typically, the surface layer is dark brown silt loam eight inches thick. The subsoil is eighteen inches thick. The upper twelve inches is reddish brown silt loam. The lower six inches is dark reddish brown, mottled silt loam. The substratum is dark reddish brown, very firm, mottled gravelly loam to a depth of sixty inches or more.

Included with this soil in mapping are small, intermingled areas of well drained Cheshire and Wethersfield soils and poorly drained Wilbraham soils. Included areas make up 5 to 15 percent of this map unit.

The permeability of this soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. Available water capacity is moderate. Runoff is medium. This soil dries out and warms up slowly in the spring. Unlimed areas are very strongly acid to medium acid in the surface layer and subsoil and very strongly acid to slightly acid in the substratum. This soil has a seasonal high water table at a depth of about twenty inches from late autumn until midspring.

This soil has fair potential for community development. The slowly permeable or very slowly permeable substratum and the seasonal high water table are the major limitations. Onsite septic systems need careful design and installation. Artificial drains help prevent wet basements. Steep slopes of excavations tend to slump when saturated. Lawns are wet and soft in spring and autumn and for

several days after heavy rains in the summer. Quickly establishing plant cover, providing temporary diversions, and establishing siltation basins are suitable management practices during construction.

Hartford sandy loam. This nearly level, well drained soil is on glacial outwash plains and stream terraces in the northwestern part of the county. Areas are irregular in shape and range from 5 to 300 acres. Slopes are smooth.

Typically, the surface layer is dark brown sandy loam nine inches thick. The subsoil is fifteen inches thick. The upper seven inches is yellowish red sandy loam, and the lower eight inches is reddish brown loamy sand. The substratum is reddish brown, stratified sand and gravel to a depth of sixty inches or more.

Included with this soil in mapping are small, intermingled areas of excessively drained Manchester soils, well drained Branford soils, and moderately well drained Ellington soils. Included areas make up 5 to 15 percent of this map unit.

The permeability of this soil is moderately rapid in the surface layer and subsoil and rapid to very rapid in the substratum. Available water capacity is moderate. Runoff is slow. This soil dries out and warms up early in the spring. Unlimed areas are very strongly acid to medium acid.

This soil has good potential for community development. Droughtiness is the major limitation. Onsite sewage systems need careful design and installation. Steep side slopes of excavations are unstable. Lawn grasses, shallow-rooted trees, and shrubs require watering in summer. Quickly establishing plant cover is a suitable management practice during construction.

Wethersfield loam. This sloping, well drained soil is on drumlins and side slopes of glacial till uplands. Areas are oblong or irregular in shape and mostly range from 3 to 50 acres. Slopes are mostly 100 to 400 feet long.

Typically, the surface layer is dark brown loam eight inches thick. The subsoil is reddish brown and dark reddish brown loam eighteen inches thick. The substratum is very firm, reddish brown gravelly loam to a depth of sixty inches or more.

Included with this soil in mapping are small, intermingled areas of well drained Cheshire and Yalesville soils, moderately well drained Ludlow soils, and poorly drained Wilbraham soils. Also included are a few small areas with stones and boulders on the surface and a few areas of soils that have a silt loam or fine sandy loam surface layer. Included areas make up 5 to 15 percent of this map unit.

The permeability of this soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. Available water capacity is moderate. Runoff is rapid. This soil is very strongly acid or strongly acid in the surface layer and subsoil and very strongly acid to medium acid in the substratum.

This soil has fair potential for community development. The soil is limited mainly by the steep slopes and the slowly permeable or very slowly permeable substratum. Onsite septic systems need careful design and installation. Steep slopes of excavations slump when saturated. Erosion is a major concern in unprotected areas of this soil. Quickly establishing plant cover, providing temporary diversions, and establishing siltation basins are suitable management practices during construction.



Very limited erosion and sedimentation controls have been incorporated into this subdivision plan. The proposed erosion and sediment controls include: two foot sumps in catch basins to catch sediment, a retention basin which will act as a sediment basin collecting storm water from only two of the four watershed areas of the subdivision, and a detail showing that hay bales should be used at the toe of fill embankments, but no specific locations for haybales are outlined on the plans. No other notes or guidelines are on the plans.

A Construction Schedule should be included on the plans to outline what work is necessary and the order in which it should be done. For example: "devices to catch sediment, such as retention basins and haybales, should be installed before any other ground is disturbed."

Seeding Instructions should indicate where, when, and how temporary and permanent vegetation will provide erosion control. Guidelines for mulching should also be included. For example: "stockpiled top soil should be seeded with a quick growing grass such as annual rye." The Soil Conservation Service Sediment and Erosion Control Handbook can serve as a guide to developing a sediment and erosion control plan.

Maintenance requirements should also be outlined to insure the erosion and sediment controls function properly. For example: "sediment should be removed from haybale check dams and haybales should be replaced as necessary." In addition, it is advisable to remove all sediment from permanent sediment control devices before the roads are accepted by the town.

All erosion and sediment controls should be shown on the grading plans as well as the plan and profiles to insure that all parties involved in the construction will be aware that these controls are to be included.

Locations where staked haybales will be required should be shown on the plans. To catch sediment before runoff enters the drainage system during construction, haybales or other devices which perform the same function should be used downstream of any discharge (including the two discharges across Route 17); at the toe of any cut or fill slope over four feet high (diversions at the top of the slope may be required on high cuts or fills); across swales and diversions at regular intervals; around the edge of disturbed areas where the sediment might pollute a wetland or watercourse; and around all inlets, such as catch basins and D-G endwalls. The trapped sediment should be removed when the amount of sediment causes the runoff to flow over the top of the bales. The bales should be replaced as they deteriorate, until vegetation is established.

The sizing of the rip rap at each discharge is not specified on the plans. The sizing should be based on the discharge velocities, quantity of discharge, and channel slope. The bedding material for the rip rap and the method of installing both the bedding and the rip rap should be specified on the plans. Methodology can be found in the Connecticut Department of Transportation Drainage Manual of 1979.

Sections of the roads in excess of 8% can present erosion problems during construction as a result of runoff concentration on the steep slopes. Diversions or other methods should be employed to slow down the runoff and/or channel it

The 30" pipe under Route 17 which receives the discharge from the retention basin is depicted on the plans as an existing pipe. On the approved subdivision plans for the portion of the property in Durham, the same pipe is depicted as an existing 24" pipe. The pipe size was field verified by the Durham Town Engineer. The 24" pipe was approved as adequate for the storm water discharge from the Durham property only.

If the 24" pipe is to be removed and replaced with a larger pipe, it should be so stated on the plans. The adequacy of the increased pipe size to accept the discharges from both the Middletown and Durham properties should be demonstrated in the drainage calculations.

An additional discharge under Route 17 from Meadow Lane uses an existing pipe which discharges into the public water supply drainage basin. No retention is planned for this discharge, and no plans are included to reduce sediment and erosion.

In the public water supply drainage basin, all storm water drainage systems shall be designed to minimize soil erosion and maximize absorption of pollutants by the soil in accordance with The Public Health Code Section 19-13-B32(i). In the two cases where storm water discharges across Route 17, the erosion protection at the existing outlets either should be shown to be adequate or improvements should be shown on the plans. If there is any question as to the adequacy of the plans to prevent pollution to the public water supply, the Connecticut Department of Environmental Health Services has the jurisdiction to review the plans.

There are two additional discharges from the eastern sections of the subdivision. No retention has been provided for either of these two discharges. Rip rap has been shown at the outlets on the grading plans, but not on the plan and profiles, and the size has not been specified. No methods to collect sediment have been proposed.

Both discharges require "Rights to Drain" from adjoining property owners; one discharge is into the Town of Durham. Subdivision approval should not be granted until the approval from the adjoining property owners has been received and options to the Rights to Drain have been produced.

In most cases, discharge velocities will be higher than shown in the drainage calculations. More extensive erosion controls will be needed than are shown on the plans. Water velocities in the pipes are high in some cases due to steep slopes. Methods to reduce the velocities in the pipes should be employed to reduce scour damage to the pipes. Paved inverts are especially important for steeper pipes.

All catch basins should be analyzed to determine if the grate has the capacity to accept the amount of runoff calculated to enter the basin. This is especially important at low points and localized low points at intersections. Intersections should be carefully analyzed in regards to grading and location of catch basins to prevent ponding. Intersections at State Highways merit special attention.

Catch basins on roads graded 8% or steeper should be analyzed to determine the amount of runoff bypassing the inlet and thus determining the required spacing

to a discharge point in an established area until the road is paved. A device such as a double chamber sediment catch basin should be used as the last inlet structure in the road before any discharge. This type of device functions similarly to a septic tank with a baffle; the sediment is allowed to settle out before the storm water overflows to the discharge. Maintenance is not difficult because the device is located at the road, both chambers are accessible via a grate or manhole, and the sediment is removed in the same manner as from a catch basin sump.

## STORM DRAINAGE

The Middletown Subdivision Regulations have no requirements for storm drainage except that there be a storm drainage system and that increased runoff be retained to predevelopment flows. The comments in this section of the report are based on commonly used manuals and the engineering design experience of the Team engineer.

Asphalt Coated Corrugated Metal Pipe (ACCMP) is specified throughout the plans for drainage pipe material. Experience has shown that paving the invert of the pipe significantly increases the useful life of the pipe. Most of the major pipe manufacturers recommend that the inverts be paved and many Public Works Directors require it. ACCMP is normally supplied with helical or spiral corrugations as opposed to annular or circumferential corrugations. Helically corrugated pipe is superior for many reasons. For example, the seam is stronger and more water tight, and the friction in the pipe is less, thus increasing the pipe's capacity. Based on the friction coefficient used in the drainage calculations, ACCMP with annular corrugations and without a paved invert is proposed. The coefficient of friction has an effect on the pipe capacity and the water velocity; in this case the pipe capacity will be greater and the velocities will be faster using ACCMP with helical corrugations. Pipe with a paved invert further increases the capacity and velocity. While checking the drainage calculations using the same design criteria as the design engineer had used, a number of pipes were found to be undersized.

Some items in the calculations leave questions about the adequacy of the storm drainage system and the retention basin. The pipes in the system leading to the retention basin may be undersized. The time of concentration for this system was based on extensive regrading and clearing of the area inside the circle of Bayberry Drive, including completely filling in the pond. The Middletown Inland Wetlands Commission would have to issue a permit for the pond to be filled in. The clearing would involve three acres of wooded land to be completely stripped. If a less drastic approach to the grading is used and the watershed division line remains essentially where it exists, the time of concentration for the runoff will be greatly reduced resulting in a significant decrease in the total runoff. Both the pipe capacities and the size of the retention basin would be affected.

The runoff from an upper area (labeled with D-Catch basins) discharges directly into a swale that joins with the area which discharges directly into the retention basin (labeled with B-Catch basins). The runoff from the upper area is not included in the runoff calculation for the lower area. This, too, affects the size of the pipes and the retention basin.

of the catch basins. Generally, catch basins on steep slopes should be spaced 200-150' apart, although closer spacing may be needed at times. The methodology to determine grate capacity and gutter flow is outlined in the Connecticut Department of Transportation (DOT) Drainage Manual of 1979.

### Storm Water Retention

The Middletown subdivision regulations require the increased runoff due to land development be retained such that the flow into lakes, streams, or ditches not be greater than it was before development. There are four watershed areas in this subdivision.

1. The west area is in the Laurel Brook Reservoir watershed which is a tributary to a public water supply. A retention pond is located in this area, but runoff from a portion of this area is discharged directly across Route 17 with no retention.
2. The central area drains to a swale in Durham and eventually reaches a small brook. The runoff in this area is diverted to the west area retention pond.
3. The northeast area drains to the Long Hill Brook. No retention or sedimentation control is provided in this area.
4. The southeast area drains directly into Durham via a tributary to Ball Brook. No retention or sedimentation control is provided in this area.

For a retention basin to function properly, it must be maintained. Often public works departments do not have the time or money for demanding maintenance schedules. Therefore, retention basins should be designed to be as maintenance free as possible. The retention basin in this subdivision was designed, perhaps not intentionally, to act as a sediment basin. No measures have been planned upstream of the basin to collect sediment, except that catch basins will have two foot sumps which will not accomplish complete removal.

The pipes carrying storm water to the basin are steep enough to carry sediment. The first half of the basin is a 3.5% slope and the remainder is flat; the sediment will settle out in the flat section. Removal of the sediment from the storm water is desirable, especially during construction, but this method has some problems.

Eventually the basin will fill in with sediment, the perforated portion of the discharge pipe will be blocked, thus retaining the storm water for longer than a day or two, and the holding capacity of the basin will be reduced. The proposed design has no provision to completely drain the basin for maintenance or an access road to the basin to perform the maintenance. The type of outlet structure proposed should include an anti-vortex baffle, trash and safety guard, and a gate or other provision to completely drain the basin. The retention basin and swales to carry the storm water should be built prior to any other construction on site.

A properly designed, low maintenance retention basin should include a device to remove the majority of sediment from the storm water before it reaches the basin. One method is to make the last drainage structure in the road before the retention basin a sediment catch basin. A double chamber catch basin with a baffle between the chambers could be employed. Both chambers are easily accessible to road crews doing periodic cleaning of catch basin sumps. The importance of periodically removing the sediment from the catch basin sumps cannot be overstressed.

The slope across the bottom of the basin should be steep enough to discourage prolonged ponding. The discharge device should be designed to meter the discharge depending on the storm size and completely empty the basin after the retention period. A V-shaped weir could be used as the control device. The design engineer should demonstrate the effectiveness of the retention basin by developing cumulative inflow/outflow hydrographs for various storm frequencies including 2-year, 10-year, 25-year, 50-year, and 100-year. The retention structure should be designed for a 50-year storm with an overflow spillway to handle a 100-year storm.

Even with the sediment preventing methods mentioned above, the basin will require maintenance from time to time. An access road should be constructed so the public works department can drive a maintenance vehicle to the outlet control structure. The subdivision has no provision for access to the retention basin.

Prior to the City accepting the roads and erosion and sediment control, the developer should perform all necessary maintenance procedures. This should include but not be limited to: cleaning all catch basin sumps; removing any sediment in the streets; removing or replacing haybales as necessary; and repairing any damage done by erosion. The City will save time and money by requiring this work because the greatest amount of erosion and sedimentation usually occurs during construction.

The Soil Conservation Service "Urban Hydrology For Small Watershed Technical Report 55" method was used improperly to determine the pre-development storm water runoff versus the post-development storm water runoff. The design engineer uses the method incorrectly, substitutes improper parameters, does not include all areas contributing to the total runoff leaving the property, and compares a 50-year, twelve-hour storm for pre-development runoff to a 25-year storm determined by the rational method, for post-development flow. The peak runoff rates for both pre-development and post-development as developed by the design engineer are lower than they should be, and the resultant amount to be retained is also too low. (It has been estimated to be 30% of the total amount of retention needed for this proposal.)

The drainage calculations have been sent to an Engineer at the Soil Conservation Service in Storrs to further check the use of the SCS TR 55 Method for determining the peak runoff rates, and to determine the amount of required storage and the adequacy of the retention basin design.

## GROUND WATER CONTROLS

As was discussed in previous section on Soils, the soils in this subdivision characteristically have a perched water table above the fragipan during the early spring. In addition, the soil tests indicate shallow depths to sandstone, tight

soil or hardpan, mottles, ground water, or ledge. Ground water control will be needed throughout the subdivision.

Every house in the subdivision should have a footing drain to protect the foundation except lots 1, 6, 7, and 8. All footing drains should be tied into the storm drainage system or discharged in such a manner that no nuisance be caused to downstream land owners. The subsurface conditions in some lots indicate that uphill curtain drains should be used in addition to filled septic systems. The manner of discharge required is the same as for footing drains.

Ground water not removed by underdrains will saturate the road subgrade and cause weakness or frost heaves which will lead to early deterioration of the pavement and base. Saturated soils can cause slippage on steep slopes and seeps on cut slopes. The underdrains should be located four feet off the edge of pavement, as specified in the Middletown Road Specifications, or four feet from the top of embankment on cut slopes. (Drainage easements may be required in some cases.) Underdrains should be used on both sides of the road when the ground water surface is parallel to the road surface and only on the uphill side when the ground water surface slopes downhill from the road surface. The underdrains should be tied into the storm drainage system. Road underdrains are not specifically required in any location on the subdivision plans, although a typical underdrain is shown on the standard detail sheet. The underdrain is specified to be constructed under the pavement rather than four feet off the edge of the pavement.

The underdrain should be placed at least six inches into the fragipan layer or at least 48" below the finished road grade. The soils in this subdivision have a high silt content, therefore the perforated pipe should be wrapped in unwoven filter fabric and the trench backfill should be similar in grading to concrete sand or bank run gravel. The top of the trench should be sealed with an impervious material to prevent the entrance of surface water. Ground water drains should be 25' from any part of the septic leaching area, except in public water supply watersheds where the distance shall be 50' as required by the State Health Code.

#### WATER SUPPLY/WASTE DISPOSAL

Water supply for the proposed subdivision would be provided by extending a water service line from the existing public supply which is apparently near the site. It is understood provisions would also be needed to secure adequate water pressure for houses in the higher elevations of the development.

Although Middletown has large areas serviced by municipal sewers, the project site is outside the area having such facilities. It is further understood that any possibility for the future servicing of this outlying area is not being considered. Therefore, the subdivision will utilize and rely for the long term on on-site subsurface sewage disposal facilities.

The majority of the soils in this subdivision are Wethersfield and Ludlow soils with the exception of a portion of the lots fronting on Route 17 which are excessively drained Hartford soils formed in glacial outwash of stratified sand and gravel. The Wethersfield and Ludlow soils formed in compact glacial till; the Wethersfield soil is well drained and the more loamy Ludlow soil is moderately drained. Both soil types have a loamy, brittle subsoil horizon which

is low in porosity and inhibits the drainage of the upper layers. A perched water table above the subsoil horizon or fragipan is common during the early spring.

A study on the longevity of septic systems (Hill & Frink, 1974) revealed a high percentage of failures in systems installed in compact glacial till. Soil testing done during drier seasons does not reveal the high water table, and ground water control is not incorporated in the system design. In addition, due to the high amount of silt in these soils, the exposed surfaces of the trenches may become smeared during excavation, especially if the soil is wet. The smeared soil surface decreases the porosity of the soil and contributes to the early failure of the septic system. Therefore, to insure their success, the septic systems should be engineer designed with ground water control, minimum size based on percolation rates in the 11-20 minutes per inch range (larger systems to be required for slower rates), and construction limited to the dry periods of the year.

The west and central watershed areas are in a public water supply watershed. (The central area is included because the storm water is diverted to the west area, thus including all lots west of lots 45/58/66/32.) Under this condition, the State Department of Health requires the separating distance between the septic system and any tributary to the public water supply including surface water, ground water, and cellar or footing drains be increased from the normal 25' to 50'. In addition, under any circumstances, the Department of Health requires the separating distance between a septic system and another dwelling to be 50'.

When the required separating distances are marked out on the grading plans, very few of the lots in the public supply watershed area have room enough for a house. Many of the septic systems in that area are also too close to the storm drainage and road underdrains. Some of the lots which are not in the public supply watershed also do not have adequate space for houses even though the separating distances are not as stringent. There are approximately 45 to 54 of the 70 lots which do not have adequate space for a house.

In reviewing early May 1981 test results by the Middletown Health Department, it is apparent a considerable number of the proposed lots have a high ground water condition and/or shallow depth to bedrock. In general, with the exception of two or three lots in the lower open field where bedrock is a factor, the mid to upper areas of the site are most affected. The soil percolation rate for the parcel generally falls in the range of 11-20 minutes per inch, although in about a dozen instances, it was recorded at an inch in 40 minutes or higher. While it should be possible to install satisfactory subsurface sewage disposal systems for individual houses on lots containing soils with minimum percolation rates of one inch in 60 minutes or less, leaching systems in poorer soil will normally have to be kept large, shallow and spread out. The bottoms of the leaching areas must also be at least 18 inches above the maximum ground water table and four feet above underlying bedrock. Essentially, soils with a percolation rate slower than one inch in 60 minutes would be unsuitable for sewage disposal purposes.

While it has frequently been the practice to recommend minimum size lots of one-half acre where public water supply is available and on-site sewage disposal will be utilized, consideration should also be given to the favorability of

natural site conditions for this purpose. In this particular location, where conditions are far from being ideal, the proposed overall density of lots for the subdivision seems to be excessive. Relatively small lots do not allow for any degree of flexibility in house placement and septic system location. The available data also supports the position that careful design and installation of the sewage disposal systems will be necessary in order to prevent future sanitary problems due to system malfunction. One lot in particular contains a sizable pond, and an adjoining one has extremely high ground water. Development suitability of a number of the proposed lots is questionable.

Many lots require filled septic systems due to extremely shallow ground water or bedrock. Most of these lots have proposed leaching areas too close to the property lines to provide the required 15' from the edge of the system to the top of the fill embankment and to grade the embankment back to original ground. These lots which require fill should be combined with a lot which meets the health code; have engineer designed septic systems drawn at 20 feet to the inch scale submitted as part of the subdivision application; or the fill should be placed, compacted, and inspected prior to subdivision approval.

## ROAD DESIGN

The Team Engineer has prepared a detailed analysis of the proposed street design for this subdivision. Design criteria referred to in this section of the report was generally taken from the American Association of State Highway and Transportation Officials (AASHTO) "Geometric Design Guide for Local Road and Streets" 1971, and from professional experience as a licensed design engineer. Middletown's Subdivision Regulations and Road Specifications provide some guidance for street design, however, some design features have not been addressed and are so noted.

Of the fourteen vertical curves in this subdivision, six are not long enough to provide minimum sight distance for the recommended 30 mph design speed as outlined in AASHTO's "Geometric Design Guide for Local Roads and Streets" 1971. The city does not have any regulations or guidelines on this subject. Two, perhaps three horizontal curves on Bayberry Drive are too tight (Center line radii 100', 125'). The minimum center line radius should be 200' or at the very least 150' for safe maneuverability. The city does not have any regulations or guidelines on this subject.

A 525 foot section of Meadow Lane is graded at a 13% slope. This is clearly in violation of the Subdivision Regulations which state the maximum grade for a local road is 10%.

Three intersections are excessively steep. One, at Meadow Lane, is sloped at 5% and two, at Meadow Lane and Route 17, and at Bayberry Drive on itself, are at 6%. The intersection at Route 17 is exceptionally dangerous due to the high volume of traffic (ADT 11,700; CONNDOT 1979). In addition, two intersections, at Meadow Lane and Ash Court, and Bayberry Drive on itself, are located at through street slopes in excess of 8%, Bayberry Drive is at a 6% intersection. For safe stopping, an intersection should be designed with a 2% (preferred) or 3% (maximum) slope for at least 50 feet past the street line before beginning the transition to a steeper slope. No regulations or guidelines for this topic were found in the Middletown Subdivision Regulations. The town Road Specifications have a



detail for public access, but it is not clear whether the detail is for driveways or roads; the detail is not generally considered good design for safe road intersections.

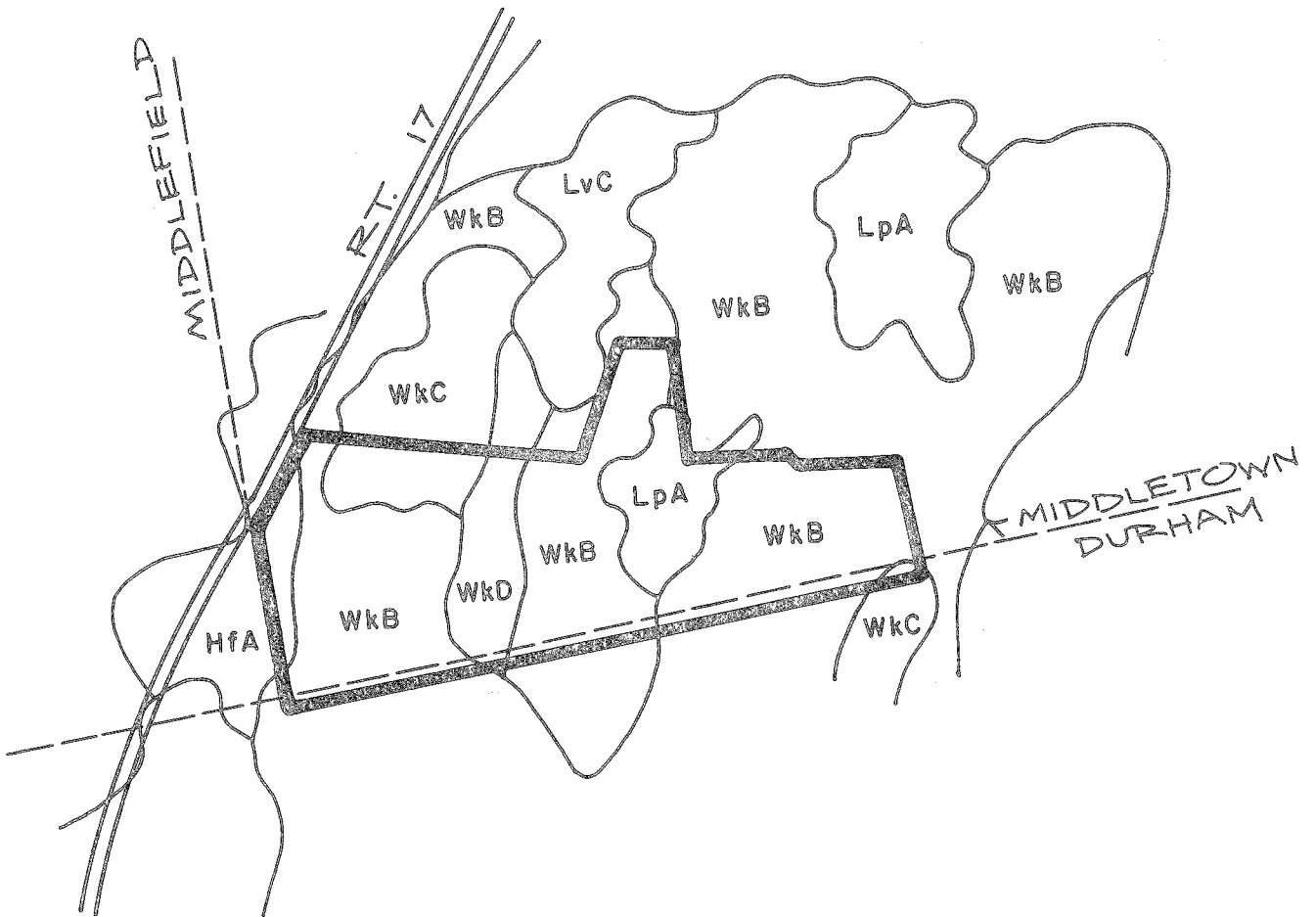
The intersection angle of Bayberry Drive and Meadow Lane is very close to 60 degrees. Although this is allowed in the town Subdivision Regulations, it is not generally considered good design. Intersections should be designed within five to ten degrees of ninety degrees or perpendicular. In addition, this intersection is graded at five percent, is located on a curve, and the pavement is rounded with rather large radii which will encourage excessive speeds. The road specifications indicate that the inside curve radius should be 20-25 feet and the outside curve radius should be 25-30 feet. In this case, both radii are 40 feet.

The Subdivision Regulations state the pavement turning radii should be 15 feet and the Road Specifications indicate the maximum turning radii for a 90 degree intersection should be 20 feet. Because a car requires 15 feet to maneuver a turn, minor intersections should have pavement radii of 20 to 25 feet. Where school buses are expected to maneuver on local roads, the radii should be 25 to 30 feet. Where a local road intersects with a collector or arterial road, the radii should be 35 to 40 feet to insure larger vehicles can make the turn without straying too far into the wrong lane. In this subdivision, the turning radii at Route 17 is 30 feet, while all others are 35 to 40 feet.

The Subdivision Regulations require sidewalks in all new subdivisions, but none are shown on these plans.

# Appendix

# Soils



ROYAL OAK PARK II  
MIDDLETOWN, CONNECTICUT

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series	Natural Soil Group	Soil Symbol	Approx. Acres	Percent of Acres	Principal Limiting Factor	Urban Use Limitations*			
						On-Site Sewage	Buildings with Basements	Streets & Parking	Land-Scaping
Hartford		HfA	2	6%	Droughty	1	1	1	2
Ludlow		LpA	3	8%	Percs slowly, large stones	3	3	3	1
Wethersfield		WkB	24	67%	Percs slowly, frost action	3	1	2	1
Wethersfield		WkC	3	8%	Percs slowly, slope	3	2	2	2
Wethersfield		WkD	$\frac{4}{36}$	$\frac{11\%}{100\%}$	Percs slowly, slope	3	3	3	3

LIMITATIONS: 1 = slight, 2 = moderate, 3 = severe.

## SOIL INTERPRETATIONS FOR URBAN USES

The ratings of the soils for elements of community and recreational development uses consist of three degrees of "limitations:" slight or no limitations; moderate limitations; and severe limitations. In the interpretive scheme various physical properties are weighed before judging their relative severity of limitations.

The user is cautioned that the suitability ratings, degree of limitations and other interpretations are based on the typical soil in each mapping unit. At any given point the actual conditions may differ from the information presented here because of the inclusion of other soils which were impractical to map separately at the scale of mapping used. On-site investigations are suggested where the proposed soil use involves heavy loads, deep excavations, or high cost. Limitations, even though severe, do not always preclude the use of land for development. If economics permit greater expenditures for land development and the intended land use is consistent with the objectives of local or regional development, many soils and sites with difficult problems can be used.

### Slight Limitations

Areas rated as slight have relatively few limitations in terms of soil suitability for a particular use. The degree of suitability is such that a minimum of time or cost would be needed to overcome relatively minor soil limitations.

### Moderate Limitations

In areas rated moderate, it is relatively more difficult and more costly to correct the natural limitations of the soil for certain uses than for soils rated as having slight limitations.

### Severe Limitations

Areas designated as having severe limitations would require more extensive and more costly measures than soils rated with moderate limitations in order to overcome natural soil limitations. The soil may have more than one limiting characteristic causing it to be rated severe.

# 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 activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, sanitary landfills, commercial and industrial developments, sand and gravel operations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

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

## REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected officials of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the Chairman of your local Soil and Water Conservation District. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, 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 (889-2324), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360.