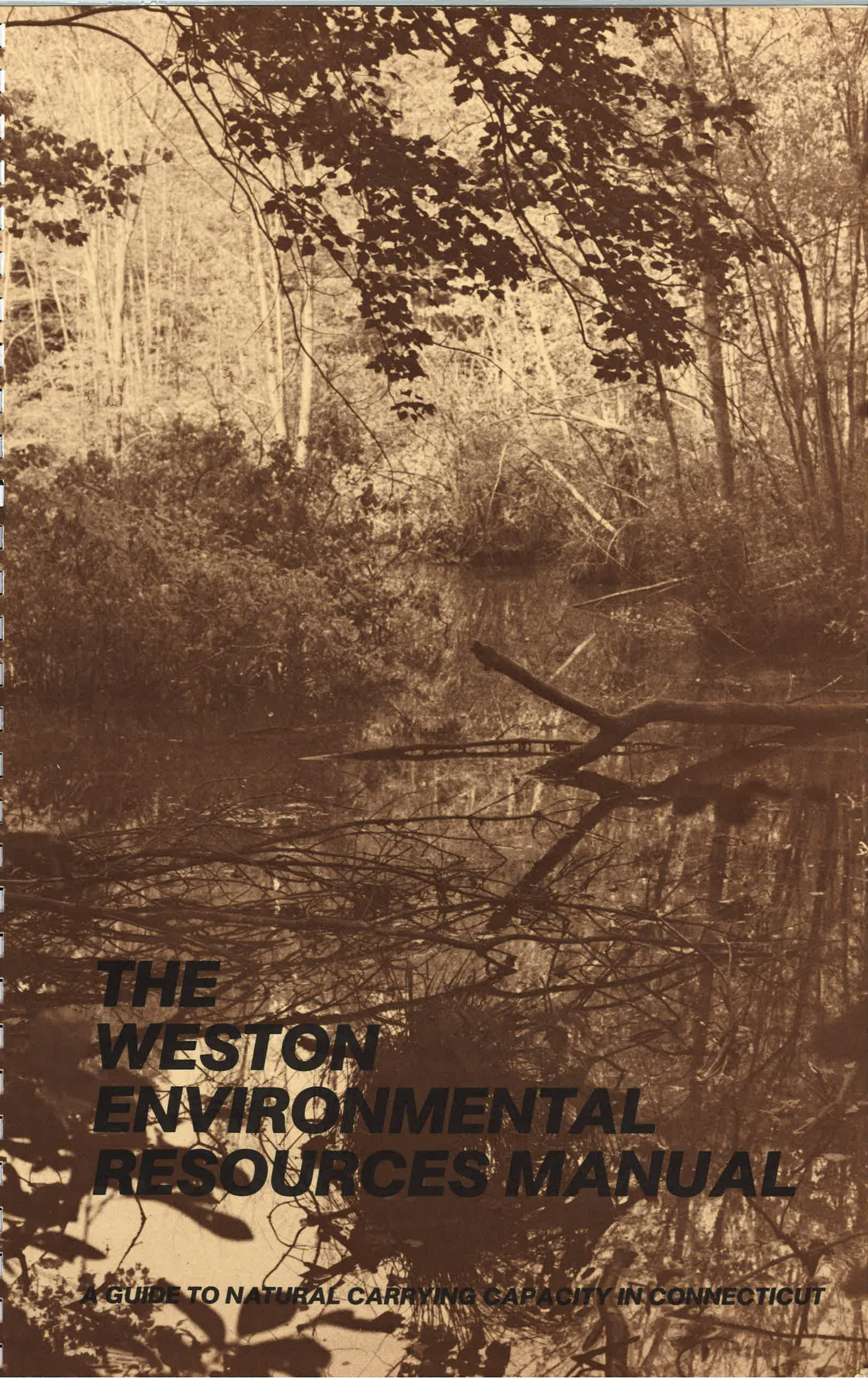
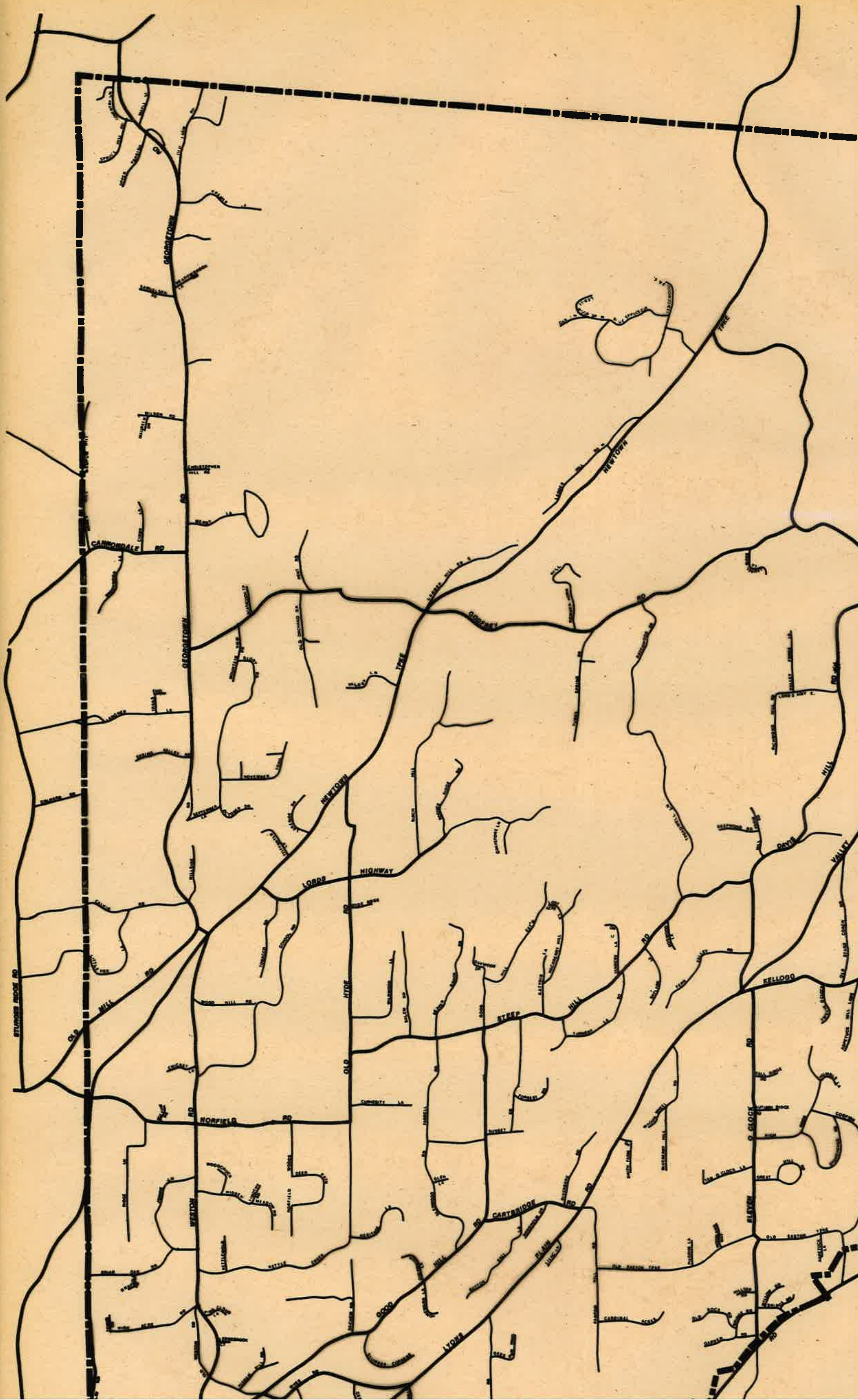


THE WESTON ENVIRONMENTAL RESOURCES MANUAL

A GUIDE TO NATURAL CARRYING CAPACITY IN CONNECTICUT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ELEVEN O CLOCK RD
STURGES RIDGE RD
OLD MILL RD

THE WESTON ENVIRONMENTAL RESOURCES MANUAL

A GUIDE TO NATURAL CARRYING CAPACITY IN CONNECTICUT

PREPARED FOR THE

PLANNING AND ZONING COMMISSION
Town of Weston,
Connecticut

Dominski/Oakrock Associates
ENVIRONMENTAL PLANNING
NEW HAVEN
CONNECTICUT

NEXUS ENGINEERING ASSOCIATES
WILTON, CONNECTICUT

NICHOLAS QUENNELL ASSOCIATES
NEW YORK

SEPTEMBER
1976

ABSTRACT

Title: Weston Environmental Resources Manual; A Guide to Natural Carrying Capacity in Connecticut

Authors: Dominski, Anthony S, PhD., and Oakrock, Barbara E.

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Supporting Technical Materials: Technical Appendix, copies of MAPS 2 through 15 at original scale of 1″ = 1000′, copies of aerial photographs (see MAP 2). Available for reference; original field notes, well log, seismic logs, culvert inventory, water quality log and reports.

Source of Supporting Technical Material: Town Hall, Weston, Ct.

Weston, Connecticut (1975 population 8000, area 12,750 acres) is a residential community set in a temperate forest ecosystem having crystalline bedrock, hilly topography and surface glacial deposits ranging from 0-50 feet in depth. The functioning of Weston's forest ecosystem regulates water supply and quality, disposes of septic wastes and performs engineering functions in regulating erosion, purifying air and buffering the inhabitants against noise and the extremes of the New England climate.

The study for the Weston Environmental Resources Manual, conducted from June 1975-September 1976, had the following overall goals: 1. to determine the present state of Weston's environment at a point when 50% of its current, zoned, saturation density had been reached; 2. to determine whether Weston's current environmental quality could be maintained as Weston doubles its population, especially with regard to drinking water from wells and surface water quality; 3. to develop an environmental planning tool to be used by Town government and private citizens to ensure that the natural functioning of Weston's forest-ecosystem is maintained, so as to avoid the necessity for the installation of public sewage and water supply systems, as the Town develops to its maximum density.

Presently, Weston's forest ecosystem, provides not only an excellent water supply to its own inhabitants, but also exports large quantities to neighboring towns through the Saugatuck Reservoir and well fields within the Saugatuck River aquifer.

Weston provides both a pleasant, rural environment for its inhabitants and also provides a substantial amount of regional open space enjoyed by visitors—a tremendous asset in the highly urbanized Boston-Washington corridor. The Town also functions as an airshed supplying clean air, carried by prevailing westerly winds to the urbanized coastal corridor.

Maintaining Weston's environmental quality presents a challenge because the largest portion of the remaining undeveloped land is ecologically sensitive—wetlands, and areas either with steep slopes or shallow soil.

The environmental planning tool embodied in the Weston Environmental Resources Manual consists of maps, aerial photographs along with technical reports and appendices, and a series of guidelines and procedures. It was constructed according to the relatively modern discipline of multidisciplinary environmental planning to evolve a blueprint by which optimum human use of Weston's landscape can be achieved.

The core of the Manual is a set of fifteen maps; nine which present basic ecologic and land use data, four which interpret the base data from the environmental planning point of view and two which provide a location index to technical data, supporting the Manual. All environmental planning recommendations in the Manual are keyed to these maps.

The major recommendations and findings of the Manual are: 1. the designation of a Townwide system of interconnected conservancy zones to protect the function of ecologically sensitive areas; 2. determination of the natural carrying capacities of major undeveloped tracts to treat septic wastes and to supply pure water; 3. the institution of a zero-extra-runoff policy for development which will encourage maximum retention of natural vegetation, maximum recharge of the water table and minimal pollution of watercourses and flooding; 4. the institution of an environmental monitoring system.

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NEW HAVEN CT / LANDSCAPE DESIGN
06515 / 203 387-0021

Robert P. Turner, Chairman
Planning & Zoning Commission
Town Hall
Weston,
Connecticut
06880

September 15, 1976

Dear Mr. Turner:

We are pleased to transmit herein the manual, which was the object of the year-long environmental resources study.

As the phases of the study progressed and the data base was focused into a discrete picture it became apparent to us that the people of Weston occupy a unique position; the base quality of the Town is extraordinarily high, and the Town government exhibits an estimable consciousness of environmental processes. It seems clear that the major planning task of the years to come is maintenance of this quality.

The overall strategy for maintenance is embodied in the CRITICAL PLANNING UNITS MAP highlighting natural carrying capacity, the PROTECTION ZONES and WETLAND MAPS locating fragile and sensitive areas, and the DATA POINTS AND MONITOR STRATEGY MAP locating the pressure points and stress zones of Weston in its present condition.

We are convinced that the most effective use of this Manual in the maintenance of a Town environment—especially where the community chooses, as Weston does, to rely on a natural framework—depends on a willingness of affected parties to engage in a dialogue, using the Manual as a common reference. The Manual should be viewed as a tool for all parties involved, to bring to the surface environmental issues which need to be addressed.

We are extremely appreciative of the support and participation invested in the conduct of our study by many Weston citizens and officials. Indeed, it has been an unusual pleasure to address the Planning and Zoning Commission itself.

Interaction and proferrment of data has been generous; the Conservation Commission, the Weston Watershed Association and the Historic Society have contributed greatly. The researches of Scott Hill, Jean Matson, Anne Blyde, John DeBrun and Charles Putnam are embodied in many of the basic studies.

The day-to-day progress of the study was much advanced by the liaison with Mrs. Eleanor Milmore, Zoning/Wetlands Inspector, whose keen intuition about the land was a frequent aid.

Sincerely yours,

DOMINSKI/OAKROCK ASSOCIATES

Tony Dominski
Barbara E Oakrock

Tony Dominski
Barbara E Oakrock

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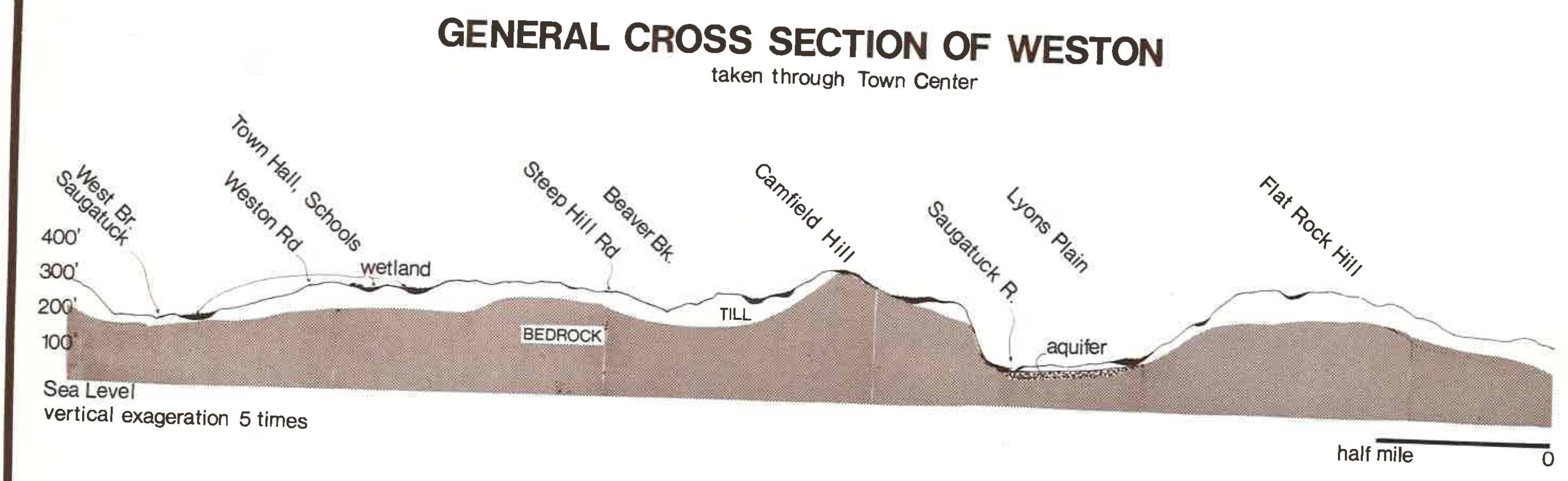


PART I; INTRODUCTION

Weston, Connecticut, is an exurban residential community (1975 population, 8000) lying on 12,750 acres of the eastern deciduous forest biome. It has a moist cool climate, with 46 inches of annual precipitation, distributed fairly equally throughout the year. Precipitation is mainly in the form of rain, but during winter months two or more feet of snow may be recorded. Average dates of the first and last killing frost are April 25 and October 15. Temperature in summer often exceeds 90°F and in winter can go below 0°F. Weston is occasionally subject to high east and northeast winds associated with tropical storms, in summer and autumn.

Weston is part of the Ridge and Valley physiographic province of the Appalachian Highlands, known locally as the Western Connecticut Highlands. This province is characterized by extremely variable, folded topography. Weston is underlain by hard, metamorphic, crystalline bedrock composed principally of gneisses schists and granites.

Weston's surface geology has been greatly modified by glaciation. The last glacial ice pack retreated 15-20,000 years ago, leaving behind thin, 1-10 foot layers of stony till on ridges and high slopes, thicker layers (10-50 feet) on lower slopes and water-washed, stratified drift deposits of sand and gravel in major valleys. The thin till deposits on ridgetops and stratified drift deposits in valleys gave rise to well drained soils. The thicker till deposits on lower slopes gave rise to hardpan soils. In depressions and low-lying flat areas wetlands were formed.

Although Weston is located in the region described as the glaciated section of the oak-chestnut region of the eastern deciduous forest biome, its vegetation has been greatly modified from its original state. The chestnut blight eliminated its co-dominant tree species in the early part of the 20th century, and the forest has a long history of clearing for agriculture and cutting for charcoal. Today Weston is a complex mosaic of vegetation types, reflecting variations in local topography and soils and modification by human activity.

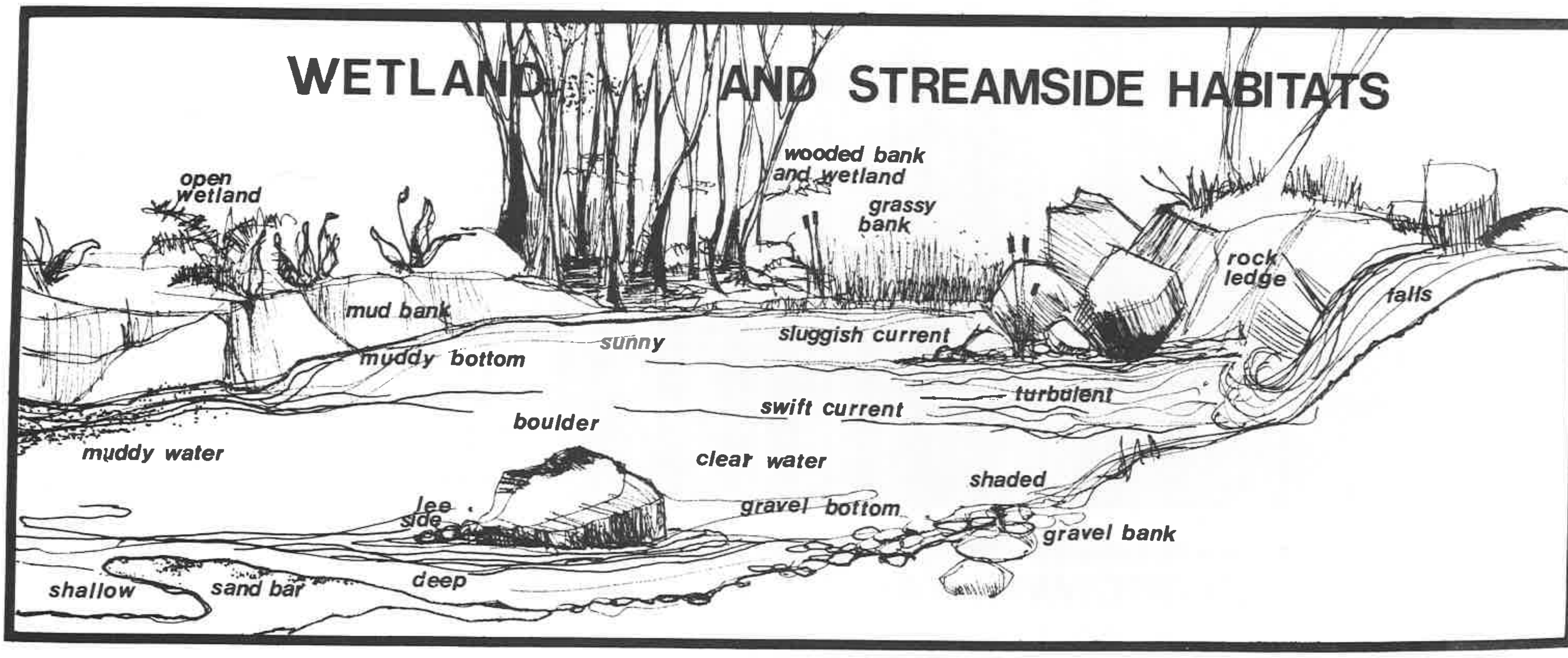
Agriculture, first practiced by Indians, was concentrated on flat areas around river valleys. The first tenure of white settlers in the 17th and 18th century was based on subsistence agriculture with consumption and processing of products from field and forest, centered around a local village economy. In the early and middle 1800's human development centered on water power sites on major streams and rivers.

By the late 1800's and early 1900's Weston's population declined, with the shift of agriculture from New England to the Midwest and the shift of industry to elsewhere in New England. This trend was reversed after 1940 with the suburban exodus, spurred by the construction of the Merrit Parkway. From the period 1940-1970 the number of residential units in Weston increased from 411 to 2199.

With the decline of Weston's agriculture and industry around 1875-1925, vast tracts of land were abandoned from human use and forests grew up. This explains the presence of Weston's predominant vegetation cover of trees ranging from 50 to 100 years of age, representing a mature and stable forest ecosystem.

The forest itself is extremely varied. On the thin-soiled uplands, oak-dominated forests are most common; in the rest of Town mixed hardwoods predominate. In steep gorges along the Saugatuck River there are magnificent hemlock-hardwood stands and in wetlands the stands are dominated by red maple. Other cover types include natural pine stands, conifer plantations and old fields and lawns kept open by mowing.

At present, Weston's future evolution is being affected by the dynamics of the New York Metropolitan Region, which is part of the greatest urban agglomeration in the world (population 50,000,000) running in a belt from Virginia to Vermont. The largest part of Weston's economy is based on employment in other parts of Fairfield County and in New York City. Development of Weston in the immediate future will probably depend on the same economic base.



A stream community has a complex structure which can be unfavorably altered by human development (redrawn from Hunt, 1967).

The Environmental Resources Manual was developed as a tool to maintain environmental quality in Weston in the face of expected future growth in residential development, with its supporting commercial and public facilities. The two chief foci of the Manual were the maintenance of Weston's present economic and ecologically sound system of water supply and sanitary waste disposal via private wells and septic tanks, and the preservation of its present rural and historic character with its commensurate quality of life.

METHODS

The study, which is encapsulated here as the Environmental Resources Manual, was underwritten by the philosophy that an excellent environment can only be maintained by a dialogue within the concerned community of cognizant parties—both public and private agencies as well as individuals—who have a mutual stake in the disposition of questions of environmental policy.

The Manual brings together environmental data previously scattered in the files of many public and private agencies and integrates it with new data gathered during the Environmental Resources Study. It also interprets the data within an ecological framework and indicates how it can be used to make decisions which bear on environmental protection. Thus, it overcomes common obstacles to environmental protection—namely that environmental data is generally not easily and rapidly retrievable, that there is no integrated way to interpret it and no way to link individual decisions and overall environmental quality.

There is presently a lack of basic studies which resolve conclusively the relationship between common environmental practices and the environmental degradation they appear to cause. Yet environmental scientists are compelled to exhort the public to adopt practices which appear, at least superficially to sustain net losses to society: Fishing may be prohibited in one place, manufacturing in another. The market value of a family's land, representing their life savings, may be sacrificed to the environment of the future.

These exhortations of protection even where many factors remain unquantified are based on two indisputable laws of living systems: **1. that changes proceed with exponential order, and 2. that degradation to the living system is absorbed inconspicuously until irreversible damage is sustained.**

The purpose of the Manual is to make information accessible and comprehensible to those who would have use of it: planning committees, land-owners, prospective owners, Town Commissioners, lawyers, teachers, environmental scientists. As a tool it is designed to be up-dated in the process of its use.

Therefore, the Manual does not present an environmental Town plan, but instead, it is **an information base** and **a process** by which the information can be applied in the decision-making process to maintain a quality environment.

The underlying concepts of the Environmental Resources Study are:

1. The welfare of people is inextricably connected to the health of the ecosystems which provide them food, water, air and the services of treating and dispersal of human wastes.

2. The health of the ecosystem can be maintained by tailoring human development and its associated engineering structures to the natural processes and functioning of the ecosystem.

3. It is cheaper in the long run to design human development in harmony with the ecosystem and prevent problems such as flooding and water pollution, rather than correct them with expensive engineering solutions.

4. The practice of environmental planning in any locale must be geared to the cultural goals of its inhabitants and to its historic land-use patterns. The human carrying capacity of any land must be related to a previously agreed-upon level of technology and a mutually acceptable rate of environmental degradation of the community.



PART II; THE ENVIRONMENTAL GOALS AND STRATEGY

BASIS OF AN ENVIRONMENTAL STRATEGY

The development of an environmental strategy for Weston requires an understanding of two key concepts—the concept of the **forest-ecosystem** and the concept of **life-support capacity.**

The **forest-ecosystem** in which Weston is situated is a complex interacting unit of nature consisting of plants, animals and soil developed in mixed geologic deposits of loose rocks, gravel, sand, silt and clay, 0-50 feet in depth and resting upon a hard crystalline bedrock. The **forest-ecosystem** is constantly exchanging energy (mainly from sunlight), water and chemical elements with the atmosphere and neighboring ecosystems such as Long Island Sound. If left to itself, the forest ecosystem tends to evolve toward a dynamic equilibrium to maintain its internal functions and stable exchanges with its larger environment.

The forest ecosystem functions as a **unit** in regulating the flow and chemical quality of water entering it from the atmosphere and flowing through the vegetation, soil, the underlying loose geologic deposits and the bedrock. Ecologists have found that the functioning of a forest is most easily understood by making measurements on individual **watershed** units within the forest. A watershed is an area of land that feeds a particular stream, or body of water. Areas of high ground, hills, ridges, etc., form the boundaries or divides between watersheds which are effectively catch-basins for rainwater. (See MAP 6, HYDROLOGY.)

Most of Weston is within the watershed of the Saugatuck River and of the West Branch Saugatuck. Within these major watersheds sub-watersheds such as Godfrey Brook and Jennings Brook which feed the major streams can be distinguished.

When left undisturbed, the watershed units of the forest ecosystem function to recharge excellent quality water into the ground and to maintain a consistent flow of streamwater across the surface. Streamwater can either come from direct runoff of precipitation, or else has its origin in water which has previously been stored in the ground.

The quality of water in the natural state is chiefly maintained by the action of the soil. The soil contains thousands of decomposing organisms—earthworms, insects, bacteria, fungi, etc.,—which breakdown wastes such as dead leaves and feces to their simple mineral components. The soil also filters particles from the water flowing through the soil and to the streams.

Within a forest no more waste is produced than can be effectively transformed in the soil and diluted by rainwater. Thus, largely in contrast to human communities, the health of the forest-ecosystem is never endangered by the production of excess waste which cannot be adequately treated.

Weston residents benefit from the natural functioning of a forest ecosystem when they withdraw clean water from wells, which is constantly replenished and purified, and by the natural action of the forest soil in transforming, filtering and diluting septic waste from its leachfields. They also benefit from the action of a forest and its associated wetlands in reducing flood peaks and in maintaining a pristine, even flow of water to streams.

DEFINING LIFE-SUPPORT CAPACITY

LIFE-SUPPORT CAPACITY

The effect of human development in Weston is to act against the natural regulatory processes occurring within its forest-ecosystem. By creating open fields and lawns, which are less permeable to water than the spongy humus under forests, and by covering the soil with impervious areas such as driveways, parking lots and roads people reduce the amount of water entering the soil. As a result, the water table is lowered, and the extra runoff flowing over the surface erodes soil and carries large amounts of particulate matter such as silt and bits of humus to streams.

The eroded material pollutes streams; the extra runoff erodes and widens the original banks, degrading the visual character of the stream. The filling in of wetlands for development reduces their functioning as floodwater retention basins and as water filters and purifiers.

Human activity within a forest ecosystem also leads to concentrations of wastes, such as in landfills, and in septic leach fields which tax the natural waste transformation and dilution processes.

In summary, each increment of human activity acts to decrease the total life-support capacity of the forest ecosystem. The role of environmental management is to minimize the loss of life-support capacity when land is developed for human use.

A prediction of life-support capacity in Weston requires an analysis of the movement of water through the forest ecosystem, the amount of water being withdrawn for wells, the amount and kinds of wastes being disposed of and the present water chemistry.

It must be stated that extreme caution is necessary. in predicting Weston's life-support capacity. At present there is a lack of detailed knowledge of the long-term behavior of ecosystems. Moreover, the typical behavior of ecosystems under stress is that they degrade quantitatively, in small steps, until they get beyond a certain point at which a drastic qualitative change occures. This, would be analagous to the behavior of water under heating or cooling. It retains its essential behavior until it reaches a critical point and either becomes steam or forms ice.

Paul Wessel

Paul Wessel

For these reasons, any definition of life-support capacity has to be contingent on a regular monitoring system of Weston's environment. The monitoring system provides a check on whether the forest-ecosystem is responding as predicted to successive increments of stress as Weston develops.

A monitoring program can provide time for preventative action before the life support capacity in any part of Town is exceeded. It also provides the strongest possible legal support for land use decisions to protect the environment. Publication of monitoring data can enlist community support in this effort.

The Environmental Resources Study established a baseline of environmental quality in Weston. Any data gathered from this point on can be compared to this baseline to determine how new conditions are affecting the ecological condition of the Town.

The function of a forest ecosystem in water supply, waste disposal, regulation of streamflow and other environmental purification to residents, can be considered a kind of natural utility or **life-support** function.

Obviously, there is a limit to the amount of water which can be supplied and to the amount of waste assimilated in a given section of the forest ecosystem. The maximum ability of Weston's forest ecosystem to provide these and other natural utilities is termed its **life-support capacity.**

Here on the eastern seaboard of the Western Hemisphere, forestation, as described, is the equilibrium state of the natural environment. Removing the forest removes the *natural* life-support capacity to the extent that the forest is removed. Since the population of Weston patronizes the local forest ecosystem for water and waste removal, they must understand its laws or lose its services.

In order to accomplish any environmental goal, it is necessary to: 1. Define specifically the life-support capacity of the indigenous forest ecosystem; and 2. Adhere to a policy of development which respects the inherent natural capacity by applying the techniques of environmental management.

An overstretching of Weston's life-support capacity would be indicated if the following conditions are present:

1. The level of environmental contaminants exceeds state and federal standards, or if there is a significant trend of increase in contaminant levels, projected to rise near state and federal standards.

2. The hydrology is altered unfavorably—with some or all of the following conditions—fall in groundwater levels due to overwithdrawal of water; excessive flooding with resulting erosion of river banks, or very low dry season flows in the rivers.

3. Erosion of topsoil reduces the ability of the land to support vegetation and causes extensive sedimentation of waterways.

4. The cultural uses of the landscape are altered resulting in a significant loss in the aesthetic and recreational values of the environment.

THE TOWNWIDE GOAL

THE GOAL

The basis of practical environmental management for Weston is implementation of a Townwide strategy, assuming the technology of private wells and septic systems, on a site scale. This can be accomplished by the application of three mutually interdependent principles of environmental protection:

1. Adhere to maximum carrying capacity as set forth in MAP 5, CRITICAL PLANNING UNITS to prevent septic contamination and to avoid over-use of natural water supply.

2. Maintain the natural ecological function of wetlands (See MAP 3, WETLANDS) and protection zones (see MAP 4, PROTECTION ZONES). Leaving these areas intact will ensure the ecological functions of Weston's lowlands and will maintain its ecological diversity and rural character.

3. Guide drainage design for new development by a goal of zero-extra-runoff. This will encourage ecologically sensitive site design which will maintain groundwater recharge, prevent flooding, protect surface water, minimize erosion and encourage maximum retention of natural vegetation.

TOWNWIDE LIFE-SUPPORT CAPACITY

At a population density of 0.63 people/acre, Weston's ground and surface water are of an excellent character for water supply (see Technical Appendix). Presently, Weston is withdrawing approximately 8% of its total water recharge each year, most of which is returned to the ground via leaching fields. The excellent quality of the water is related to the largely forested character of the land (MAP 4, PROTECTION ZONES), the relatively high Townwide dilution for septic effluent ranging from 12-40 times (Data on Life Support Capacity), and to the relative impermeability of Weston's soils which minimize contamination of ground water by nitrates.

Since, the effect of Weston's 8000 people on ground water quality has been remarkably minor, it can be concluded that if Weston doubles its population to reach 16,000 people, the ground water will remain overall in satisfactory quality. Probably, the most serious threat to water quality at this population level will be microbiological contamination, and this can be minimized through strict and uniform enforcement of the health code. Microbiological contamination would be most likely to show up on shallow soiled areas where bedrock is near the surface.

There is likely to be a significant decline in the quality for surface water if Weston's population reaches 16,000. The Mill River in Fairfield, which is as highly urbanized as Weston would be at a population of 16,000 (Mill River population density = 1.2), has been placed in Inland Waters Class B and C, (Water Quality Standards 1974, CT. DEP). The same could occur in Weston, depending upon development practices. Presently, The West Branch Saugatuck can be placed in Inland Class B and the Saugatuck River in Inland Class A. Inland Class A is suitable for water supply, bathing and fishing while Inland Class B is suitable for bathing and fishing.

Judging from data on Fairfield rivers (Bongiorno 1975) the primary cause of the degradation of surface water quality would be non-point source pollution from storm drainage; septic tank effluent would have a much smaller effect on surface water quality because it is filtered through the soil and acted on by the roots of vegetation.

EROSION CONTROL

ZERO EXTRA RUNOFF

EROSION CONTROL AND THE ZERO-EXTRA RUNOFF GOAL

Human development of a piece of land increases the total amount of runoff from a site and the rate at which runoff occurs. Streams leading from urbanized areas have earlier and higher storm flow peaks than their condition before development.

A number of factors lead to increased runoff. The paving and compaction of the natural soil and the placement of buildings upon it reduces the overall permeability of the site. Thus, less precipitation soaks into the ground and more runs over the surface to the stream. The extra surface runoff generated travels faster to the stream than natural runoff did. The smooth paved surfaces over which it flows offers less resistance than natural surfaces. The presence of smooth-walled culverts and storm sewers, which replace meandering streams, also increases the velocity of runoff.

The increase in runoff amount and velocity accompanying development is related to a syndrome of adverse ecological effects. Rapidly moving surface runoff strips top soil from a site reducing its ability to support vegetation. The sediment load carried from the site pollutes nearby streams and fills in ponds, lakes and reservoirs.

High runoff peaks caused by urbanization pose the danger of flooding downstream. The extra water causes streams to overtop and erode their banks. The banks eventually cave in and the channel widens, causing more downstream sedimentation. With increased runoff in the stream channel, less water is recharged to the water table, causing lower stream flows, especially during summer dry periods. The combination of wider, eroded, stream channels and lower summer flow is aesthetically unpleasing.

Data gathered by Bongiorno (1975) on water quality in Fairfield, Connecticut, rivers, indicates that storm runoff has a major adverse effect on water quality. He found the effect to be directly proportional to the degree of urbanization and the amount of extra-runoff draining into streams. The impact of urbanization on stream water quality could not be reversed by the installation of public sanitary sewers. Since Weston and Fairfield adjoin each other and have similar ecology, it can be inferred that extra runoff in Weston will have similar adverse effects on stream-water quality.

The West Branch Saugatuck, for example, conforms to Connecticut Department of Environmental Protection "Class B," suitable for swimming and recreational purposes. It misses being placed in "Class A," suitable for public water supply, due to the presence of measurable numbers of coliform bacteria from wild and domestic animals washed in from surface drainage.

Adverse effects of extra storm runoff on a development site and nearby streams can be minimized by adopting a zero-extra-runoff goal of drainage design. The principle provision of the zero-extra-runoff concept is maintenance of a rate of runoff after development which is largely equal in quantity and velocity to that before development. In the optimum condition, while the drainage may change internally, no large systemic variations from the natural picture are sustained as a result of development.

The most practical and inexpensive way to implement this concept is to retain as much of the forest cover as possible on a site, and to use the area in forest cover to absorb extra runoff from the non-porous surfaces in the development.

Natural forested cover is effective in several ways in regulating runoff from a site. The leaves, branches and trunks intercept some of the precipitation before it reaches the surface, and can break the impact of rain on the soil to protect the soil from erosion. When precipitation hits the ground, it is rapidly absorbed by the forest floor—a 4-6" spongy mat of roots and humus which is punctured by animal dens and old root holes. From the forest floor, the water is directed downward to the lower soil layers where it is filtered and taken in to the water table.

It is important to understand that forest cover absorbs precipitation more rapidly than rough cover such as hay meadows, and that lawn cover has a significantly lower absorption rate than either forest or meadow. In many instances, it is possible to direct runoff from lawns, driveways, roads, etc., onto rough cover where it can be absorbed. On moderate slopes (0-5%) it is preferable to eliminate curbs on roads and let drainage flow into ditches and/or rough cover.

Another effective way to implement the zero-extra-runoff concept is to direct excess storm runoff to existing wetlands, swales, depressions, etc., where it can be held temporarily during peak flow periods. In some cases, it may be desirable to dam the outlets from these retention areas. It should be noted that ponds can serve as effective storm retention areas.

Other important ways to implement the zero-extra-runoff concept are use of porous paving (for example, crushed stone) and drywells to direct stormwater into the ground.

SEPTIC LIMITS

SEPTIC RATING OF LIFE-SUPPORT CAPACITY

The maintenance of private water supply and septic waste disposal systems in Weston has a number of ecological and economic advantages over alternative centralized public systems:

1. It minimizes regional loads on public sewage and water supply facilities, and helps to maintain regional water supply potentials, by keeping stratified drift aquifers recharged. Septic fields placed on aquifers provide a direct recharge. Septic fields outside of aquifers maintain the groundwater feeding stream systems leading to aquifers; once water is carried to aquifer watercourses it can seep down into underground storage.

2. Weston's septic tanks release less nutrients to regional waterways as compared with centralized sewage plants serving the same population. Soil and vegetation located in and around septic leach fields can intercept large amounts of nutrients. In conventional two stage sewer plants effluents with high nutrient concentrations are piped directly into waterways resulting in overfertilization of water plant life, reduction in oxygen levels and a decrease in the diversity of plant and animal life.

3. The use of private wells and septic tanks is cheaper in the long run. The alternatives of replacing private water and septic disposal facilities, with public facilities would cost millions of dollars. The construction of the miles and miles of pipelines associated with such facilities would entail extensive disturbance to the landscape.

Thus, a major ecological issue for Weston is how it can remain within its life support capacity as it develops to maximum population, and still maintain its ecologically and economically advantageous system of private water supply and septic waste disposal systems. Analysis of the interaction between Weston's natural systems and its present pattern of human development showed that the primary mode by which the Town's life support capacity would be exceeded is the contamination of wells through excessive or improperly engineered application of septic effluent. The secondary mode would be overwithdrawal of water from wells. Thus, for management purposes, it is most logical to express life support capacity as a rating for reception of septic effluent.

A septic rating provides a firm foundation for planning and design decisions on land use because it is easily comprehensible and scientifically quantifiable Moreover, a limit on septic effluent application automatically puts a limit on water withdrawn from wells, since septic volume approximates water withdrawn from wells.

The conclusion that Weston can double its population and remain within its natural life support capacity is in line with the estimates for Holzer (1975), for Mansfield, Connecticut, and with the 1975 Water and Land Resource Study conducted for the town of Pound Ridge, N.Y.—areas geologically similar to Weston.

Holzer estimated on the basis of dilution of nitrate from septic tank effluent, that the natural life support capacity of residential areas could be expressed as 2.5-3.0 people/acre. However, since an estimated 37% of his study area was unsuitable for septic systems, Townwide density would be reduced to 1.5-2.0 people/acre.

The Pound Ridge Water and Land Resource Study predicted, on the basis of water supply potential and present water quality, that Pound Ridge has a maximum life support capacity to handle a population of 12,800-14,000 in an area of 12,869 acres of which 3300 acres or around 25% of the land area is taken up by the Pound Ridge Reservation. This would amount to a density of 1.0-1.1 person/acre in the town overall or 1.3-1.5 people/acre on the area available for residential development.

Septic limits for Weston's undeveloped lands are given in Table 4, page 20.

EFFECT OF ALTERNATE TECHNOLOGIES ON DEVELOPMENT DENSITY

The capability of Weston's forest ecosystem to treat wastes and supply water to human development is basically a fixed quantity. Within the capacity, the density of human development which can be supported in a given area depends mostly upon per capita rates of water use and waste disposal.

There is presently a proliferation of household technologies designed to conserve water and to reduce waste discharge (Smyser, 1976). With the use of these technologies the potential number of people which the ecosystem can support in any given area increases as the dose of waste decreases. However, it should be emphasized that if density is less limited by water supply and waste disposal, it will be more limited by other factors such as excessive erosion, destruction of the forest and loss of cultural values in the landscape. For example, the conversion of more than 50% of Weston's rough cover (forest and meadow) to lawns, houses, roads, etc., would result in a serious threat to the ecological integrity and rural character.

Areas with poorly drained or shallow soils, where large amounts of fill would normally be needed for septic leach fields, are appropriate areas for first trials of alternate water conservation and waste disposal technologies. Probably, the technology most likely to be tested is the **aerobic septic tank** (see Smyser, 1976). This septic tank is essentially a conventional septic tank equipped with an aerating device in its middle chamber. Aeration of septic effluent oxidizes organic matter, reduces the biochemical oxygen demand (B.O.D.) and destroys disease causing bacteria. This treatment, which is equivalent to that of a secondary sewage treatment plant, prevents clogging of leach fields and bacterial contamination of groundwater. Moreover, the reduction in B.O.D. reduces the area of the leaching field needed to dispose of septic waste.

Another technology compatible with conventional household plumbing is the **tertiary package sewage plant**, designed to treat the waste from a group of homes. A tertiary plant removes most of the B.O.D. from sewage and a high proportion of nitrates and phosphates. The effluent is commonly discharged into a stream, raising the issue of whether the stream can suitably dilute the effluent, especially in low flow periods. Stream discharge also implies that the local water table may drop due to lack of recharge. This problem could potentially be handled by recharging the effluent into a large leach field. The chief problem with tertiary treatment plants, however, is that they require a great deal of maintenance and, thus, are not considered to be reliable.

Another major category of alternate technology is the **self-contained toilet**. These would virtually eliminate the possibility of bacterial contamination of groundwater. Perhaps, the most well-known self-contained toilet is the Clivus-Multrum **composting toilet**, developed in Sweden to eliminate the contamination of lakes by summer homes. One Clivus is being installed on Fern Valley Road, here in Weston. Other self-contained toilets include the **incinerating toilet**, the **biological waste digesting toilet** and the **oil-recycling toilet**.

Water conservation would be greatly promoted by the use of self-contained toilets, or by the use of **low-volume flush toilets**. Toilet flushing typically consumes 25 gallons of water per person per day. Other major water conservation measures are the use of **low flow shower heads** and **faucet aerators**.

All of these reduce the amount of water and waste per capita as compared to conventional plumbing technology thereby offering the possibility of a lower waste dose and water draw in marginal situations.

MONITORING THE TOWNWIDE ENVIRONMENT

MONITORING STRATEGY

The Environmental Resources Study established a baseline of environmental quality for Weston. As monitoring proceeds, year by year, the results can be compared against this baseline to determine how new conditions are affecting the environment.

An efficient monitoring strategy for Weston is to concentrate data collection on the critical water quality indices—coliform bacteria, nitrate, sodium, chloride and lead and on the stress areas shown on MAP 8, DATA INDEX AND MONITOR POINTS.

Currently, microbiological contamination—as indicated by the presence of coliform bacteria— is the most serious threat to Weston's water supply. Microbiological contamination arises from improperly functioning septic systems, and from the feces of wild and domestic animals.

Although present nitrate concentrations pose no immediate threat to water supplies, they could in the future. In certain cases high application rates of nitrogen fertilizer could contaminate wells with nitrate. Nitrate is a sensitive indicator of the action of the forest ecosystem in treating and diluting Weston's septic waste. **A Townwide rise in nitrate levels would provide early warning of environmental deterioration.**

Excessive application of salt (as sodium chloride) for road de-icing and use in water conditioning equipment has contaminated water supplies in a number of Connecticut towns. Fortunately, this does not seem to be an immediate threat to Weston.

Within the Jennings Brook watershed, there is evidence that high lead levels in groundwater in the vicinity of the Town sanitary landfill may be linked to the spread of leachate from the landfill. Lead in groundwater can also originate in soils or rock and from automobile exhaust.

Water tests should be made on surface water, shallow wells and deep wells, as was done in the Environmental Resources Study (see Table 1, Monitoring Recommendations). Recommended surface sampling points are shown on MAP 8, DATA INDEX AND MONITOR POINTS; the surface points include all those tested during Summer 1975 and additional points chosen on the basis of ecological position within watersheds.

In contrast to spatially fixed surface sampling points, well data should be gathered in a random manner. A town inventory should be made of all deep and shallow wells, as potential sampling sites.

The water testing program should account for potential seasonal differences. Testing should be done in winter when soil is at its wettest and road salting is occurring and in summer under contrasting conditions.

Measurement of critical water quality indices on a Townwide level will indicate where problems are occurring or likely to occur. When problem areas are identified, a full battery of water quality indices can be employed to provide a complementary definition of the origin and extent of contamination. Water quality samples should be consistently measured at one laboratory to minimize variation due to analytical method.

Water quality tests should be correlated with the mapped geological, ecological and land use data. Such a correlation will indicate the performance of Weston's LANDSCAPE SYSTEMS in providing life-support functions to human development.

TABLE 1
MONITORING RECOMMENDATIONS

Sampling Points	*Number of Points*	*Testing Frequency (times/yr.)*	*Sample Selection Mode*
SURFACE WATER*			
Townwide	36	1	fixed
Stress Zone*	6	4	fixed
SHALLOW WELLS			
Townwide	10	1	random
Stress Zone*	5	1	random
DEEP WELLS			
Townwide	50	1	random
Stress Zone*	25	1	random

* Shown on MAP 8, DATA INDEX AND MONITOR POINTS, page 29.

PART III; THE DATA RESOURCES

Introduction:

A solid data base provides the best scientific and legal basis for environmental planning. Data resources include all field logs, reports and maps resulting from the 1975 Environmental Resources Study by Dominski/Oakrock, and other relevant materials found useful to the environmental planning and design process. These include aerial photographs, reports and technical publications.

The entire data base is available to the public. Much of the data is present in this publication and its TECHNICAL APPENDIX, copies of which are available through Town Hall. Copies of the fifteen DATA RESOURCE MAPS, and aerial photographs at full scale are also available.

Additional material is available for inspection through Town Hall in the form of a TECHNICAL DATA FILE. THE TECHNICAL DATA FILE BIBLIOGRAPHY reproduced in this section lists by subject matter all materials generated or reviewed by Dominski/Oakrock for the Environmental Resources Study. Most but not all of the titles in the BIBLIOGRAPHY are reproduced in the TECHNICAL DATA FILE. The only materials not present in the FILE are technical works cited, which could not be obtained for inclusion.

TABLE 2; LOCATION GUIDE TO DATA

ITEM	*RETRIEVAL*
MAPS 1-15	
Original mylars, 1″ = 1000′ 22 x 42″	Used for full scale diazo reproductions, from Town Hall
Paper Prints of maps — 1″ = 1000′ 22 x 42″	Diazo copies from original mylars, Town Hall
Reduced half-scale maps, 11 x 17″	This publication
AERIAL PHOTOS — as indexed on MAP 2, REFERENCE INDEX.	
Stereo coverage, 1″ = 1000′ (9x9″ paper prints)	Inspection, Town Hall
Single coverage frames, 1″ = 1000′ 9 x 9″ screened mylar	Diazo copies by frame number, Town Hall
Single coverage frames, 1″ = 500′ 18 x 18″ screened mylar	Diazo copies by frame number, Town Hall
Extra copies of stereo photos or mylars	Keystone Aerial Surveys, Box 217, Glenside, Pa. 19038. Ask for Conn. 1975 series by frame. Larger scales available.
TECHNICAL APPENDIX	Copies available from Town Hall
Discussions:	
Water Chemistry as Indicator of Life Support Capacity	
Critical Water Quality Indices	
Prediction of Life Support Capacity from Water Quality	
Hydrologic Overview	
Dilution Factors for Septic Waste	
Nitrate as Indicator of Life Support Capacity	
Future River Water Quality in Weston	
Stratified Drift Aquifers	
Effect of Water Softeners on Water Quality	
Recommendations to Planning and Zoning Commission	
Sample Drainage Calculation for Zero-Extra Runoff Goal	
TECHNICAL DATA FILE	Inspection Town Hall; bibliography appears at the end of this section
Contents:	
Air Pollution	
Bridgeport Hydraulic	
Environmental Administration	
Geology	
History	
Hydrology	
Sanitation	
Soils	
Water Softening	
Vegetation	
Water Softening	
Water Quality	
Wetlands	
Wildlife	
1975 FIELD DATA	
Field notes on Weston geology, John Minard	Geology Section; MAPS 10, 12
Seismic runs, Nexus Engineering	Geology Section; MAP 8
Historical research, Scott Lewis	History Section; MAP 15
Culverts Data, Nexus Engineering	Hydrology Section; MAP 8
Vegetation Data, Cowmeadow and Dominski	Vegetation Section; MAP 4
Water quality data (wells and surface), Nexus Engineering	Water Quality Section; MAP 8
BIBLIOGRAPHY	Listed below (pages 44-45)

THE DATA RESOURCE MAPS

DESCRIPTION OF BASE MAP

The base upon which all data was mapped was constructed from four U.S.G.S. quadrangle topographic surveys which cover Weston (Westport 1971, Norwalk North 1971, Bethel 1970, Botsford 1969). The maps were enlarged photographically to a scale of one inch equals one thousand feet. The resulting map was then corrected to include new roads and construction.

Where detailed topographic information was useful to the interpretation of the data being presented, such as wetlands, the data was mapped onto the original ten foot interval contour map. However, in many cases, the clarity of the finished map was increased by simplifying the base. Therefore, a second base showing only the fifty foot contours was constructed from the original.

MAP 2: REFERENCE INDEX

EXPLANATION OF THE LEGEND

The stereoscope, a simple optical instrument, reveals the three-dimensional character of areas which are covered by two consecutive frames of the series of aerial photographs.

Sources: April 1975 Aerial Survey of Connecticut conducted by Keystone Aerial Surveys, Glenside, Pa., under Connecticut Contract 745-A-3730.

Explanations:

MAP 2, REFERENCE INDEX was developed to correlate the 1975 aerial photographs with the DATA RESOURCE MAPS. The index was produced by laying out a grid which best fitted the overlapping aerial photographs. Largest inconsistencies in the grid are vertical or lateral drift of the aircraft from its chosen course. Distortion, as an apparent change in scale, results from the two-dimensional represention of the three-dimensional field. This is most noticeable at the edges of the photograph where camera angles are greater. Where topography is rising at the edge, apparent scales are compressed and when topography is falling the scale is expanded.

Note that the numbers of the grid ascend by two's—i.e., 47-7121, 47-7123, 47-7125; the missing numbers 47-7122 and 47-7124 represent the stereo pair to each adjacent photograph. When two consecutively numbered photographs—i.e., 47-7122 and 47-7123—are viewed in a stereoscope, the overlap between them (approximately 60%) is seen in three dimensions, with a vertical exageration of 300%. When a small locale of interest falls at the edge of one frame, for instance 47-7122, it can be located also on adjoining frames, usually more centrally, for greater continuity.

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49 7077
49 7079
48 2424
50 2520
49 7081
48 2426
Weston
50 2522
49 7083
51 2698
50 2524

MAP 3, WETLANDS

THE GREAT, LIVE, SPONGES IN THE LANDSCAPE

The soil auger brings up a sample of black, wetland muck. Vegetation identification and this simple soil test are the most practical way to identify and map wetlands.

The oval leaf and pungent berry of the Spice Bush identify a very characteristic wetland plant.

Wetlands in Weston occur mainly as a flattening of topography along streamcourses. They provide basins in which floodwaters spread out and are temporarily impounded. The storage capacity of wetlands reduces the storm flow of streams and spreads the discharge from a watershed over a period of days. Evidence of this function can be observed in the high water level in wetlands for several days after a storm.

In evaluating alterations to wetlands, it is imperative that consideration be given not only to the immediate wetland affected, but also how the whole complex of wetlands and connecting channels downstream will be affected. Map 6, Hydrology, shows how the stream and wetland complexes fit into Weston's watersheds.

While floodwaters remain impounded in wetlands, they become purified. Since water in wetlands moves more slowly, the load of sediment drops out; wetland vegetation promotes this action by further filtering sediments from floodwaters. Wetlands also purify water by removing dissolved chemicals. Nitrates are taken up by wetland vegetation—trees, shrubs, herbs and submerged aquatic plants. The decaying wetland sediments remove nitrate and sulfate from waters through biochemical action of microorganisms which convert these elements to a gaseous state.

Since wetlands hold runoff for a period of time, they provide sites at which water can be recharged into the ground. This action is most effective when wetlands lie over the permeable sand and gravel deposits of stratified drift aquifers. They can be likened to great, live, sponges in the landscape which trap and purify water for future human use.

In addition to regulating the flow and quality of water through the ecosystem, wetlands are valuable habitats for plants and animals. Map 4, Protection Zones, indicates areas in which wetlands have special habitat value. For example, the large wetland lying between Cannondale Road and Langner Lane has significant value for waterfowl.

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EXPLANATION OF THE LEGEND

Two basic criteria were used in mapping wetlands: soil criteria as defined by the Soil Conservation Service, and vegetational criteria as described in *Inland Wetland Plants of Connecticut.* 1973 by Niering and Goodwin.

WETLANDS are areas in which the water table is at or near the surface throughout the year. These areas have peat and muck soils, corresponding to the Soil Conservation Service designations 91 Adrian and Palm mucks and 92 Carlisle muck.

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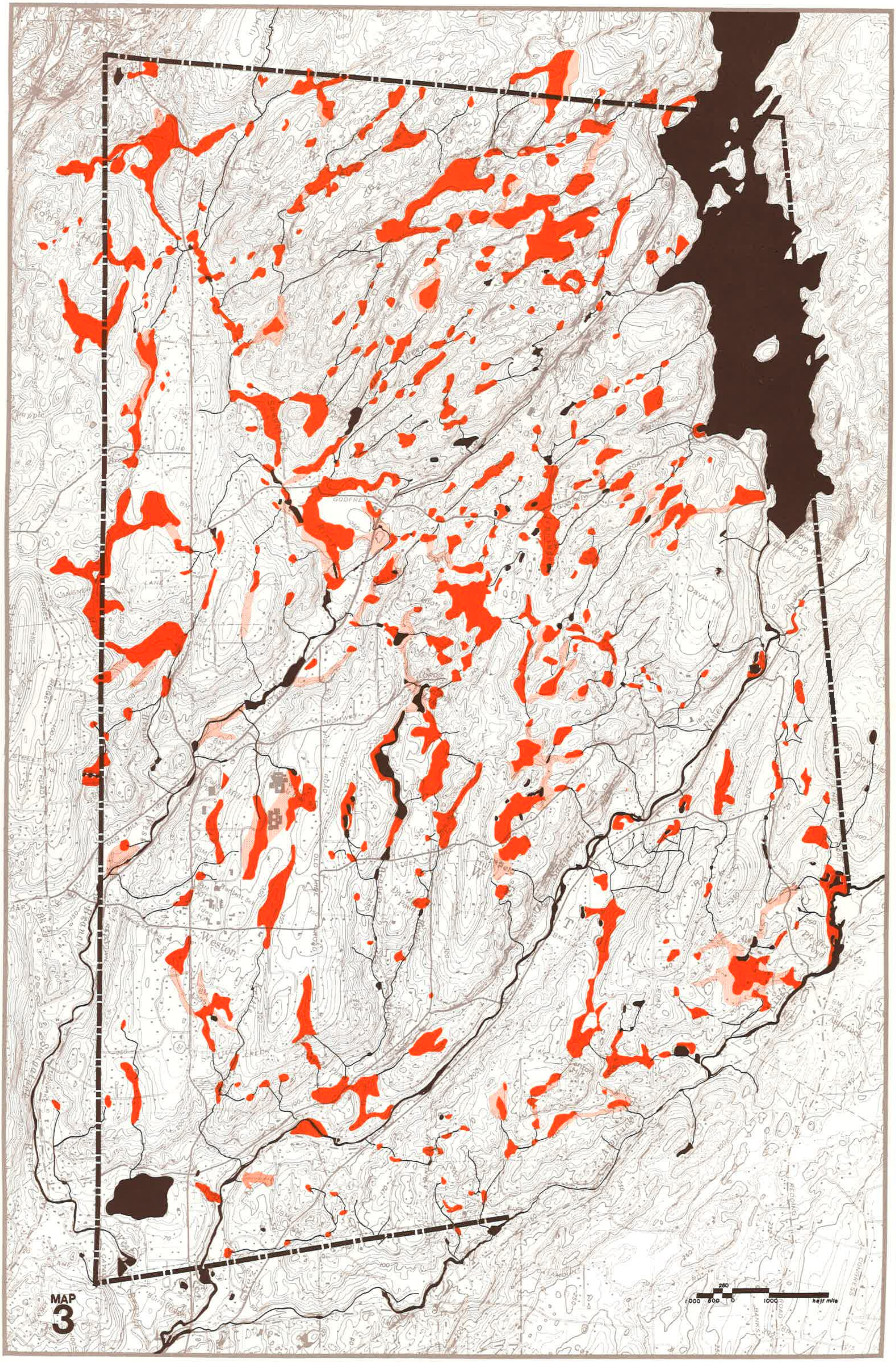

MAP
3

MAP 4, PROTECTION ZONES

Aside from their beauty, wetlands control flooding, purify and recharge water and harbor wildfire.

Specimen pine trees within a designated Protection Zone.

The Protection Zones Map shows six categories of natural features which need special management because of their crucial role in maintaining Weston's excellent environmental quality. Although the efficiency of its services is often unnoticed, the Protection Zones represent the invisible mechanical system of the Town. Its conduits are the permeable soils, the wetlands and watercourses. The healthy forest is its air conditioner and waste purifier. Like the mechanical system of a building, it cannot continue to perform if its conduits are obstructed or removed.

For each of the features shown, there is recommended one or more options for management. The overall goal to management of these units is to minimize or eliminate the loss of their ecologic function as the Town develops to its maximum density.

The most direct way to eliminate loss of the natural function of an area designated as a Protection Zone is to minimize human development within it. However, since this will not always be possible, a series of codes or guides to management have been established. The principle behind the treatment of the Protection Zones is not to prohibit development, but merely to insure that as development proceeds, the environmental resources upon which it rests are not destroyed.

PROTECTION ZONES

DEDICATED OPEN-SPACE consists of parcels of land which have been preserved in perpetuity as public open-space. Here, unique and fragile pieces of the natural environment are managed in the public interest. The largest single piece of public open-space, The Lucius Pond Ordway Preserve of the Nature Conservancy is a fine example. It lies on steep, folded, thin-soiled topography dotted with wetlands and picturesque habitats. In its conserved state, the Ordway Preserve insures the future water quality of the West Branch Saugatuck River, for which it is the headwaters.

Management:
In the course of time, as various parcels of land move from private ownership into the public domain, the task of evaluating each for its resources and sensitivities will become necessary. This process of inventorying of environmental features is the framework for revealing a logical management goal for each parcel. Recreation opportunities notwithstanding, the public management of **DEDICATED OPEN-SPACE** must not facilitate environmental degradation—especially to water resources. Each of the management options of the various categories of specific Protection Zones must be applied, as required.

RECOMMENDED OPEN-SPACE has been identified on the basis of large contiguous areas which support natural complexes of ecologic sensitivity; contiguous areas of unique or vanishing habitat; areas of significant cultural, historic or recreational value to the public.

Management:
One of the most important goals in open-space acquisition—from an environmental viewpoint—is to maintain the biological diversity of the landscape. This diversity assures ecologic stability and therefore protects the human co-inhabitants from environmental degradation. The best example of this principle at work in Weston is the action of the diverse landscape of the Ordway Preserve to collect, filter, purify and regulate the headwaters of the West Saugatuck. Its acquisition by the Nature Conservancy is an immeasurable benefit to Townfolk who rely on the quality of its water.

STREAM BUFFERS highlight the necessity of protecting watercourses from the development process. In order to maintain their natural functions they should be channelized as little as possible and be protected from sedimentation. A filter strip of natural vegetation between the streamside and the site of development can alleviate sedimentation which is trapped on its way to the stream by the porous soil and plants encountered in the strip. The width of the filter strip, or **STREAM BUFFER**, varies with the slope of the bank of the stream.

Management Options: The following table gives the minimum width of **STREAM BUFFERS** for ordinary residential situations. The maximum values are recommended where careful protection is necessary, as in the case of streams leading to a public water supply or swimming area. Thus, for example, the maximum values should be applied to all streams within the Saugatuck Reservoir watershed and along the West Branch Saugatuck.

TABLE 3

RECOMMENDED WIDTHS FOR STREAM FILTER STRIPS (after Lavine *et al* 1974)

Slope of Land Between Cleared Area and Stream	*Width of Filter Strips*	
	minimum	*maximum*
0%	25 feet	50 feet
10%	45 feet	90 feet
20%	65 feet	130 feet
30%	85 feet	170 feet

CONSERVANCY CORRIDORS—identified on the basis of ecological sensitivity and relative freedom from development—this Zone provides the framework for a Town-wide system of conserved open-space.

The majority of **CORRIDORS** follow wetland and stream complexes which have been judged to be the most sensitive specific pieces of Weston's natural inventory. **CORRIDORS** provide for the unobstructed natural drainage and for the free movement of wildlife within them. They also offer the possibility of Townwide recreation opportunities. As visual buffers to development they preserve the rural character of the Town.

Management Options: Keep building out of the CORRIDORS. Avoid impermeable paving. Do not clear vegetation. Encourage inter-connected trails.

WOODLAND, FOREST signifies those portions of the landscape where, generally, the canopy of deciduous trees is continuous, typifying the climax vegetation of the northeastern seaboard. As an environmental amenity these areas represent that portion of Weston where the forest ecosystem can be assumed to be intact.

Management Options: Preservation of large tracts as well as a significant stands of the forest intact has preserved the environmental quality of Weston as a human community based on natural water supply and waste disposal. (See Technical Appendix; Nitrate Dilution Discussion.)

CLEARED LAND refers to those areas where the canopy of deciduous or evergreen trees is discontinuous. Old fields, lawns, parking lots, and cultivated land fall into this category. Because the edge between cleared land and forest is often gradual, the boundaries are general. The most useful interpretation of the information conveyed by this category is the extent and pattern of the absence of the forest ecosystem as an environmental amenity.

Management Options: Allow old fields to remain in rough meadow. Encourage reforestation.

PROTECTION ZONES

WESTON ENVIRONMENTAL RESOURCES MANUAL

Dominski / Oakrock Associates
ENVIRONMENTAL PLANNING
NEW HAVEN, CONN.

LEGEND:

Vegetation

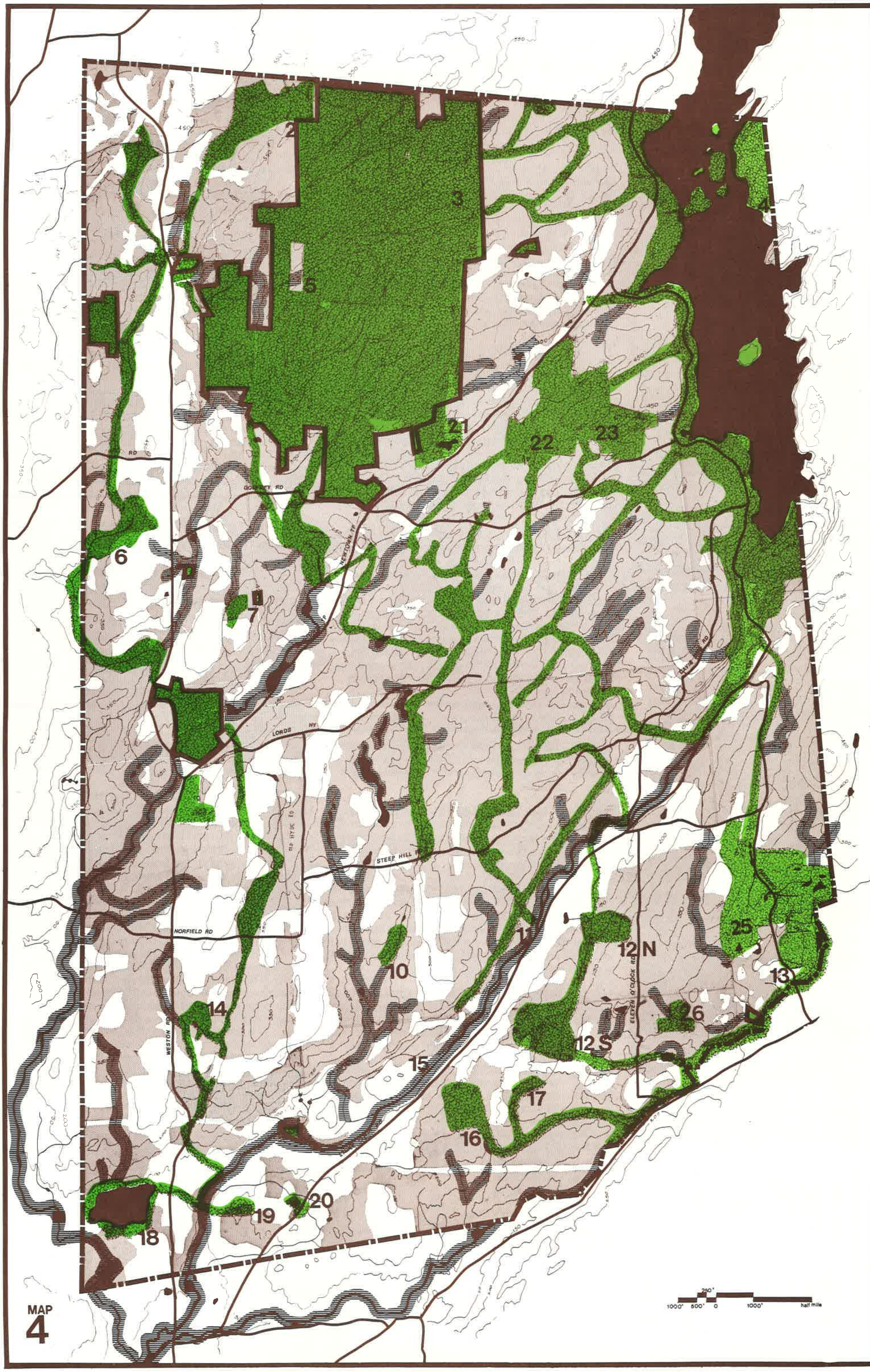
- cleared land, open field, lawn, discontinuous forest
- forest, woodland

Protection Zones

- proposed open space recommended for conservation
- dedicated open-space
- wildlife and conservancy corridors in woodlands
- conservancy corridors in open field
- stream buffer zones
- 14 unique natural areas

See p. 48

scale:
source(s): D/O
date: June, 1976


MAP
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NORFIELD RD
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MAP 5; CRITICAL PLANNING UNITS

THE LANDSCAPE SYSTEMS OF WESTON

UPLAND LANDSCAPE
The intrinsic beauty of the mixed vegetation of an old field—fruit trees and columnar cedars—is often overlooked as development proceeds.

LOWLAND LANDSCAPE
Sixteen percent of Weston's total area consists of lowlands—peat and muck wetlands, wetland linkages and surface water. These landscapes have a very low carrying capacity for human development.

Weston's forest ecosystem consists of a complex mosaic of habitats woven into its irregular topography. These habitats vary widely in their ecologic/engineering suitability for development, depending primarily on slope, soil depth and drainage characteristics.

For the purposes of developing guidelines for land use planning, Weston's habitats can be catalogued into a number of repetitive types—three lowland and four upland. The lowland landscape types—peat and muck wetlands, wetland linkage and surface water—are unsuited to human development except in special cases. The upland units, in contrast, are mostly suitable for development, with reservations according to their **natural carrying capacity**.

Each landscape system or type has a unique carrying capacity. Wetlands have a poor ability to sustain human development; upland areas suffer a recognizably smaller insult from disturbance. The carrying capacity of upland areas is primarily dependent upon soil type, slope and geographical position within their watershed. For example, the upland areas of the Saugatuck Reservoir Watershed have a lower carrying capacity than similar areas in the rest of town, due to the ecological sensitivity of the reservoir. Thus, a shallow-soiled area within the Saugatuck Reservoir Watershed can sustain less development than its counterpart in the Godfrey Brook Watershed.

ORGANIZING THE LANDSCAPE SYSTEMS FOR PLANNING: CRITICAL PLANNING UNITS

Critical Planning Units are contiguous areas of uniform landscape type whose disposition is crucial to future environmental quality and life-support capacity of Weston. There is a total of seven categories of **Critical Planning Units** identified: one unit is **AQUIFERS** and the other six units consist of largely undeveloped tracts sharing a common upland landscape pattern (see Tables 7,8 p. 25), and a common ecological role in the macro-watershed context of the Town.

The major constraints to development of upland areas, in order of importance, are: slope, depth to bedrock and drainage. All upland areas with steep slope were mapped together into **STEEP SLOPE UNITS**. The moderate slope, shallow soil areas were mapped into a **SHALLOW SOIL UNIT**. The moderate slope, deep soil areas were separated into two categories: those with hardpan into the **HARDPAN SOIL UNIT** and those without hardpan into **WELL-DRAINED, DEEP UNIT**. Hardpan usually found 15-40" below the surface is a compact layer of sand and silt particles cemented together, which obstruct downward drainage.

The Critical Planning Units map rates the carrying capacity of major pieces of undeveloped land. As such it provides a logical basis upon which to make land-use decisions on a Townwide basis. The recommendations inherent in the Critical Planning Units are complementary to those of the Protection Zones Map which shows areas within the Critical Planning Units which have a special ecological role which must be maintained to protect future environmental quality. These areas include buffer zones around water courses, conservancy corridors and recommended upland tracts of open-space.

For each of the units which are largely undeveloped there is a life-support capacity rating, expressed as a maximum gallons/acre/day of septic effluent which can be sustained in the upland portions of the unit, without endangering private and public water supplies. The maximum septic ratings refer to the residential engineering design standards of the Aspetuck Valley Health District of 200 gallons/bedroom/day or its equivalent in effluent from commercial or institutional buildings.

TABLE 4

CARRYING CAPACITY RATINGS FOR CRITICAL PLANNING UNITS

UNIT	*MAXIMUM SEPTIC DOSE gallons/acre/day*
STEEP SLOPE UNITS	270-400
SHALLOW SOIL UNITS	400
HARDPAN SOIL UNITS	400
WELL-DRAINED DEEP UNITS	400-800
SPECIAL SHALLOW-SOIL UNIT	270
SPECIAL WELL-DRAINED UNIT	800+

DESCRIPTION OF THE UNITS

The colored areas represent the units most sensitive to environmental degradation.

AQUIFER UNIT—now mostly developed, but nevertheless holding extraordinary potential for delivery of large-scale water supplies.

STEEP SLOPE UNITS—areas largely undeveloped with majority of slopes over 10%. The limiting environmental factor is considered to be erosion hazard and run-off associated with steep slopes.

SHALLOW-SOIL UNITS—areas largely undeveloped with majority of slopes less than 10% and in which bedrock lies within ten feet of the surface. The limiting environmental factor is considered to be possible inadequacy of septic potential/possible septic contamination of wells or groundwater.

HARDPAN SOIL UNITS—areas largely undeveloped with majority of slopes less than 10%; bedrock lying greater than ten feet of the surface and having soils with hardpans. Hardpans occur in SM and ML-SM soils (see MAP 9).

WELL-DRAINED, DEEP UNITS—areas largely undeveloped with majority of slopes less than 10%, bedrock laying greater than 10 feet from the surface and soils without hardpans. Five of these units lie within the general boundaries of the AQUIFER UNITS. Limiting environmental factor is considered to be the danger of heavy point discharge of contaminants to aquifer where local conditions otherwise favor high human carrying capacity.

SPECIAL SHALLOW-SOIL UNIT—an area within the watershed of the Saugatuck Reservoir with particular ecologic sensitivity to pollutants from development which would flow directly into the reservoir. This limiting environmental factor is the origin of the life-support rating of this unit which is lower than all other SHALLOW-SOIL UNITS.

SPECIAL WELL- DRAINED UNIT—located near Godfrey Road, this unit has a higher life-support rating than any other area so rated. This rate is due to the combination of excellent drainage and potentially abundant water supply. The water potential derives from the fact that this parcel lies on an aquifer fed from the Godfrey Brook watershed, most of which is occupied by the Lucius Pond Ordway Preserve of the Nature Conservancy. The protected nature of its watershed assures the aquifer of a long-term supply of excellent quality water. The limiting environmental factor in this special unit is considered to be the hazard of a heavy point stress to the Townwide environmental fabric since the local condition appears favorable to dense human development.

Table 4 gives the life-support rating of the seven Critical Planning Units.

CRITICAL PLANNING UNITS

LEGEND:

- AQUIFER UNIT
- SHALLOW SOIL UNIT
- HARDPAN SOIL UNIT
- WELL-DRAINED DEEP UNIT
- WATERSHED BOUNDARY [SEE MAP 6]
- STEEP SLOPE UNIT
- SPECIAL SHALLOW SOIL UNIT
- SPECIAL WELL-DRAINED UNIT
- LARGELY DEVELOPED

WESTON ENVIRONMENTAL RESOURCES MANUAL

Dominski / Oakrock Associates
ENVIRONMENTAL PLANNING
NEW HAVEN, CONN.

scale:
source(s): D/O, Nexus
date: June, 1976

Legend to the map on the opposite page.


SAUGATUCK RESERVOIR
CANNONDALE RD
GODFREY RD
LORDS HY
STEEP HILL RD
WESTON RD
ELEVEN O'CLOCK RD
REDDING RD
250'
1000' 500' 0 1000' half mile
MAP
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MAP 6, HYDROLOGY

Complexes of streams and wetlands can be clearly identified in this aerial photograph. The streams appear as dark lines while the typical wetland vegetation appears darker and bubbly in contrast to the surrounding woodland.

Human development in wetlands and along wetland margins may be subject to flooding and malfunctioning septic fields.

The natural drainage of Weston is organized by three river systems: the East Branch and West Branch Saugatuck River and the Norwalk River. The Aspetuck drains into the Saugatuck and is considered part of its system. For the purposes of analysis and management, the three rivers were divided into study areas, by watersheds of the major tributaries. This breakdown is shown on Table

Any human activity—agriculture, forestry, industry, residential living with associated storm and sanitary sewage—will affect water flow and quality *within a watershed in which it lies.* By monitoring the watercourse exiting from a given watershed, it is possible to assess the impact of human development within the watershed, including the effect of land use on water supply.

In Weston, there is special concern about how human activity within a watershed affects water seeping to bedrock, which is tapped for wells and recharges the stratified drift aquifers. There is also concern about the extent to which human development has and will impact streams by lowering water quality and causing increased flooding.

As indicated in Table 5, Weston shares a common interest in watershed management with surrounding towns, since a number of watersheds extend beyond Weston's border.

EXPLANATION OF THE LEGEND

FIRST ORDER STREAMS. The East Branch and West Branch Saugatuck River are the first order streams in Weston, with the Aspetuck River joining the East Branch.

SECOND ORDER STREAMS are major tributaries of first order streams.

THIRD ORDER STREAMS are major tributaries of second order streams, which run all year.

INTERMITTANT STREAMS dry up during periods of low precipitation because of lack of ground water discharge. Intermittant flow is characteristic of streams with small sub-watersheds, with limited ground water storage capacity.

WATERSHED BOUNDARIES are the high points—ridges, hills, plateaus, etc.—determined from topographic maps, aerial photos interpretation and field observation which define a drainage basin that moves water to a single point of exit into a larger system. Theoretically, if a raindrop were to fall exactly on a BOUNDARY, one-half of the drop would flow to the streams and then the exit of one watershed, and the other half to the adjoining watershed. The amount of time, usually measured in minutes, which is required for a drop of water falling at the farthest point in the watershed to reach the exit is called the Time of Concentration, a value used to calculate peak flow.

A watershed defines an area which is working as a drainage system, and conversely, indicates the limits of a hydrologic picture. For example, since streams never cross WATERSHED BOUNDARIES, it can be inferred that a point source of pollution will spread in a predictable way down its system and will not show up in a neighboring watershed. However, while streams and rivers do not cross their WATERSHED BOUNDARIES, bodies of water may lie on the BOUNDARY. In Connecticut's folded topography, it is common to have a wetland of a lobed shape lying on a BOUNDARY in a high, flat location, draining into two adjoining watersheds. This situation can be observed on the BOUNDARY between the Saugatuck Reservoir Watershed and the Godfrey Brook Watershed. It is also possible for a limited amount of underground flow to cross watershed boundaries.

W—WETLANDS appear schematically to indicate approximately their presence and location along streams. In the hydrologic picture they represent sites at which storm water can be expected to be retained and ordinary flow will spread out and slow down, with deposition of sediment loads. When passing through wetlands, a stream channel may become indistinct and for practical purposes the entire area of peat soil should be understood to be functioning as the channel even though a dry-season flow may favor a particular route through the area.

WATERSHED EXIT is the point from which precipitation falling anywhere in a watershed could make its way to the larger system, and ultimately to the ocean. Water may travel over the surface (called overland flow) and go into a stream leading to the exit, or it may first be absorbed into the ground, and then move to the water table from where it may also feed the streams and rivers. About half of the precipitation falling on a Weston watershed never reaches the watershed exit, because it gets evaporated from plants and soil.

Of a total average annual precipitation of 46.5 inches, 23.4 inches reaches the watershed exit—13.4 inches coming from surface runoff and 10.0 from groundwater discharge. It is the groundwater discharge, also called **base flow**, which keeps the streams running during dry periods. The ground water discharge into streams is used as an estimate of the total amount of water being recharged into the ground each year. Human development in Weston takes up an average of 1.2 inches of precipitation annually via wells and returns most of it back to the ground via septic leach fields.

The 23.1 inch portion of annual precipitation which never reaches the watershed exit is evaporated into the atmosphere. This includes water which falls directly on plants and never reaches the soil, or is taken from the soil by plant roots and transpired or evaporates from the soil surface or bodies of water within the watershed.

HYDROLOGY

LEGEND :

- watershed boundaries
- lake, pond
- watershed exits
- W wetlands
- all gray tones simply distinguish between one watershed and the next
- river
- stream, 2nd order
- stream, 3rd order
- seasonal flow

WESTON ENVIRONMENTAL RESOURCES MANUAL

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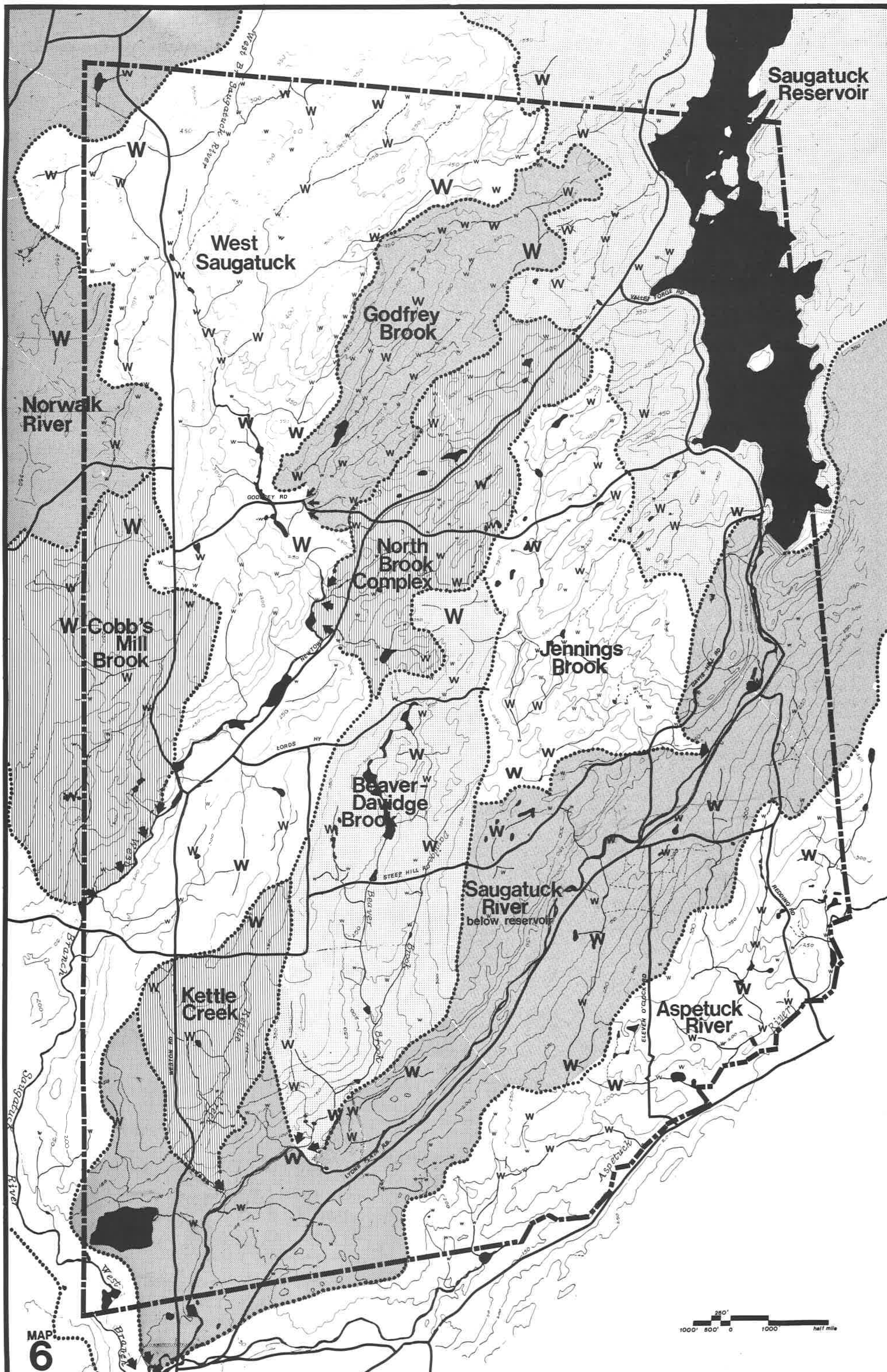
NEW HAVEN, CONN.

scale:
source(s): dominski, nexus, u.s.g.s.
date: may, 1976

Legend to the map on the opposite page.


Saugatuck Reservoir
West Saugatuck
Godfrey Brook
Norwalk River
North Brook Complex
Cobb's Mill Brook
Jennings Brook
Beaver-Davidge Brook
Saugatuck River below reservoir
Kettle Creek
Aspetuck River
MAP 6

Planning to maximize environmental quality at each stage of development, requires an analysis of the unique character of its individual watersheds. This character resides in the distribution of **Landscape Systems** in a watershed, their geographical relation to each other and their interaction with present and potential human development.

TABLE 6 summarizes the landscape composition of Weston's watersheds. The lowland areas, steep areas and shallow areas which are quite sensitive to development constitute 58.4% of Weston's area.

An analysis of CRITICAL PLANNING UNITS (TABLE 7) shows that **the remaining undeveloped areas have a much higher proportion of steep and shallow-soiled areas than the town as a whole.** This reflects the fact that the more easily developable, moderate slope and deep-soiled areas have been preferentially developed. Fortunately, for Weston's environmental future, a large proportion of undeveloped steep and shallow-soiled areas are in the Lucius Pond Ordway Preserve.

A number of recommendations, unique to individual watersheds, are embodied in the maps and technical reports produced as part of the Environmental Resources Study. For convenience, these are listed here.

TABLE 5

WESTON WITHIN ITS REGIONAL WATERSHED CONTEXT

Regional Watersheds in Weston

12.0	East Branch Saugatuck
7.6	West Branch Saugatuck
0.3	Norwalk River
19.9	Total Weston Area (sq. mi.)

East Branch Summary

Jurisdictions: Easton, Redding, Ridgefield, Newtown, Danbury, Bethel, Weston, Fairfield, Westport.

Outlet: Long Island Sound

Total area: 79.1 square miles

Weston area: 12.0 square miles

Subdivision of Weston Area:

Stream	*Area*
Saugatuck Reservoir	2.4
Saugatuck River (main branch below reservoir)	4.1
Aspetuck River	1.7
Beaver-Davidage Brook	1.7
Jennings Brook	1.5
Kettle Creek	0.6
	12.0 (sq. mi.)

West Branch Summary

Jurisdictions: Redding, Wilton, Westport, Weston

Outlet: Saugatuck River

Total area: 11.9 square miles

Weston area: 7.6 square miles

Subdivision of Weston area:

Stream	*Area*
West Branch Saugatuck	4.7
Cobbs Mill Brook	0.8
Godfrey Brook	1.0
North Brook Complex	1.1
	7.6 (sq. mi.

Norwalk River Summary

Jurisdictions: Norwalk, Wilton, New Cana Ridgefield, Redding, Westchester County, Weston.

Outlet: Norwalk Harbor

Total area: 61.4 square miles

Weston area: 0.3 square miles

WATERSHED RECOMMENDATIONS

SAUGATUCK RESERVOIR WATERSHED

1. Special monitoring of drainage from Blue Spruce Circle and Laurel Ridge Road (see MAP 8, DATA INDEX AND MONITOR POINTS).

2. A master plan for the watershed should be developed which takes into account its extraordinary ecological sensitivity and recreational potential. This would forstall haphazard incremental development which could threaten water quality.

Weston contains most of the shoreline of the Saugatuck Reservoir and 7% of its total watershed. Several parcels within the Weston portion of the watershed are currently slated for sale by the Bridgeport Hydraulic Company. Development of these parcels or other areas within the watershed could adversely affect reservoir water quality. Storm drainage from new development with its content of chemical pollutants—gasoline, oil, salt, fertilizers, lead, pesticides, etc.—and turbidity from erosion will adversely affect water quality, as delivered to customers of Bridgeport Hydraulic in neighboring towns.

Today's water treatment plants cannot cope with dissolved chemical pollutants, and turbidity has been linked to the production of chloroform, and other chlorinated hydrocarbons, when drinking water is chlorinated. The precise effect of development on these water quality problems, unfortunately, cannot now be predicted in advance.

Richard Woodhull, chief of the water supplies sector of the Connecticut State Health Department, has stated that development criteria for state water company land would be based on distance from water, slope and soil type. The definition of CRITICAL PLANNING UNITS and PROTECTION ZONES within the watershed has taken these factors into account. (see MAP 4, PROTECTION ZONES and MAP 5, CRITICAL PLANNING UNITS).

JENNINGS BROOK WATERSHED

1. Close Town Landfill at earliest possible time.

2. Institute monitoring in vicinity of Landfill immediately (see MAP 8, DATA INDEX AND MONITOR POINTS).

3. The entire watershed should have a master plan taking into account the ecological stress zone associated with the landfill.

KETTLE CREEK WATERSHED—no special recommendations.

NORTH BROOK COMPLEX—no special recommendations.

WEST BRANCH SAUGATUCK WATERSHED

1. Protect major aquifer. (MAP 11, AQUIFERS).

2. Town center needs special monitoring. (MAP 8, DATA INDEX AND MONITOR POINTS).

3. One of a limited number of opportunities for higher density development exists in a parcel along Godfrey Road. It is recommended that this potential be considered in Townwide planning. (MAP 5, CRITICAL PLANNING UNITS).

4. Area adjoining west border of Lucius Pond Ordway Preserve recommended for open space acquisition. (MAP 4, PROTECTION ZONES).

SAUGATUCK RIVER WATERSHED

1. Protect major aquifer. (MAP 11, AQUIFERS)

2. Extensive acquisition of open space recommended including hemlock grove below reservoir, a major complex of wetland, upland forest and open fields east of Eleven O'Clock Road and a gravel pit near Broad Street. (MAP 4, PROTECTION ZONES.)

ASPETUCK RIVER WATERSHED

1. Special monitoring is needed in peat and muck wetland and wetland linkage complex along Codfish Lane. (MAP 8, DATA INDEX AND MONITOR POINTS).

BEAVER-DAVIDAGE BROOK WATERSHED—no special recommendations.

COBBS MILL BROOK WATERSHED

1. Protect major aquifer. (MAP 11, AQUIFERS).

2. Acquisition of wetland-open field complex along Cannondale Road for wildlife sanctuary. (MAP 4, PROTECTION ZONES).

GODFREY BROOK WATERSHED—no special recommendations.

NORWALK RIVER WATERSHED—no special recommendations.

TABLE 6; LANDSCAPE COMPOSITION BY WATERSHED (IN ACRES)

WATERSHED	UPLAND LANDSCAPE SYSTEMS Steep Slopes	Shallow Soil	Hardpan Soil	Well Drained Soil	LOWLAND LANDSCAPE SYSTEMS Peat, Muck Wetlands	Wetland Linkage	Surface Water	Total Area
Aspetuck River	44	162	140	567	93	51	16	1073
Beaver-Davidage Brook	114	166	555	122	127	13	23	1120
Cobbs Mill Brook	100	—	200	131	61	18	3	513
Godfrey Brook	206	279	—	29	118	18	5	655
Jennings Brook	189	576	—	25	110	23	8	931
Kettle Creek	—	23	312	2	40	13	3	393
North Brook Complex	135	373	3	73	53	26	11	674
Norwalk River	10	5	84	86	22	10	2	219
Saugatuck Reservoir	377	547	—	—	79	9	497	1509
Saugatuck River	732	88	569	1007	151	22	57	2626
West Branch Saugatuck	643	582	948	464	289	74	37	3037
All Watersheds	2550	2801	2811	2506	1143	277	662	12,750
Fraction of Weston Area	20.0%	22.0%	22.0%	19.6%	9.0%	2.2%	5.2%	100.0%

TABLE 7; CRITICAL UNIT COMPOSITION OF UNDEVELOPED LAND (IN ACRES)

WATERSHED	Steep Slopes	Shallow Soil	Hardpan Soil	Well Drained Soil	Special Shallow	Special Well Drained	Total Area
Aspetuck River	54	10	175	121	—	—	360
Beaver-Davidage Brook	—	234	39	13	—	—	286
Cobbs Mill Brook	93	—	38	30	—	—	161
Godfrey Brook	22	407	—	18	—	8	455
Jennings Brook	155	416	—	—	—	—	571
Kettle Creek	—	—	94	—	—	—	94
North Brook Complex	86	295	—	—	—	—	381
Norwalk River	2	—	9	48	—	—	59
Saugatuck Reservoir	380	—	—	—	500	—	880
Saugatuck River	396	63	210	159	—	—	828
West Branch Saugatuck	563	631	132	160	—	13	1499
All Watersheds	1751	2056	697	549	500	21	5574
Fraction of Weston Area	13.7%	16.1%	5.5%	4.3%	3.9%	0.2%	43.7%

MAP 7, SEPTIC SUITABILITY

Sources: MAP 9, GENERAL SOILS. MAP 10, BEDROCK. MAP 13, TOPOGRAPHIC ANALYSIS

The SEPTIC SUITABILITY MAP rates the soils of Weston from an engineering point of view according to their relative ability to absorb septic effluent. The performance of a septic field on a particular lot is predicted by the topography, the soils depth and the percolation rate (as measured by field tests).

It should be noted that septic suitability ratings are not given for areas over 8% slope which would need special engineering analysis, or for wetland-linkage soils or wetland soils. The wetland soils would be unsuitable for development, and the wetland-linkage only conditionally suitable subject to detailed engineering and ecological analysis.

The area needed for septic absorption can be determined by dividing the number of gallons of effluent to be produced in a day, by the percolation rate in gallons/square foot/day. For example, if a 4 bedroom house to produce 800 dallons/day of septic effluent is placed in a GM soil with an absorption rate of 1.6 gallons/square foot/day then 500 square feet would be needed for absorption of septic water.

If the 500 square feet of absorption area is to be provided by trenches, the trenches must be spaced so that they occupy only 25% of the leachfield area. Thus, the absorption area could be accommodated by four 63 foot long trenches, each 2 feet wide and placed on 8 foot centers. Thus, the leachfield would occupy an area of 26 x 63 feet or 1638 square feet.

The placement of a septic field also requires at least 7 feet of soil for adequate filtration of waste (the absorption area is placed about 3 feet below the surface and requires at least 4 feet for adequate filtration.) It also requires a gently sloping area, preferably sloping away from the source of septic effluent.

The placement of a septic field is, in practice, also limited by the geometry of development—setbacks needed for health codes and subdivision regulations, and areas needed for buildings, driveways and roads.

It should be noted that the Aspetuck Valley Health District now requires the layout and preparation of a spare leaching area, in case of failure of the main leachfield. This doubles the area which must be set aside for leachfields, similarly, the area of septic-suitable soil.

Each properly designed installed and maintained septic system has only a small impact on the integrity of Weston's life-support system. However, thousands of septic fields can have a large cumulative effect that threatens the quality of water supply and the physical structure of the forest ecosystem.

Regular monitoring of Weston's environment (see MAP 8, DATA INDEX AND MONITOR POINTS) will provide a check on the environmental impact of its septic systems.

A standard percolation test is performed to predict the rate at which soil will absorb septic effluent.

A poorly placed septic field in Wilton, Ct., near a steep slope and wetland, resulted in septic outbreak, creating a surface health hazard and endangering the well of the adjacent residence.

SEPTIC SUITABILITY

WESTON ENVIRONMENTAL RESOURCES MANUAL

LEGEND:

SEWAGE APPLICATION RATE IN GALLONS PER DAY TO ONE SQUARE FOOT OF EFFECTIVE LEACHING AREAS

- ML 1.1–2.2
- ML w/slope *
- SM 0.9–1.1
- SM w/slope *
- GM 2.2–3.5
- GM w/slope *
- MLSM 0.9–1.6
- MLSM w/slope *
- wetlands bodies of water
- wetland linkage

* SPECIAL ENGINEERING CONDITION

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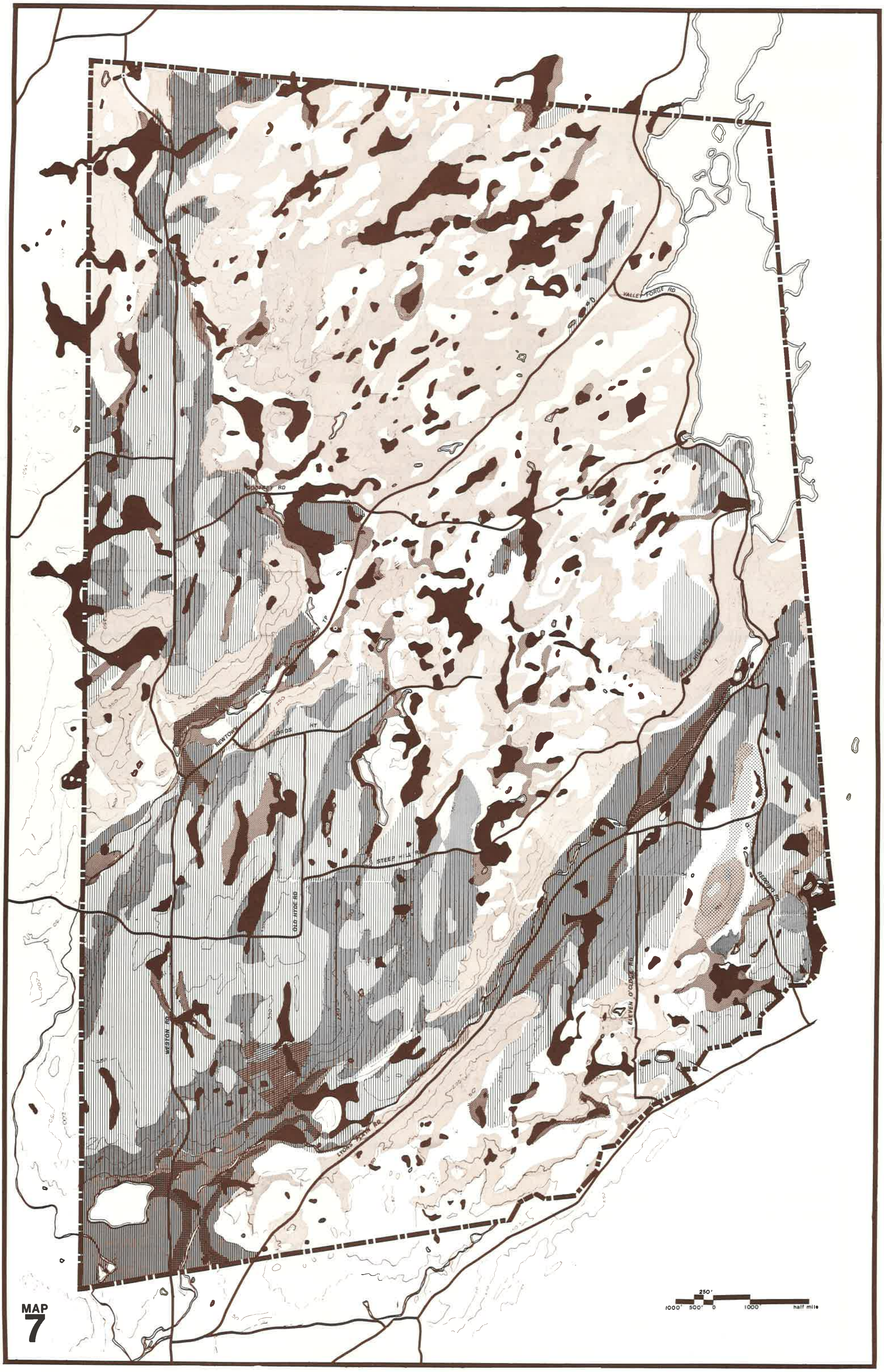
NEW HAVEN, CONN.

scale:
source(s): D/O; Nexus; Health Code, State of Conn.
date: June, 1976

Legend to the map on the opposite page.


VALLEY FORGE RD
STEEP HILL RD
OLD HYDE RD
WESTON RD
LYONS PLAIN RD
ELEVEN O'CLOCK RD
250'
1000' 500' 0 1000' half mile

MAP 7

MAP 8, DATA INDEX AND MONITOR POINTS

Sources: 1975 field-work logs—Dominski/Oakrock and Nexus. MAP 6, HYDROLOGY. MAP 14, HUMAN DEVELOPMENT.

The DATA INDEX AND MONITOR MAP shows locations where field data was gathered in the 1975 field survey of Weston. It also shows recommended surface sampling points and stress zones identified for intensive monitoring (See Technical Appendix).

Water quality sampling points were chosen to provide maximum information about how water quality was affected by human activity as it moved through a watershed. Surface sampling points were placed at headwaters of watersheds to provide a baseline of water quality and at the exits of watersheds to monitor the total effect of human activity within the watershed. Additional surface samples were taken immediately upstream and downstream of points of potential contamination. The taking of water quality samples from various geologic depths—surface, shallow wells, deep wells—provided information on how water chemistry is affected as it percolates from the surface, through the geologic overburden and into bedrock.

Depth to bedrock can be determined in the field with the aid of seismic testing. The geophone on the ground in the foreground measures the amount of time a shock wave requires to travel through the ground at various depths. The wave velocity indicates the material through which it has traveled.

EXPLANATION OF THE LEGEND

□ **CULVERTS** measured for slope, diameter and maximum capacity (See Technical Data File). An inventory of culvert capacities is useful in guiding drainage design on a macro-watershed basis.

○ **DEEP WELLS** bedrock wells sampled in 1975 for water quality (See Technical Data File).

○ **SHALLOW WELLS** dug wells sampled in 1975 for water quality (See Technical Data File).

⬡ **1975 SURFACE WATER POINTS** recommended for testing on an annual basis (See Technical Data File).

△ **SEISMIC RUNS** points at which seismic tests were done, yielding information on depth to bedrock, extent of bedrock fracture, composition of surface geological deposits and depth to water table (See Technical Data File). Points for seismic analysis were chosen to check boundaries between geologic formations and soil types and concentrated on defining aquifer boundaries. Seismic data was incorporated into MAP 9, GENERAL SOILS and MAP 11, AQUIFERS. The apex of the symbol of seismic data indicates, approximately, the direction of the run.

MONITOR STRATEGY

The concept of monitoring the environment for changes, against a background, established quality is discussed in Part II.

⬡ **FUTURE SURFACE MONITOR POINTS** not tested in 1975, but which are recommended for continuous annual monitoring.

STRESS ZONES—recommended for more intensive monitoring than the rest of Town. The area around the **Town Landfill** was designated a stress zone because of the hazards associated with landfill leachate to public health. The area around **Blue Spruce Circle** was designated a stress zone because drainage from the residential development there flows directly into the Saugatuck Reservoir; monitoring in this zone will help to predict how development elsewhere in the Saugatuck Reservoir Watershed will affect the reservoir. **Codfish Lane** was designated because residential development in this location was placed in and around a wetland-wetland-linkage complex. The area around **Town Center** was designated because of the large quantity of septic effluent produced in public buildings and commercial facilities; a special stress in this area is the siting of the school campus and associated leach fields in a wetland-wetland-linkage complex.

DATA INDEX AND MONITOR POINTS

LEGEND:

wetlands
streams
rivers
lakes

AVAILABLE DATA

□ culverts 1 - 60
△ seismic runs
○ shallow wells
deep wells
⬡ surface tests

MONITOR SCHEME

⬡ Yearly test points
□ Stress zones

WESTON ENVIRONMENTAL RESOURCES MANUAL

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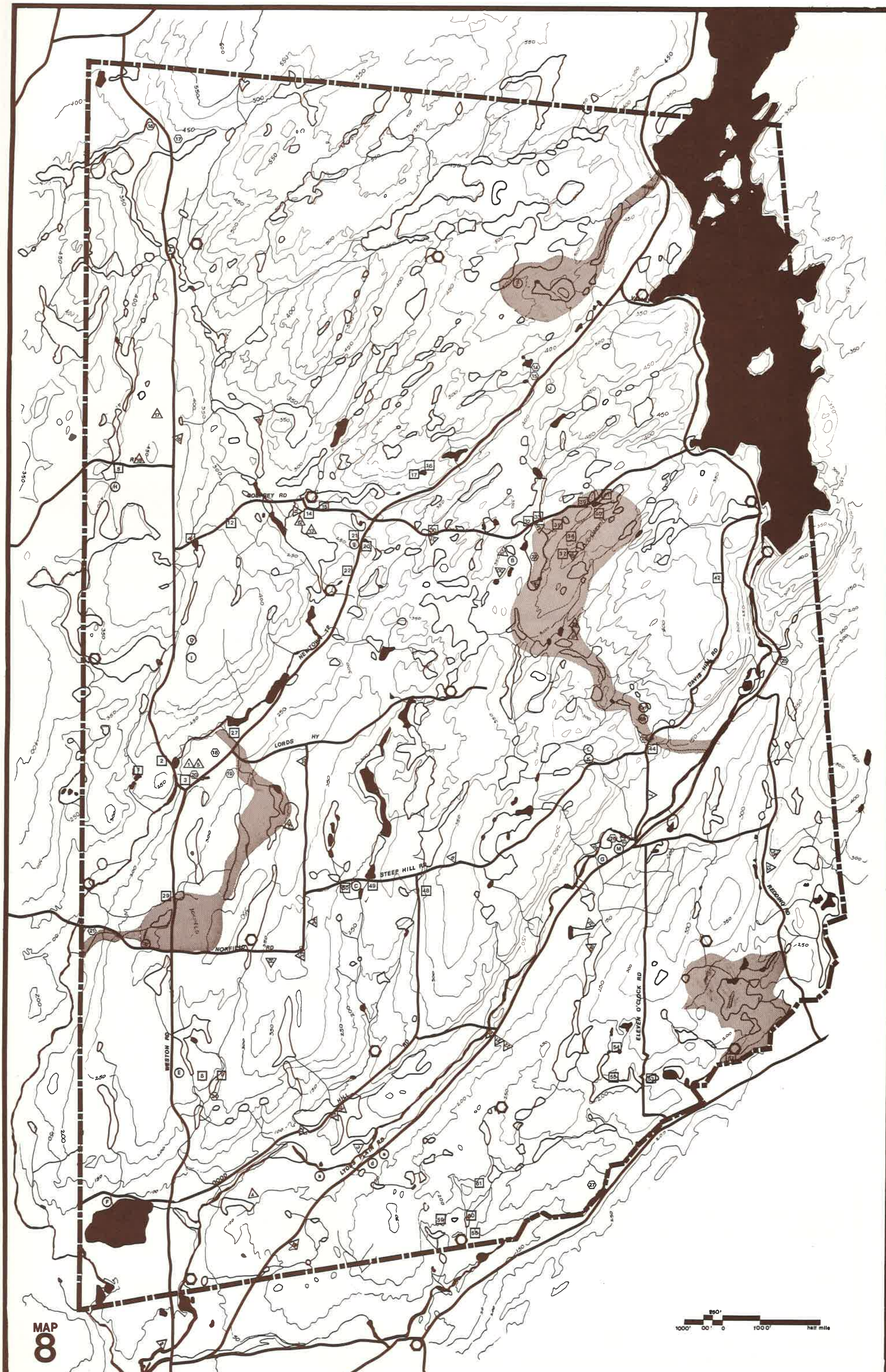
NEW HAVEN, CONN.

scale:
source(s):
date: June, 1976


GODFREY RD
NEWTOWN TP
LORDS HY
STEEP HILL RD
NORFIELD RD
WESTON RD
DAVIS HILL RD
ELEVEN O'CLOCK RD
REDDING RD
LYONS PLAIN RD
half mile

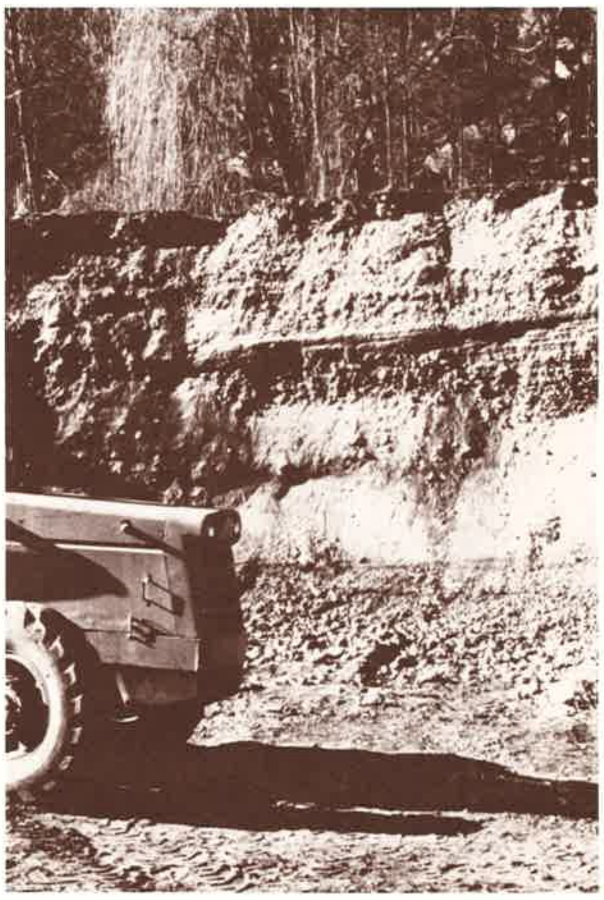
MAP 8

MAP 9; GENERAL SOILS

Sources: Soil Conservation Service *General Soils Map,* February, 1972. Well and soil test logs—Aspetuck Valley Health Office. Field observations—Seismic tests, borings, geological investigations. Map 3, Wetlands.

The GENERAL SOILS MAP classifies soils from an engineering point of view. It is useful for preliminary site analysis to call attention to major engineering conditions likely to be encountered; it is not, however, intended as a substitute for detailed soil mapping on a site scale. It provides an overview to assess overall septic suitability, potential drainage problems and structural capability of the soil. The GENERAL SOILS MAP is also useful on the scale of Townwide planning as a guide to overall potentials of undeveloped parcels for development and acquisition as dedicated open space.

The GENERAL SOILS MAP only covers conditions in the first four feet of soil. Information on lower strata may be inferred from MAP 12, AQUIFERS, from Seismic Analysis Data and Well and Soil Logs (see Technical Data File).



An excavation near Treadwell Lane shows the varied strata of SM soils, with typical permeable and impermeable layers.

DESCRIPTION OF THE SOIL TYPES

GM-SOILS—derived from sands and gravels deposited by meltwaters from glaciers deposited mainly along river valleys. These soils are characterized by silty gravels or a gravel and sand mixture and will leave a dirt stain on a wet palm. These are the best drained soils in Weston and are almost always found over aquifers. GM soils roughly correspond to group "A" on the General Soils Map, February 1972 produced by the S.C.S. It corresponds to hydrologic group "A" in the *Urban Hydrology Handbook,* S.C.S. technical release no. 55.

SM-SOILS—derived from glacial till which has been compressed and has developed relatively impermeable substrata. These soils are characterized by mixtures of silty sands, sand-silt mixtures and dirty sand and will leave a dirt stain on a wet palm. Besides the wetland and wetland-linkage soils, these soils are the most poorly drained in Weston, and can create drainage problems for foundations and installation of septic systems. SM soils correspond to group "C" in the S.C.S., 1972, General Soils Map and to hydrologic soils group "D" in the *Urban Hydrology Handbook.*

ML-SM-SOILS—derived from glacial till which has less clay content and which has been less compressed than "SM" soils. These soils are characterized by inorganic silts and very fine sands, rock flour silt, clayey fine sands or clayey silts with slight plasticity. Occasionally firm sub-strata and clay layers in these soils can create problems for drainage of foundations and installation of septic systems. "ML-SM" soils correspond to group "B" in the S.C.S., 1972 soils map and to hydrologic group "C" in the *Urban Hydrology Handbook.*

ML-SOILS—derived from shallow glacial till with a relatively low clay content. Characterized by being mainly a mixture of sands and silts, termed rock flour, which had not been compressed and has relatively permeable substrata. Engineering limitations in these soils for foundations and the installation of septic systems occur wherever these soils are within 7 feet of the surface. Soils Map, and to hydrologic groups "C" and "D" in the *Urban Hydrology Handbook.*

WT-L, WETLAND LINKAGE SOILS, where there is a fluctuating water table at or near the surface for some portion of the year. These soils could include any of the wetland soils listed for Fairfield County with the exception of the muck and peat soils, but mainly consist of 43-M (Ridgebury-Whitman-Leicester extremely stony soils). The poor drainage in these soils set severe limitations to development for urban uses. These soils correspond to group "F" in the 1972, S.C.S. General Soils Map, and to hydrologic group "D" in the *Urban Hydrology Handbook.*

PT-MH WETLAND SOILS are soils in which the water table is at or near the surface, all year. These soils contain deposits of plant materials in various stages of decomposition and include peat—which is only partly decomposed and muck which is a highly decomposed material. These soils can also contain inorganic silts, micaceous and diamaceous fine sandy or silty soils and elastic silts. These soils in Weston correspond to the S.C.S. classifications (91, Adrain and Palm mucks and 92, Carlisle muck), to group "F" in the 1972 General Soils Map and to hydrologic group "D" in the *Urban Hydrology Handbook.* Because of the high water table, and the elastic nature of these soils, they are unsuited for urban uses.

GENERAL SOILS

LEGEND:

ML -- rock flour good drainage

GM -- gravel, sand excellent drainage

ML-SM -- rock flour, silty sand

bodies of water

SM -- silty sand fair drainage

WT-L -- wetland linkage wet, stony

PT-ML -- wetland peat, muck

WESTON ENVIRONMENTAL RESOURCES MANUAL

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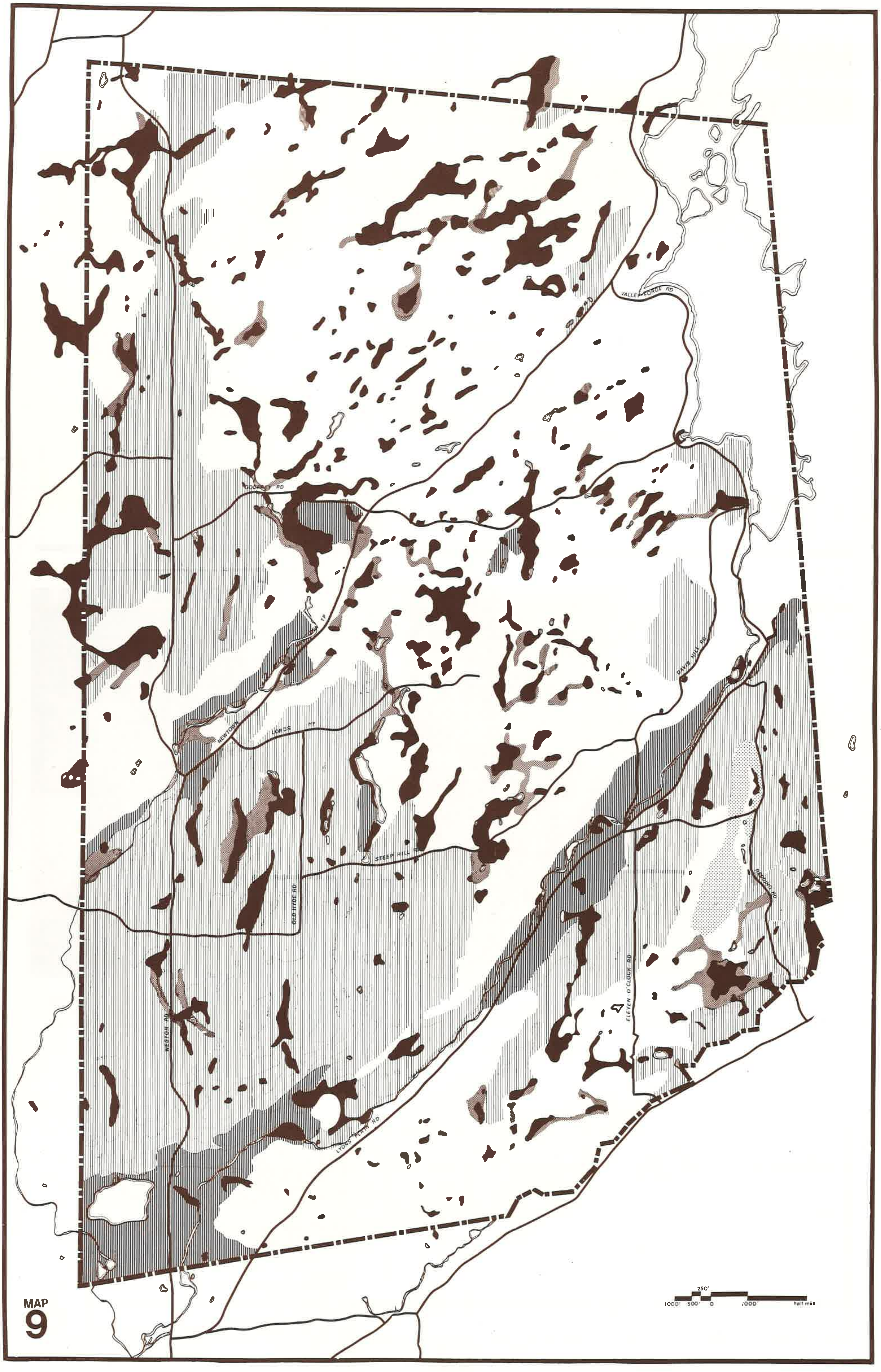
ENVIRONMENTAL PLANNING
NEW HAVEN, CONN.

scale:
source(s): Dominski, Nexus, S.C.S.
date: June, 1976

Legend to the map on the opposite page.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GODFREY RD
DAVIS HILL RD
NEWTOWN
LORDS HY
STEEP HILL RD
OLD HYDE RD
ELEVEN O'CLOCK RD
REDDING RD
WESTON RD
LYONS PLAIN RD
250'
1000' 500' 0 1000'
half mile

MAP 9

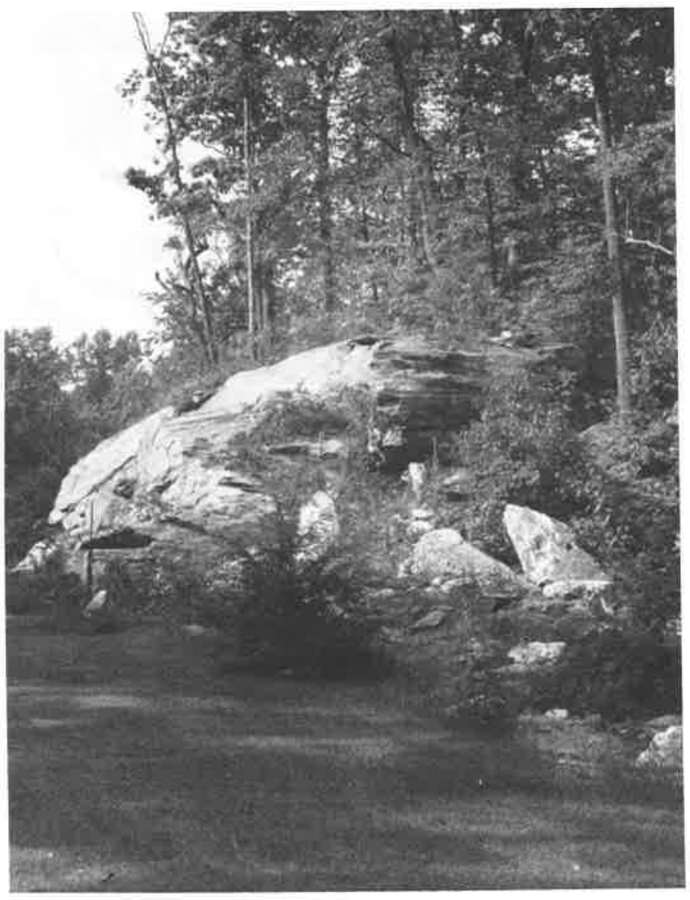
MAP 10; BEDROCK

Sources: MAP 9, GENERAL SOILS MAP. Well and soil test logs, Aspetuck Valley Health District. Seismic analysis. Geological field observations.

The BEDROCK MAP shows the depth of surface geological deposits (sometimes referred to as 'overburden' or as 'soil') to solid bedrock. MAP 9, GENERAL SOILS, indicates the nature of the first four feet of these deposits. The nature of the deposits below four feet may be inferred from MAP 12, AQUIFERS, and from the Seismic Analysis Data (See Technical Data File).

The depth and kind of surface deposit will determine its ability to store groundwater and release it either to shallow wells or to streams, as base flow. The most significant groundwater reservoirs are the stratfied drift aquifers, which are mostly 10-20 feet in depth along the Saugatuck River and range from 10-30 or more feet along the West Branch Saugatuck aquifer. The depths and therefore the water storage capacity of these aquifers are an important consideration in development of wells. The glacial till material covering the rest of the Town also stores and releases significant quantities of groundwater.

The area of the BEDROCK MAP designated 0-10 feet is an area in which there is a high probability that shallow soil depth will impose limitations on the installation of septic tanks and building foundations. If bedrock is less than seven feet of the surface, fill will be required for the proper installation of a septic leach field.



Outcroppings of bedrock pose obstacles to development. Blasting can open up cracks through which septic effluent can be conducted to wells.

Bedrock has been exposed by the action of water in Devil's Glen. Stones in the stream channel represent the remnants of glacial deposits which are too heavy for the water to carry away.

BEDROCK

LEGEND: DEPTH TO BEDROCK

- 0'-10'
- 10'-20'
- 10'-30'
- 20'-30'
- 30'+

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scale:
source(s): Nexus, Aspetuck Valley Health District
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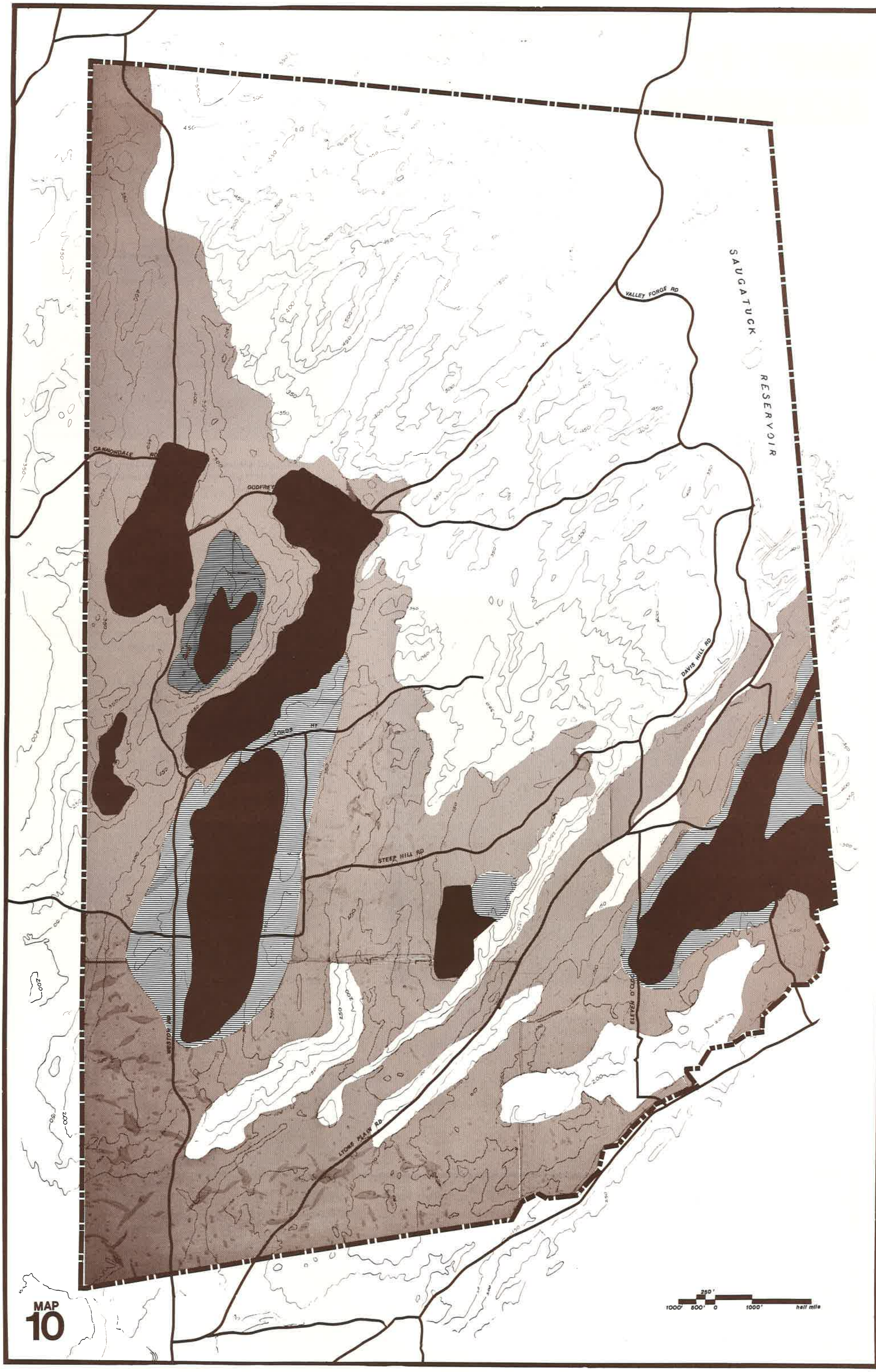
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VALLEY FORGE RD
DAVIS HILL RD
CANNONDALE RD
GODFREY
LORDS HT
STEEP HILL RD
LYONS PLAIN RD
WESTON
ELEVEN O'CLOCK
250'
1000' 500' 0 1000' half mile
MAP 10

MAP 11; AQUIFERS

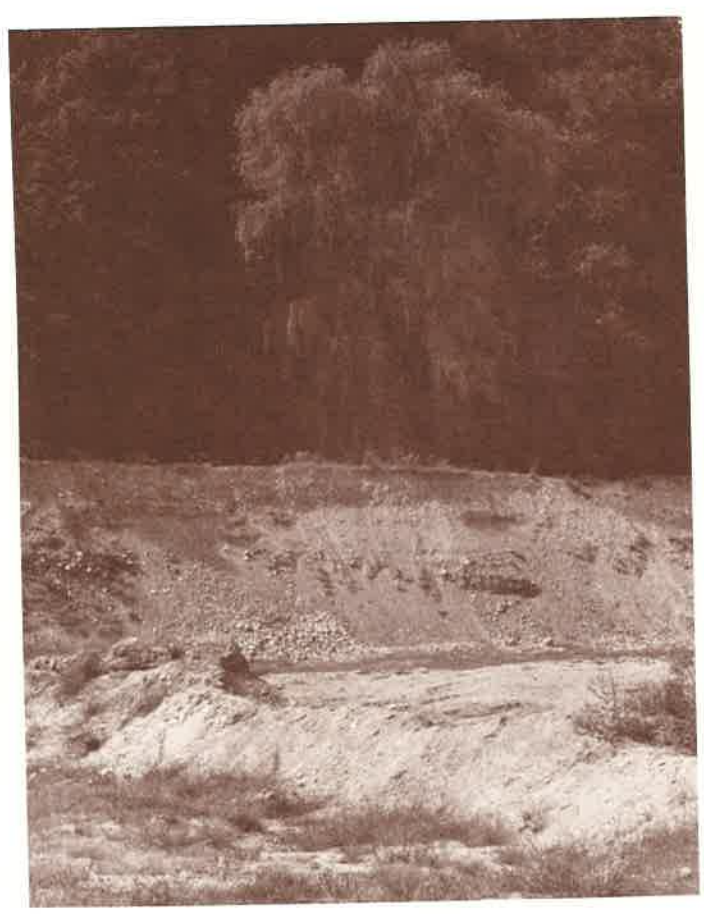
Sources: Thomas, M.P., R. B. Ryder and C.E. Thomas Jr. 1969. Hydrogeologic data for the southwestern coastal river basins, Connecticut. Connecticut Water Resources Bulletin 18.

Ryder, R.B., M. A. Cervione Jr., C.E. Thomas Jr. and M.P. Thomas. 1970. Water resources inventory of Connecticut, part 4, southwestern coastal river basins. Connecticut Water Resources Bulletin 17.

Well and soil logs, Aspetuck Valley Health District; Seismic analysis, Field observations by Dominski/ Oakrock.

An aquifer may be defined as a geologic formation or deposit yielding usable quantities of ground water. In Weston, relatively small quantities of water can be obtained from shallow wells dug in glacial till and greater but still modest quantities from wells drilled into bedrock. However, the geologic formation which can sustain long-term development of large quantities of ground water for public water supply is the stratified drift aquifer. Stratified drifts are geologic deposits lying on top of bedrock, consisting primarily of sand and gravel deposited by meltwaters from retreating glaciers along river and stream valleys. It is these stratified drift deposits which are shown on the AQUIFER MAP.

The gravel excavation at Broad Avenue and Weston Road reveals a picture of a typical stratified drift aquifer deposit.



Sand and gravel aquifer deposits follow the valleys of major streams.

The stratified drift aquifer can store and transmit large quantities of water to wells because it contains an extensive series of interconnected spaces between the sand and gravel deposits, through which water can flow.

Weston's aquifers perform a number of valuable environmental functions. They act as an underground reservoir of water which can yield large quantities of water to streams and rivers, which keeps them flowing during dry periods. (The flow of rivers fed by groundwater is termed *base flow*.) Presently, the Saugatuck River aquifer is being tapped by well fields at the junction of Weston Road and Lyons Plains Road.

Weston's aquifers also function as effective diluters of septic waste of residential development built above the aquifer. At a point when Weston's aquifers are almost completely developed, the water quality of the aquifer and of wells drilled into bedrock beneath the aquifer remains excellent.

In any future development in Weston, it is crucial to protect the water quality in the stratified drift aquifers. This can be accomplished by insuring that they continue to get recharged with water and that no more waste is allowed to flow into the aquifer than it can effectively dilute.

AQUIFERS

LEGEND:

TRANSMISSIBILITY IN GAL./DAY/FT.

10000 - 50,000

0 - 10,000

X INDICATES MINIMUM YIELD OF WELL IN GAL./DAY

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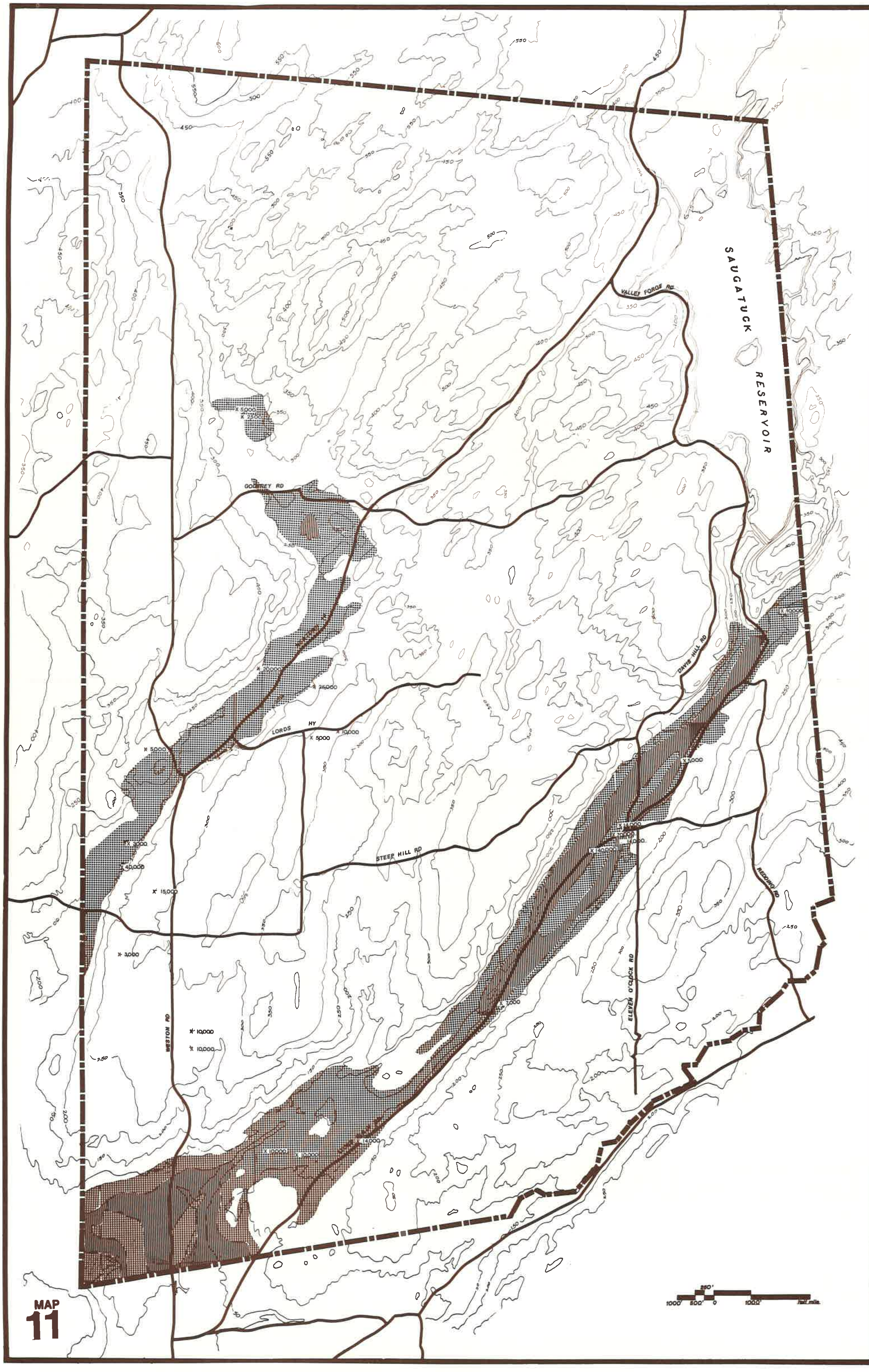
ENVIRONMENTAL PLANNING
NEW HAVEN, CONN.

scale:
source(s): U.S.G.S., Nexus, well logs
date: June, 1976

Legend to the map on the opposite page.


SAUGATUCK RESERVOIR
VALLEY FORGE RD
GODFREY RD
LORDS HY
STEEP HILL RD
DAVIS HILL RD
ELEVEN O'CLOCK RD
WESTON RD
REDDING RD
MAP
11

MAP 12; CRYSTALLINE BEDROCK

Sources: Kroll, Richard; *Bedrock Geology, Norwalk North Quadrangle,* Open File Connecticut Geological and Natural History Survey, Department of Environmental Protection, Hartford, Connecticut. Dieterich, James H. 1968; *Sequence and Mechanics of Folding in the Area of New Haven, Naugatuck and Westport, Connecticut.* PhD, Dissertation, Yale University. Carranza, Carlos. 1970; *Contributions from the Nature Conservancy No. 1., Lucius Pond Ordway Preserve—Devils Den. 1967-68 I. Geology and Geologic History.* The Nature Conservancy. Arlington, Virginia.

Field observations. Scott Hill, *Memorandum on Mines*, Sept. 19, 1975. Sohon, Julian A. 1951; *Connecticut Minerals and Their Occurrence.* Connecticut Geological and Natural History Survey. Bull. 77.

IMPLICATIONS OF THE EXISTING DATA

The bedrock geology of Weston has not been completely detailed. However, the Crystalline Bedrock Map brings together the information presently published and information gathered in field observations.

The main rock formation identified in Weston is the *Hartland Formation* which consists of mica quartzite, schists and gneisses. This formation is often associated with granites and with the gneissic outcrops, pegmatites, mica schists and mineralized veins of the *Harrison Formation*. The major rock forming minerals in these rock formations are quartz, biotite, muscovite, oligoclase, plagioclase, microcline and hornblende.

Economically valuable minerals and rocks in Weston and immediate vicinity include garnet, feldspar, hornblende and iron ore. It is believed that there was a silver mine in the Honey Hill area of Wilton. There may have been lime pits near the upper end of the present Saugatuck Reservoir.

The groundwater produced from bedrock wells in Weston reflects a heterogeneity in the chemical composition of the bedrock in various parts of town. The pH of well water (excluding Ravenwood) varied from 5.8-9.0 with most wells falling in the 6.0-8.0 range. This variability is probably due to the varying amounts of alkaline minerals such as calcite found in the bedrock in different parts of town.

Weston's bedrock is mainly metamorphic in origin, that is formed under great heat and pressure. It is of a hard, crystalline nature which is almost impermeable to water. Thus, water yielded from a bedrock well comes principally from fractures or cracks in the bedrock, and not from water stored in between mineral grains or crystals forming the bedrock. The yield of a well is directly related to the number and width of openings along water-bearing fractures intersected during drilling. There is no way to predict the yield of a well in bedrock before drilling, because the intersection of a drilled well with fractures is essentially a chance phenomenon. Most bedrock wells in Weston are between 100 and 400 feet in depth.

Since Weston's bedrock is hard, blasting is sometimes necessary during the construction process. Blasting however can lead to contamination of groundwater because surface cracks can be produced which then can conduct septic effluent down to wells drilled in the vicinity.

Weston's hard crystalline bedrock was formed under great heat and pressure. Water from wells derives from cracks within the bedrock.

CRYSTALLINE BEDROCK

ACADIAN
- MSG – MASSIVE FELSIC GNEISS
- PG – PORPHROBLASTIC GNEISS

CAMBRO ORDIVICIAN
- MXG – MIXED FELSIC GNEISS
- SG – SHIST AND GRANULITE
- MG – MAFIC GNEISS

– INDIVIDUAL OUTCROP

– AREAS OF NUMEROUS OUTCROPS

– DIP AND STRIKE OF FOLIATION

– VERTICAL FOLIATION

– HORIZONTAL FOLIATION

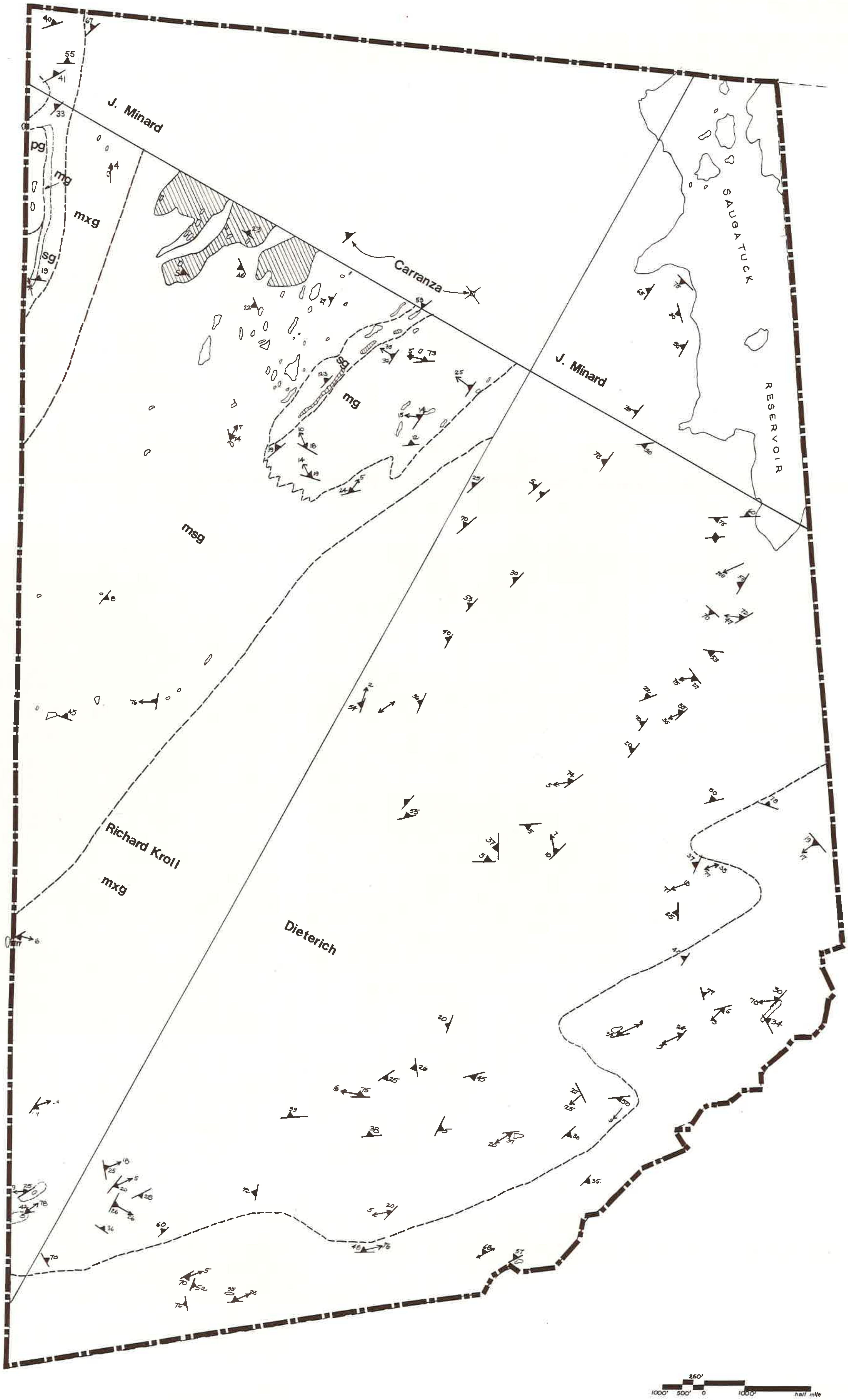
– DIRECTION (TREND) AND PLUNGE OF MINERAL LINEATION

– DIRECTION (TREND) AND PLUNGE OF FOLD AXIS

– DIRECTION (TREND) AND PLUNGE OF SYNCLINE

– DIRECTION (TREND) AND PLUNGE OF ANTICLINE

Legend to the map on the opposite page.



J. Minard
pg
mg
mxg
sg
Carranza
SAUGATUCK
RESERVOIR
J. Minard
sg
mg
msg
Richard Kroll
mxg
Dieterich
250'
1000' 500' 0 1000' half mile

MAP
12

MAP 13; TOPOGRAPHIC ANALYSIS

Sources: Base topographic map. *Urban Hydrology for Small Watersheds.* 1975. Soil Conservation Service Technical Release 55. *Developers Handbook,* Allen Carroll, Connecticut Department of Environmental Protection. Coastal Area Management Program.

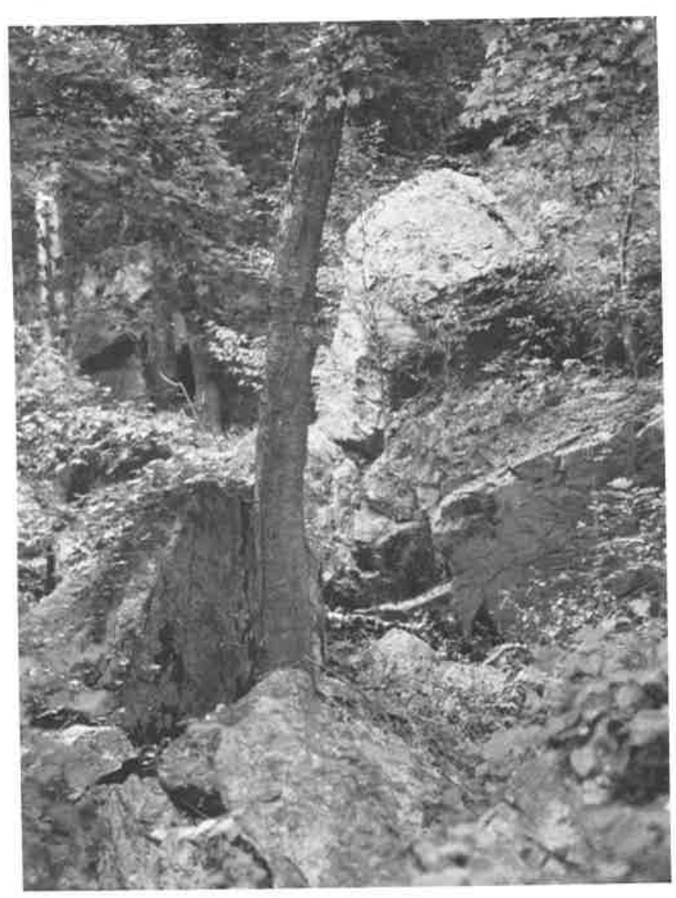
Explanations:

The TOPOGRAPHIC ANALYSIS MAP was constructed according to the Urban Hydrology Handbook criteria for flat (0-2%), moderate (3-7%) and steep (8%+) slopes from a hydrologic point of view. The greater the slope, the faster water will run off a site, and the greater will be its ability to erode the soil and carry sediment to streams and waterways. For example, water running off of lawns will be flowing at 0.5 feet/second on a 0.5% slope, 1.0 feet/second on a 2.0% slope, 2.0 feet/second on a 8.0% slope and 2.7 feet/second on a 15% slope. But every time the water doubles in velocity, its energy, and thus its potential ability to erode and carry sediment, increases by a factor of four.

In practice, most erosion on a site occurs during the very brief periods of time when water flowing off the site is at or near peak velocities during a heavy storm. On steep slopes it is necessary to pay special attention to controlling erosion because of the high peak velocities which occur during storms. On steep sloped sites it may also be more difficult to reach a zero-extra-runoff goal.

Besides presenting problems in control of erosion and runoff, steep slopes may also require special grading and septic field design. MAP 7, SEPTIC SUITABILITY, designates those sloped areas needing special engineering design of septic leach fields.

On slopes greater than 15%, there are hazards for the operation of heavy equipment and there will be extreme difficulty in the installation of septic leach fields. Considerable grading will be necessary for building sites and special precautions need to be taken against movement of soil as a whole mass down a slope (slumping).



The steep slopes of Weston are often accentuated by boulder fields.

New construction on Fern Valley Road shows three adaptations to the steep slope; pilings minimize foundation excavations, a gangplank entrance eliminates cuts and fills, and a Clivus Multrum eliminates the possibility of septic contamination on the slope above the river.

TOPOGRAPHIC ANALYSIS

LEGEND:

- 0–2 percent slope
- 3–7 percent slope
- 8 percent and greater slope

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NEW HAVEN, CONN.

scale:
source(s): D/O, Nexus
date: June, 1976

Legend to the map on the opposite page.


SAUGATUCK RESERVOIR
FORGE RD
MAP
13
250'
1000' 500' 0 1000' half mile

MAP 14, HUMAN DEVELOPMENT

The HUMAN DEVELOPMENT MAP shows general locations of all structures assumed to have a well and septic tank. Thus, it is a graphic representation of the locations where the metabolism of human development interacts with that of the forest ecosystem.

The presence of public and commercial structures is an indication of locations where there is more stress on the forest ecosystem due to the discharge of larger amounts of septic effluent and the point withdrawal of larger amounts of water from the ground.

The HUMAN DEVELOPMENT MAP is useful in Townwide planning and monitoring the environment as Weston's population increases. The original map may be easily modified to record new development.

By using the HUMAN DEVELOPMENT MAP with MAP 8, DATA INDEX AND MONITOR POINTS and the other maps documenting Weston's natural systems, it is possible to correlate the impact of human development on water quality within a given soil type, slope, depth to bedrock, vegetative cover or any combinations of these factors.

For example, to compare the environmental sensitivity of the Kettle Creek Watershed, with predominately hardpan soils, to that of Jennings Brook Watershed with predominately shallow soils, the following procedure can be used. The HUMAN DEVELOPMENT MAP shows where septic fields are already discharging in these watersheds. The DATA INDEX AND MONITOR POINTS MAP as it appears now, and with the additions of the future. shows locations of all sites where surface and well water tests have been taken, in both watersheds. THE TECHNICAL DATA FILE contains the test results. The test results from each watershed can then be analyzed to determine how development within each watershed has impacted water quality.

Similar analyses of human development versus water quality in all parts of Town may be accomplished with the data gathered in the 1975 Environmental Resources Study and the data gathered with regular annual monitoring of the Town's environment (see Section II, Monitoring the Townwide Environment). These analyses will provide an indication of where problems are occurring now, why they may be occurring and where they may show up in the future.

The aerial view shows the typical residential pattern in Weston. Most of the forest is intact with reasonably small clearings for dwellings.

HUMAN DEVELOPMENT

LEGEND:

each symbol shows the approximate location of structures which are assumed to have a well and/or septic field.

- • residential
- ▪ commercial, institutional, public

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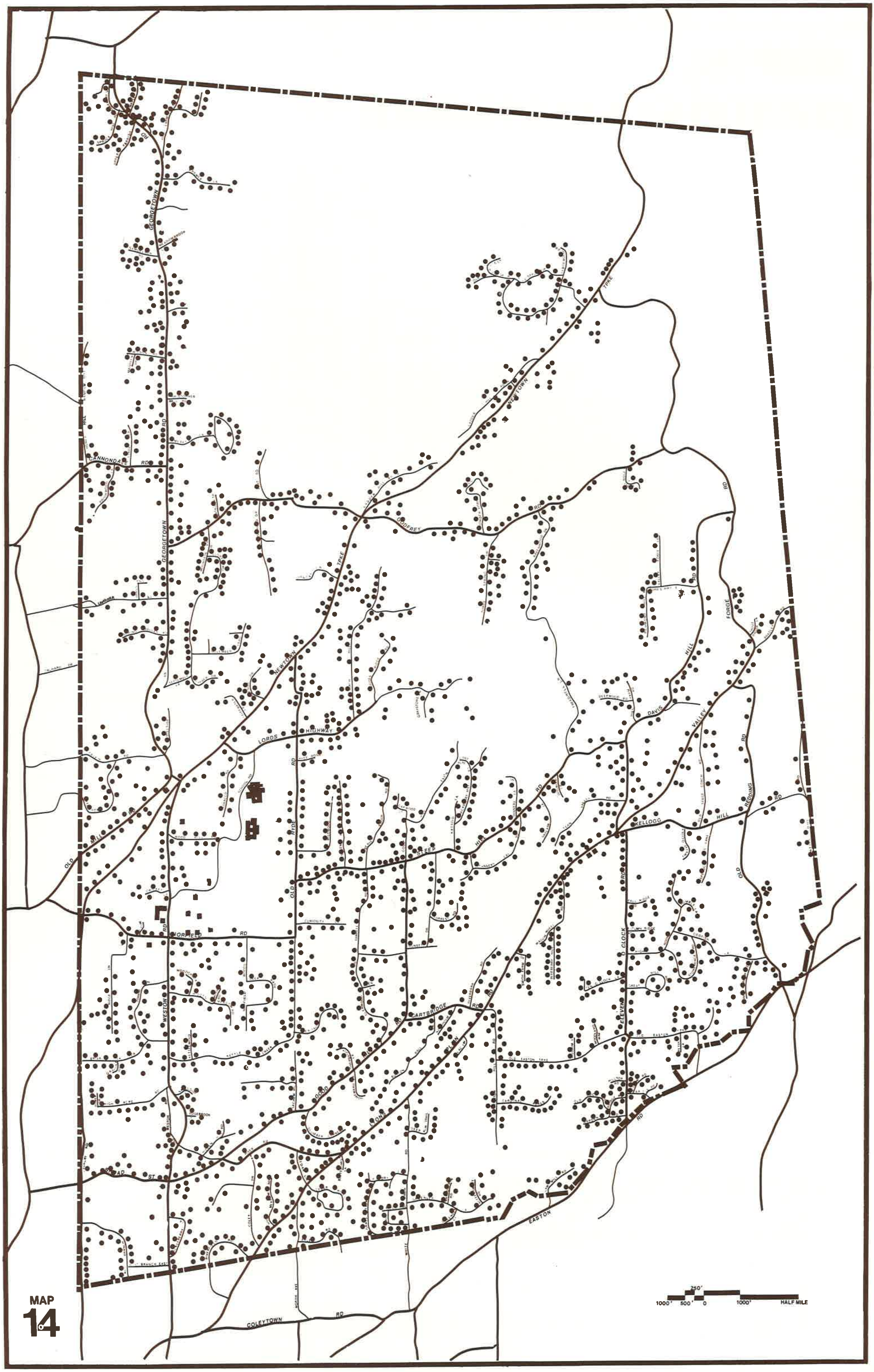
NEW HAVEN, CONN.

source(s): Town Hall. aerial surveys.
date: August 1976

Legend to the map on the opposite page.


GEORGETOWN RD
CANNONDALE RD
GODFREY RD
NEWTOWN TPKE
LORDS HIGHWAY
OLD HYDE RD
NORFIELD RD
WESTON RD
CARTBRIDGE RD
STEEP HILL RD
KELLOGG HILL RD
DAVIS HILL
VALLEY FORGE RD
REDDING RD
OLD REDDING
EASTON RD
COLEYTOWN RD
MAP
14
250'
1000' 500' 0 1000' HALF MILE

MAP 15, CULTURAL LANDMARKS

Sources: 1958 Fairfield Longlots Map. Hoe, James 1975. "Who owned your land 200 years ago?" Weston Forum April 9-15, 1975. Aerial photographs: April 1975 Aerial Survey of Connecticut. Keystone Aerial Surveys. Scott Lewis. Jean Matson.

Weston's past is an existing resource worthy of active conservation and preservation. Historical sites and structures add to the desirability of Weston as a quality environment in which to live and belong. They give continuing evidence of Weston's uniqueness and provide invaluable perspective on its present status and potential as a human environment.

A study of Weston's economic and social history brings to light the environmental factors and features which underwrote Weston's material wealth in the past. While many of these features may have no apparent use in Weston's present residential economy there may be some of critical interest in planning its future. For example, Weston's former pattern of self-sufficient villages may have some relevance to a community becoming increasingly concerned with energy conservation.

In its evolution to a suburban town, Weston has lost much of its cultural heritage. Fortunately, the Town is in a position to revitalize its rich, past, cultural heritage. In doing so, it can avoid the mistakes of many other suburban towns who neglect their cultural beginnings and ended up with symbolically bland, rootless landscapes.

The CULTURAL LANDMARKS MAP was developed to be used as a tool in a format useful for Townwide planning. Historical maps with the original place names provide an effective way of understanding the social and ecological significance of landforms. The cultural or historical understanding of the environment is complementary to the understanding provided by a series of ecological and geological maps. A reference carrying the symbolic and historical impact of "Devils Den" has a richer meaning than the scientific appellation "zerophytic upland" and "Panther Swamp" evokes more sentiment than "red maple wetland." **The richer view of the environment gained by integrating cultural knowledge with scientific knowledge provides the basis for sensitive environmental planning.**

The CULTURAL LANDMARKS MAP shows Long Lots laid out in 1758, stone walls—including those coinciding with the long lot lines, and the original upright and cross highways. It can be used along with stereo aerial photographs to locate historic sites and structures in the field. Using these resources, along with town and regional historic records, it is possible to discover historic locales which can be correlated with the other DATA RESOURCE MAPS.

Historical maps can provide the basis for the development of a Townwide plan for historic preservation. It is advantageous to designate historic districts, which can heighten Weston's appreciation of its past heritage, and could be conserved as the Town develops to its maximum population.

INDEX TO PLACE NAMES

COLONIAL MILLS

110 David Coley's Mill
130 Moses Dimon Grist Mill
135 Gilbert and Bennett Factory (possible site)
140 Godfrey Mill Site
150 Iron Forge (Keeler's 1790)
170 Sturgis Saw Mill
175 Sherwood's Grist Mill
180 Ebenezer Thorp Mill
190 Town Saw Mill (at 6th Cross and Mile of Common)

COLONIAL CEMETERIES

817 Osborne's Burying Ground
818 The Den (Godfrey's Burying Ground)
819 Bradley Burying Ground
820 Fanton Burying Ground
821 Thorp Burying Yard

OTHER SITES

855 Azor Belden's Survey (1789)
510 Coley / Dennie's Farm

Historic site near Lilac Lane. The old logging road evokes a strong image of its past offering a unique recreational opportunity.

CULTURAL LANDMARKS

Primary Settlement to 1800

WESTON ENVIRONMENTAL RESOURCES MANUAL

LEGEND:

- STONE WALLS WHICH APPEAR COINCIDE WITH LONG LOT LINES.
- OTHER STONE WALLS, AS DETECTED IN AERIAL PHOTOGRAPHS.
- SECTIONS OF OLD ROAD, UPRIGHT HIGHWAYS, AND CROSS-HIGHWAYS NO LONGER IN NORMAL USE, BUT STILL APPARENT.
- LONG LOT LINES ACCORDING TO DIMENSIONS OF FAIRFIELD RECORDS AND EXISTING STONE WALLS.
- LONG LOT LINES ALONG ORIGINAL UPRIGHT HIGHWAYS.
- SECTIONS OF OLD ROAD, UPRIGHT HIGHWAYS AND CROSS HIGHWAYS WHICH ARE STILL OPEN
- HEDGEROWS WHICH APPEAR TO COINCIDE WITH LONG LOTS OR EARLY PROPERTY LINES

Dominski / Oakrock Associates
ENVIRONMENTAL PLANNING
NEW HAVEN, CONN.

scale:
source(s): Jean Matson
date: Sept, '75

Legend to the map on the opposite page.

Great Ledge
Bulkeley's Four Corners
Cranberry Meadow
Davis Hill
Mountain Orchard
SIXTH
GODFREY
ROAD
Spectacle Swamp
Lyons Woods
Lyons Plain
Panther Swamp
FOURTH
CROSS
HIGHWAY
Weston
EXTRA
Rattlesnake Rock
Popple Plains
Aspetuck
MILE OF COMMON
MAP
15

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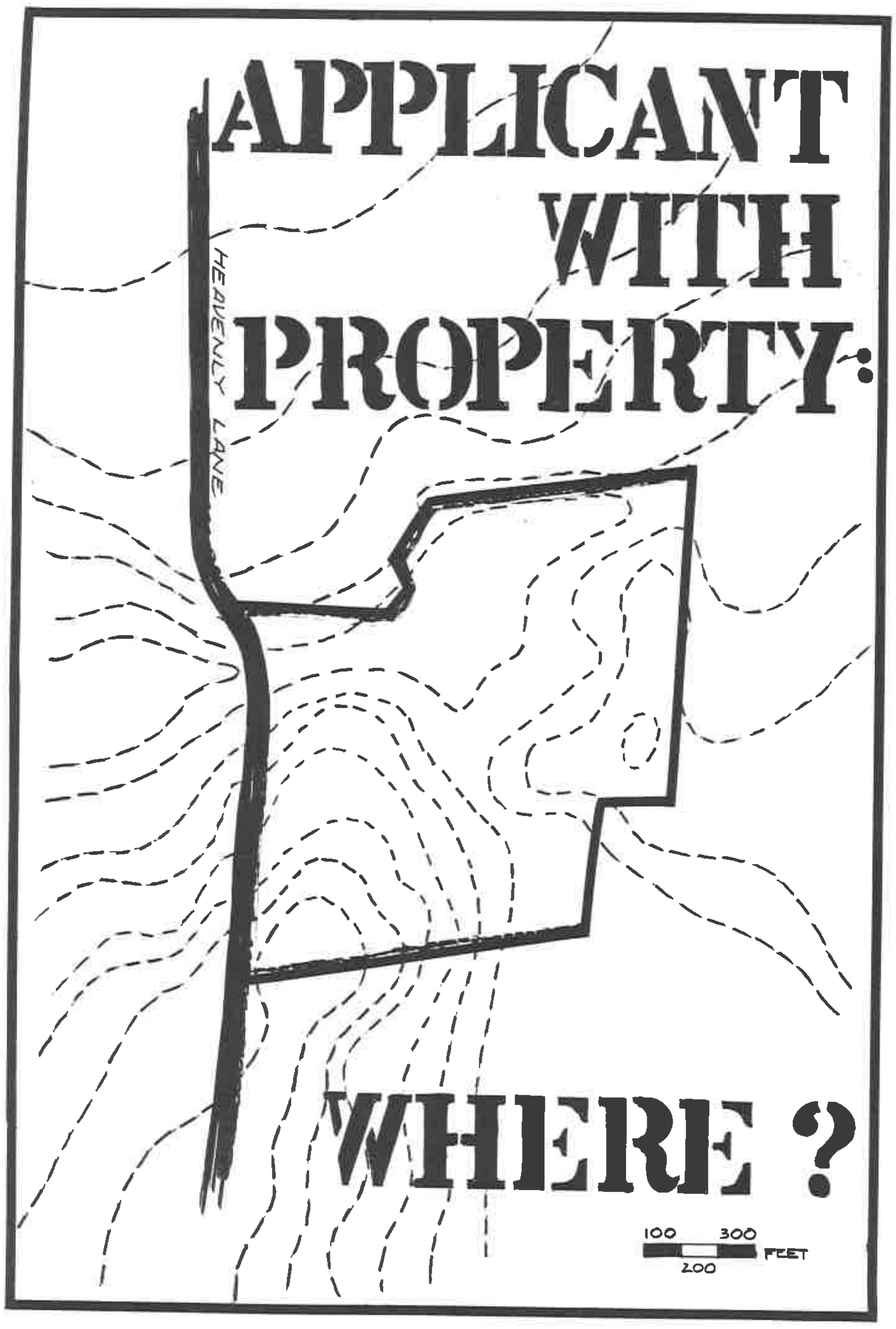
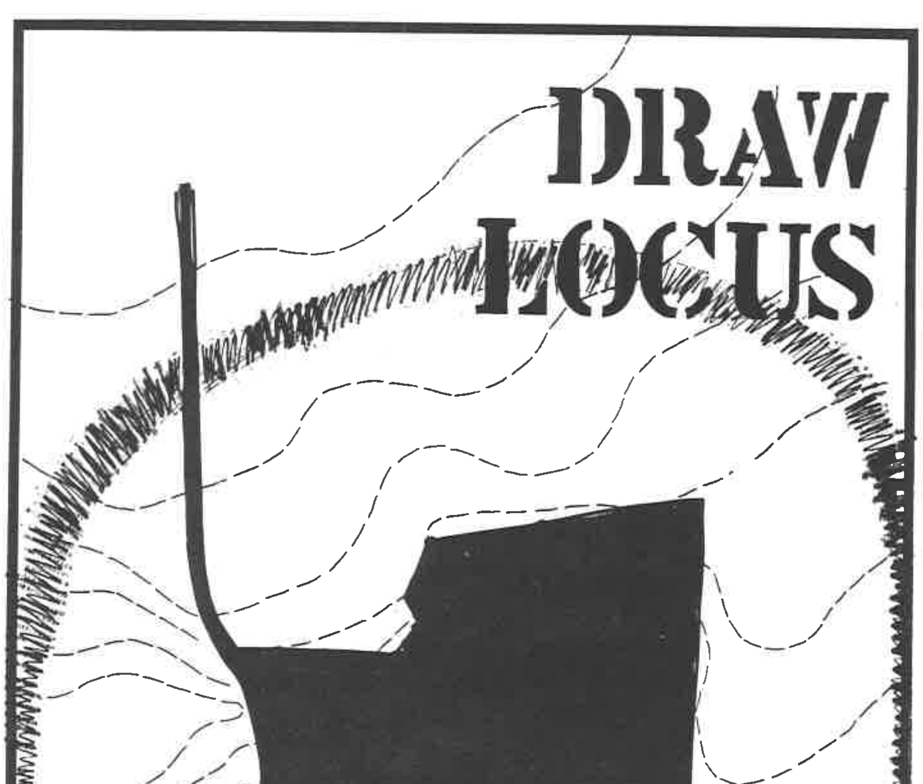


The hypothetical "Heavenly Lane" subdivision containing 24 acres of land is located in its Townwide macro-context using the acetate overlay of public roads.



An environmental impact radius is established. This radius may in some cases be extended to show hydrological features within the macro-watershed context.

PART IV; USING THE DATA RESOURCES

INTRODUCTORY REMARKS TO LANDOWNERS

One main goal of land use regulation is to maintain the environmental resources upon which the land use rests. Each property in Weston is part of a larger hydrologic, geologic and ecologic system operating on a townwide and regional scale. Each individual property in town affects and is affected by areas beyond its boundaries. Thus, the effluent from one person's septic tank can travel to a neighboring well; the filling in of a wetland can cause flooding downstream; the contamination of Weston's stratified drift aquifers can lower the potential public water supply for the region. Producing a site-plan which manages open-space, avoids wetlands, respects protection zones, retains runoff and prevents erosion may very well require more care, time and expense in the drawing stage. Minimum-impact design principles may also place disappointing restrictions on the portion of a particular site which is considered buildable.

However, there are numerous considerations demanding minimum-impact land development which justify the extra effort it takes. Proper Townwide environmental protection lowers the cost of many public maintenance services such as flood protection structures and dredging of sediment from sewers and waterways. It also will prevent the need for Townwide installation of public water supply and sewage, at an enormous saving in tax dollars.

On the site scale ecologically sensitive design can, in some instances, actually lower development costs. It is accepted environmental practice to concentrate development on moderate-slope, deep-soiled, and adequately drained areas where development costs are lowest. Also in these areas there is less likely to be costly problems such as flooded cellars, clogged septic fields and contaminated wells. Making use of the natural lay of the land can minimize expensive site clearing, grading and drainage structures.

In some cases, ecologically sensitive design can generate minimum impact designs on marginal areas. For example, alternate sanitary waste disposai systems, which are advocated for environmental protection, can be put to use in areas which have poor soil for conventional septic systems.

Finally, the Townwide implementation of environmental protection policies ensures the desirability of Weston as a place to live and maintains property values. A sensitive subdivision, which has conservancy corridors and a large portion of its natural vegetation intact,will have more value than a uniform tract with little natural beauty.

THE ENVIRONMENTAL GOAL FOR LANDOWNERS

Many principles have been presented and discussed in Sections I and II, and a data base is included in Section III. These ideas—Life-Support Capacity, Septic Rating, Critical Planning Units, Protection Zones, zero-extra runoff, watershed management, stress zones, and the preservation of the forest ecosystem—will be implemented only through their application by the Town in conjunction with individual land-owners. The protection of the Townwide environment remains in the hands of the residents and developers who will complete the growth of the community.

With an overview established, and a data base available, the task of individuals is simplified somewhat. Still, there remains a complicated fabric of information and theory to be applied to the planning of an individual site. To guide non-professionall persons through the technical data, a procedure has been recommended and outlined for the development of an **Environmental Features Map and Aerial Features Picture.**

It is considered the responsibility of the land-owner or developer to analyze and present to the proper Commissions studies enabling them to ascertain whether the developer's strategy fcr the site conforms to the Townwide goals (See Sec. II.)

The advantages of sensitive site-planning and minimum impact design are manifest in the physical beauty which is preserved, the possibility of reclaiming marginal land for development, and the assurance that, as the community grows, the natural supply of water and waste disposal capacity will be adequate.

PROCEDURE FOR DEVELOPING LOCAL STRATEGY: ENVIRONMENTAL FEATURES MAP AND SOILS STUDIES

The procedure which follows will lead the reader through an hypothetical subdivision proposal. The final product of the procedure is an **ENVIRONMENTAL FEATURES MAP**, and **SOILS STUDIES** which are the basis of evaluating the factors which become critical to each specific site.

It is recommended that all parcels of ten acres or more be analyzed according to this procedure, and that owners, or their representatives, arrange with the appropriate Town Commissions to review the Environmental Features Map and Soils Study informally, before any sub-division proposal or development or improvement plan is submitted. **The purpose of this Preliminary Environmental Review is to establish from the Features Map, the local, on-site strategy to protect the environment, against which any subsequent development plans will be judged.**

STEP 1. LOCATE THE PROPERTY IN ITS TOWNWIDE CONTEXT

Locate the approximate property lines on the loose acetate, MAP 1, PUBLIC ROADS. Draw the property lines in brightly colored felt pen directly on the acetate map. (Using the acetate as an overlay, you will be able to locate the property on all of the other fourteen Data Resource Maps in Section III. At this scale, (1" = 2272') one square inch equals 119 acres.

STEP 2. ESTABLISH LOCUS

For analysis of environmental impact, each property must be discussed in its local context. A radius of impact, or locus, is prescribed for various sizes of parcels. The principle of the locus is related to the fact that environmental features are continuous and connected. The impact of development is not contained within property lines or political boundaries. The following schedule of length of radii were established to accommodate ordinary residential or light commercial development in the Townwide context.

TABLE 8
RADIUS OF ENVIRONMENTAL LOCUS

AREA OF PROPERTY	LENGTH OF RADIUS*
10 acres or less	750 ft.
20 acres	1000 ft.
30 acres	1200 ft.
40 acres or over	1500 ft.

**In all directions from outer edge of property.*

The locus of the property represents the area for which the impact must be accounted. All features which fall within the locus must be mapped or represented as accurately as possible. In addition, the entire watershed involved must be considered in assessing the impact of drainage (see Step 8).

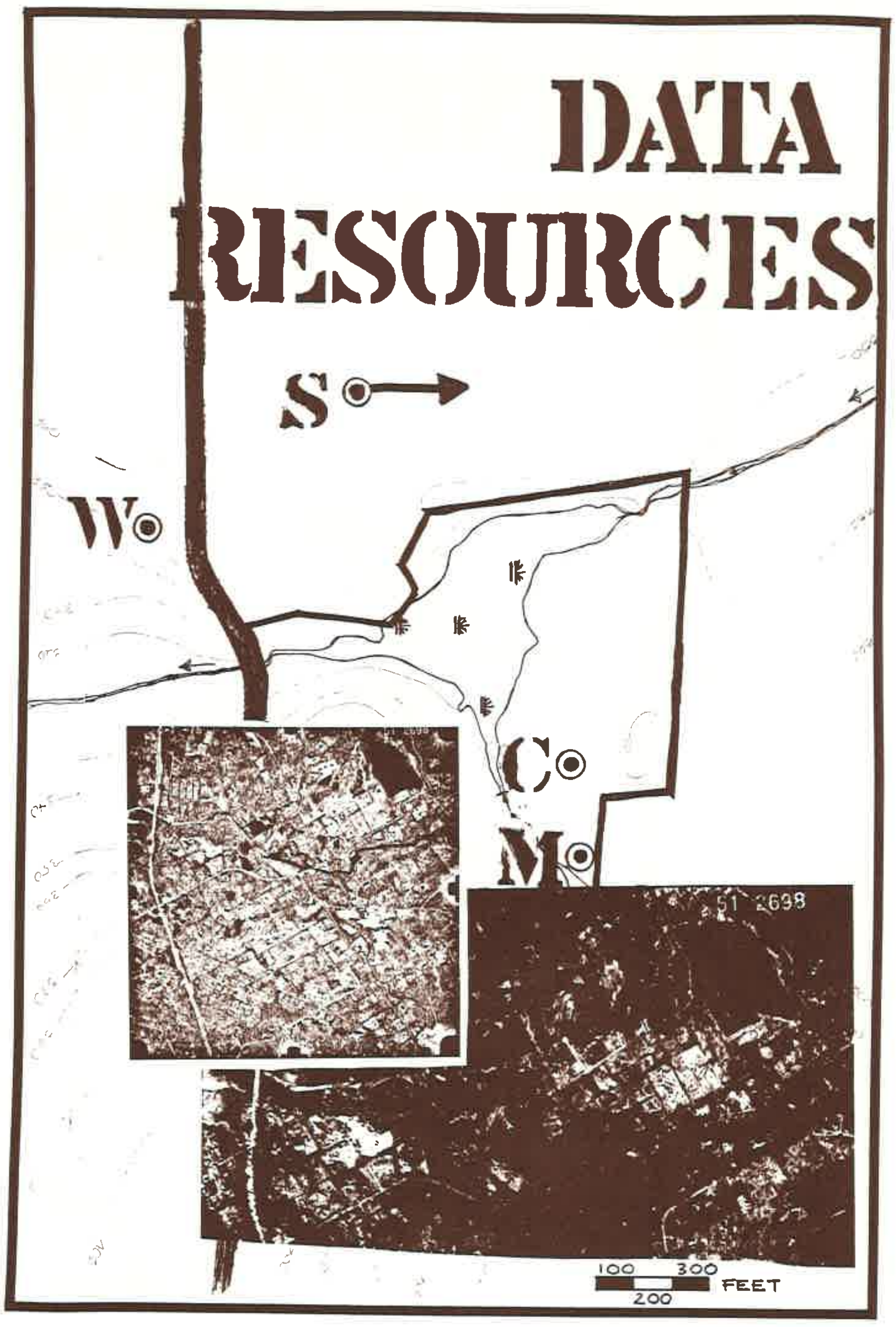
STEP 3. DATA RESOURCES

Put acetate over MAP 8, DATA INDEX AND MONITOR POINTS and note all data falling within locus—data could include surface water quality samples, well water samples, culvert capacities and seismic data. The data corresponding to these points will be found in the TECHNICAL DATA FILE (see SECTION III).

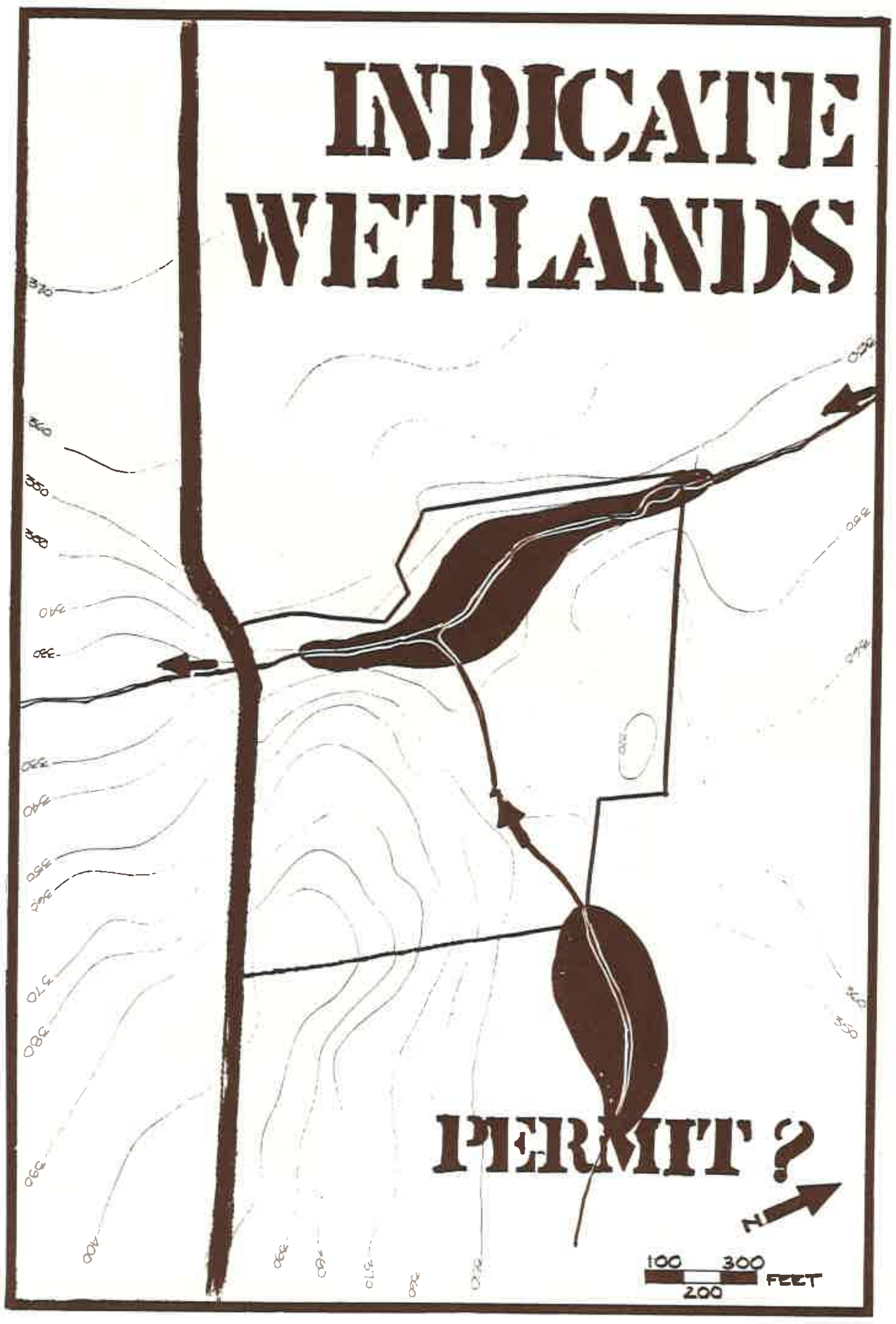
Next put acetate over MAP 2, REFERENCE INDEX to determine which aerial photographs cover the property and its locus. Prints of these aerial photographs may be obtained from Town Hall in both 1" = 1000' and 1" = 500' scales. The 1" = 500' scale aerial photographs will be used to help develop the Aerial Features Picture (STEP 10).

STEP 4. OBTAIN LARGE SCALE TOPOGRAPHIC MAP OF ENTIRE LOCUS

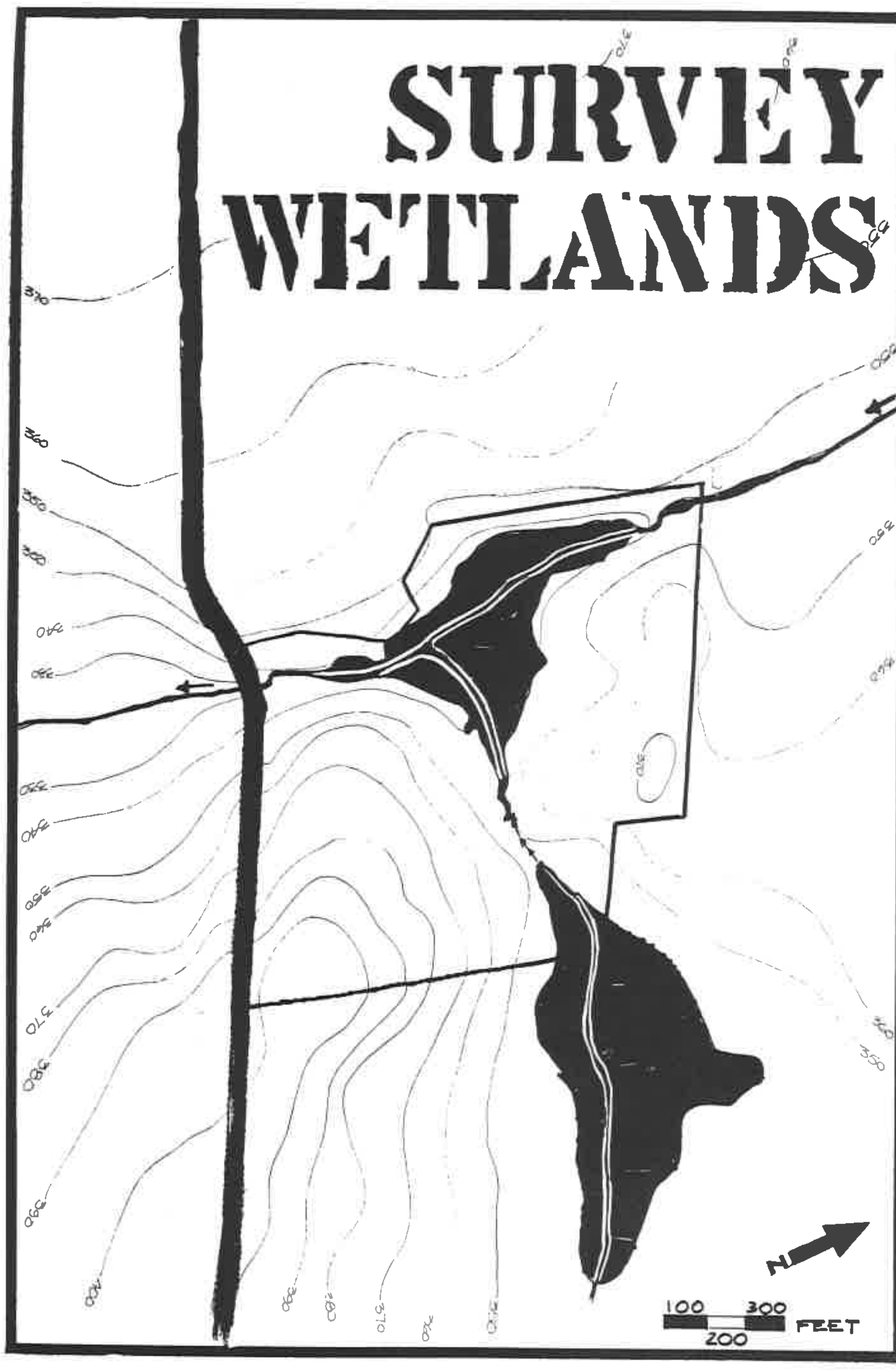
At this point you are ready to begin assembling the data, surveys and field observations which combine to produce the Environmental Features Map and Aerial Features Picture. The Environmental Features Map will be drawn on a suitably large scale base covering the entire property and locus around it. Appropriate scales for this map are one inch to one hundred feet, or for larger sites, one inch to two hundred feet. If the land-owner or developer has retained a consultant engineer, landscape architect or land planner to carry out these preliminary studies, it is important to instruct the consultant that the features of the *entire locus* must be accounted for in the final Features Map for the purposes of discussion at the Preliminary Environmental Review.



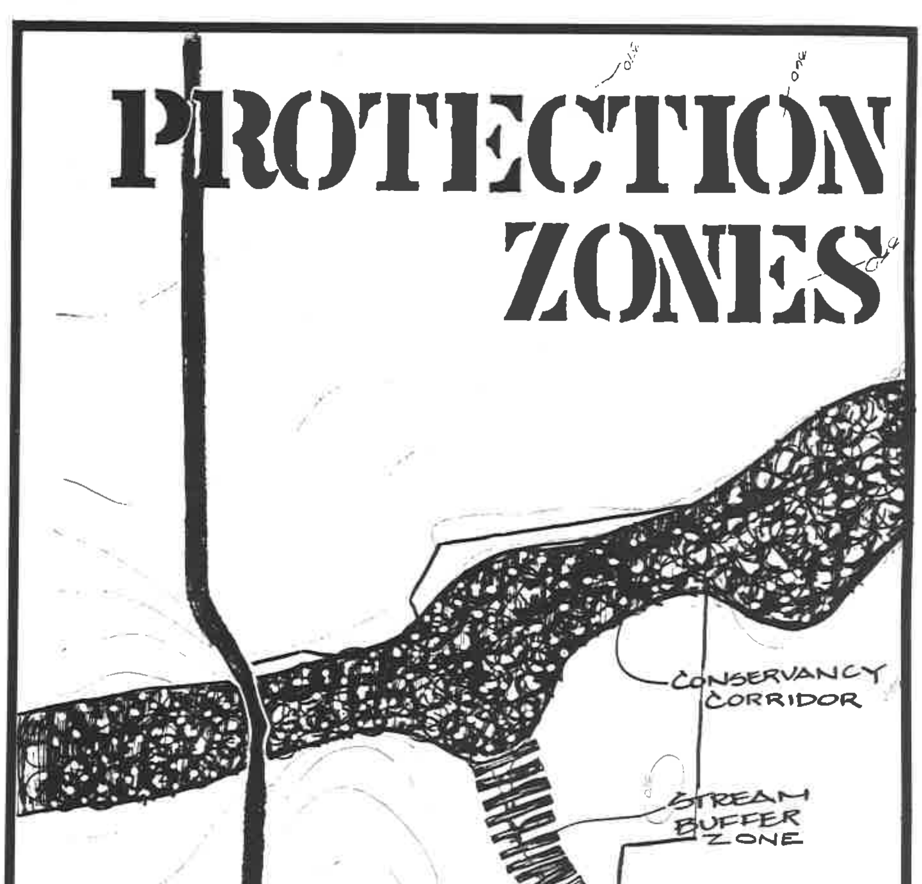
Data on seismic runs, water quality tests and culvert capacity within the locus is indexed in MAP 8, DATA INDEX AND MONITOR POINTS and obtained from the TECHNICAL DATA FILE. Aerial photos are obtained from Town Hall.



Wetlands are transferred from MAP 3, WETLANDS to the site map.



Wetlands are surveyed and mapped in detail on the site map.



Protection Zones are transferred from MAP 4, PROTECTION ZONES to site map.

STEP 5. INDICATE WETLANDS

Place the acetate map over MAP 3, WETLANDS and note whether any wetlands fall on the site or within the locus. If wetlands appear, the development will be a regulated activity subject to the articles of the Connecticut Inland Wetlands and Watercourses Act. At this point, if wetlands are present, it is advisable to contact the appropriate Town Commission.

Steps 5 through 9 represent an operation of 'fishing' or sifting the site through the fourteen Data Resource Maps to bring together all available information and data, as well as to identify the Townwide context into which the site falls. For example, in which watershed is the site located? Are there special recommendations for it? Does the site fall within or near an existing stress zone? What (if any) Critical Planning Unit is represented on the site? Does the land-owner's intention fall within the scope of the Critical Planning Unit specifications?

The wetlands as they appear on Map 3 may be used as a rough guide to their location and presence. However, this map may not be construed to be accurate at the scale of one inch to a hundred or two hundred feet, even enlarged photographically. It is necessary and important to have wetlands mapped by a soil scientist or surveyor. It may also be feasible, for smaller areas, to map wetlands by a non-professional with the aid of the publication, *Inland Wetland Plants of Connecticut,* by Niering and Goodwin.

If a soil scientist or other professional is retained, it is efficient to have a soils survey and wetlands map accomplished simultaneously.

SPECIAL NOTE: At this point it is appropriate to contact the Aspetuck Valley Health District office and initiate the survey of septic suitable areas.

STEP 6. IDENTIFY ANY PROTECTION ZONES.

Place the acetate over MAP 4, PROTECTION ZONES to ascertain whether any category of protected area appears on the site or in the locus. As with wetlands, this map represents a general indication. A site survey will identify in detail the feature which is indicated and its exact location and extent. If a PROTECTION ZONE is present, the professional consultants should be instructed to pay special attention to the on-site features which appear to represent the protected area. Typically, these consist of stream channels and banks, unique natural areas, valuable wildlife habitats, steep slopes, bodies of water, recommended and dedicated open-space parcels, etc. **The sense of the Protection Zones concept is not to prohibit development or access into or through these zones. The object is to call attention to the areas in order to encourage particularly sensitive handling so that, as development proceeds, the essential character and natural function of the Zone will be preserved. Development through or in the Protection Zones should be strictly minimum-impact in design and performance.**

TABLE 9

UNIQUE NATURAL AREAS
(from PROTECTION ZONES MAP, p. 19)

1. *Mixed hardwood grove*—mixed hardwoods grove with red oak, ash, hickory and tulip poplar trees up to 2.5 feet in diameter.
2. *Stream valley*—protected location with magnificent topography; large stands of red and white oak, sugar maple and tulip poplar in excess of one foot in diameter; extensive signs of deer activity; area has great historic value as indicated by an abundance of stone walls.
3. *Red maple swamp*—a beautiful swamp with sweet pepperbush understory and standing water which make this area an excellent wildlife habitat.
4. *Mixed hemlock-hardwood forest*—many trees with diameters over one foot; steep protected area with virginal aspect.
5. *Stream valley*—particularly scenic stream valley within Nature Conservancy; deer activity as evidenced by a fresh deer skeleton beside path.
6. *Prime wildlife area*—a complex of important wildlife habitats, including a shrubby open wetland with standing water enclosed by a forested red maple wetland and surrounded by moist old fields; grouse seen on site; at one time the open wetland had been dammed. The isolation and diversity of habitats in this area make it an excellent area for a wildlife refuge.
7. *Red maple stand*—a young stand of trees with a rare, beautiful open quality; currently under development.

TABLE 9
(continued from page 48)

8. *Deveil's Glen*—a steep, scenic sheltered valley with a magnificent stand of hemlock-hardwood vegetation.

9. *Cliff*—a magnificent cliff with huge blocks of rock along its face; one of the most beautiful sites in Town.

10. *Magnificent valley*—sheltered valley with large stands of tulip poplars, sugar maple and oak with amphitheatre-like wetland in southwest corner.

11. *Cliff*—a magnificent cliff with a mature hardwood stand growing on its face.

12. *Complex of unique natural areas*—the largest area of unique open space outside of town conservancies including a complex of wetlands, fields, forests, open fields and historical sites.

12N On the northeast side of this area is a magnificent stand of moist forest with many trees in excess of one foot in diameter; within the forest is a complex of massive stone walls. On the northwest is a swamp in which the water is held over a dense hardpan. The swamp drains north to a mill site and to open wet fields with a splendid view of the valley below.

12S A diverse complex of wetlands, fields and forest. The vegetation in this area is of a large variety of ages ranging from old fields to 125 year old forests. This is a fine area for ecological study by schools.

13. *Sugar maple stand*—a very pleasant, open stand of sugar maple with oak trees on knobs within it.

14. *Swamp forest*—within Kettle Creek drainage; mature swamp forest with many trees having diameters of over two feet; the most magnificent stand of trees encountered in Town.

15. *Cliff over wetland*—a spectacular cliff with large sugar maples, tulip poplars and oaks overlooking a broad, brushy wetland which is an excellent wildlife habitat.

16. *Pine stand*—an old pine stand over 100 years old with diameters ranging from 1-2 feet; going through stand is a double stone wall marking an old logging road; one of the most beautiful stands of trees in town and a prime location for open space.

17. *Mature swamp forest*—dominant trees are tulip poplar, oak and sugar maple; soil is two feet of peat underlain by clay.

18. *Gravel pit*—a flood plain forest to the north; to the south a delightful complex of pines and old fields. When the gravel operations are completed and the lake landscaped it will be a very beautiful place.

19. *Mature moist forest*— large sugar maples, tulip poplars and oaks with diameters in excess of one foot; the presence of non-barbed wire and the large diameters indicate that the stand is in excess of 100 years old.

20. *Pine stand*— a natural pine stand with diameters ranging from 8-14 inches.

21. *Weston Field Club*—mostly in steep slope, forested units.

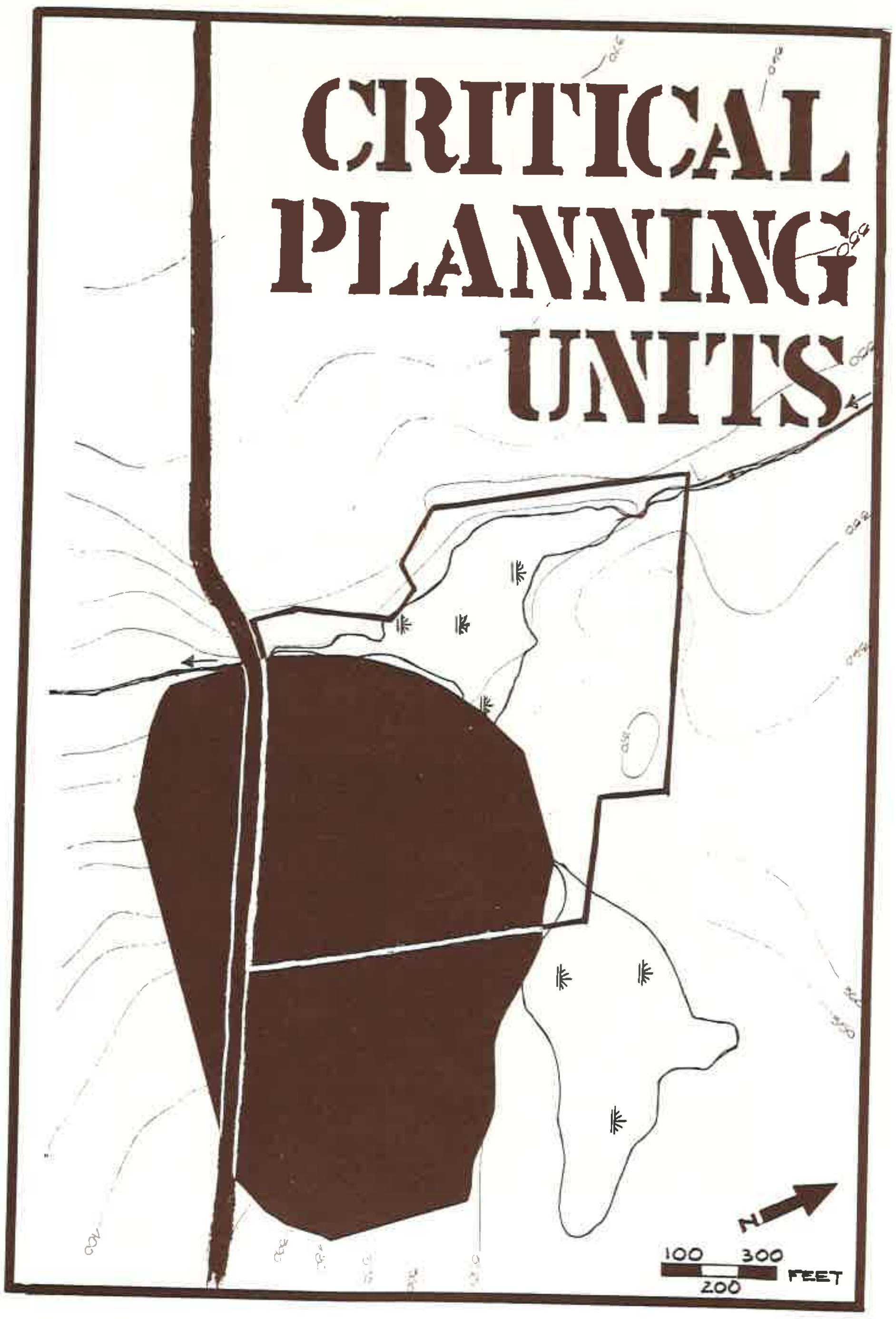
22. *Singing Oaks Day Camp*—mostly in forested, shallow soil units.

23. *Weston Gun Club*—consists of forested steep and shallow units within the Saugatuck Reservoir Watershed.

24. *Weston Riding Club* (Nimrod Farm)—pastures and some woodland on aquifer and hardpan units.

25. *Aspetuck Valley Country Club*—mostly lawn on hardpan units.

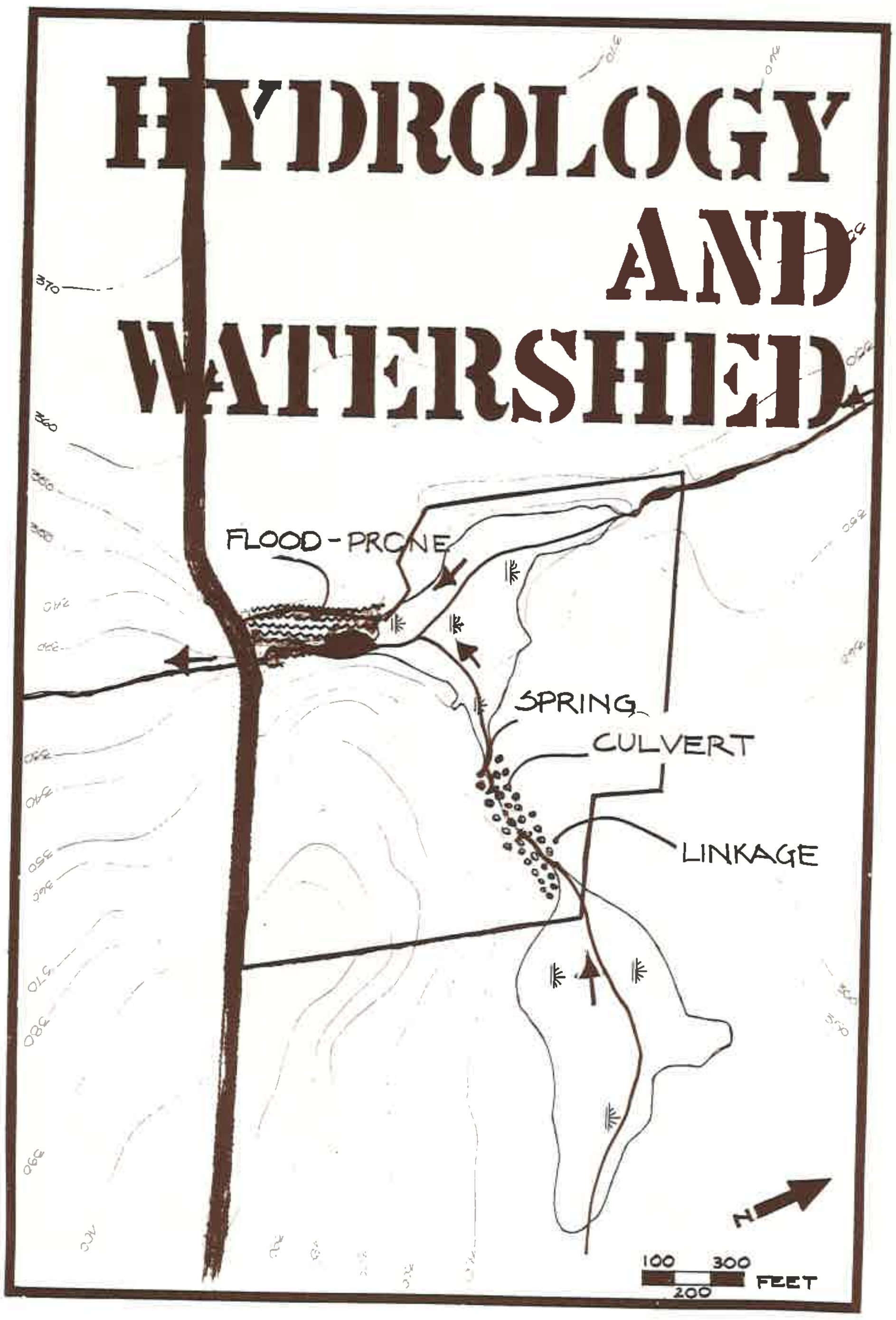
26. *Camp Aspetuck*—mostly shallow forested units.



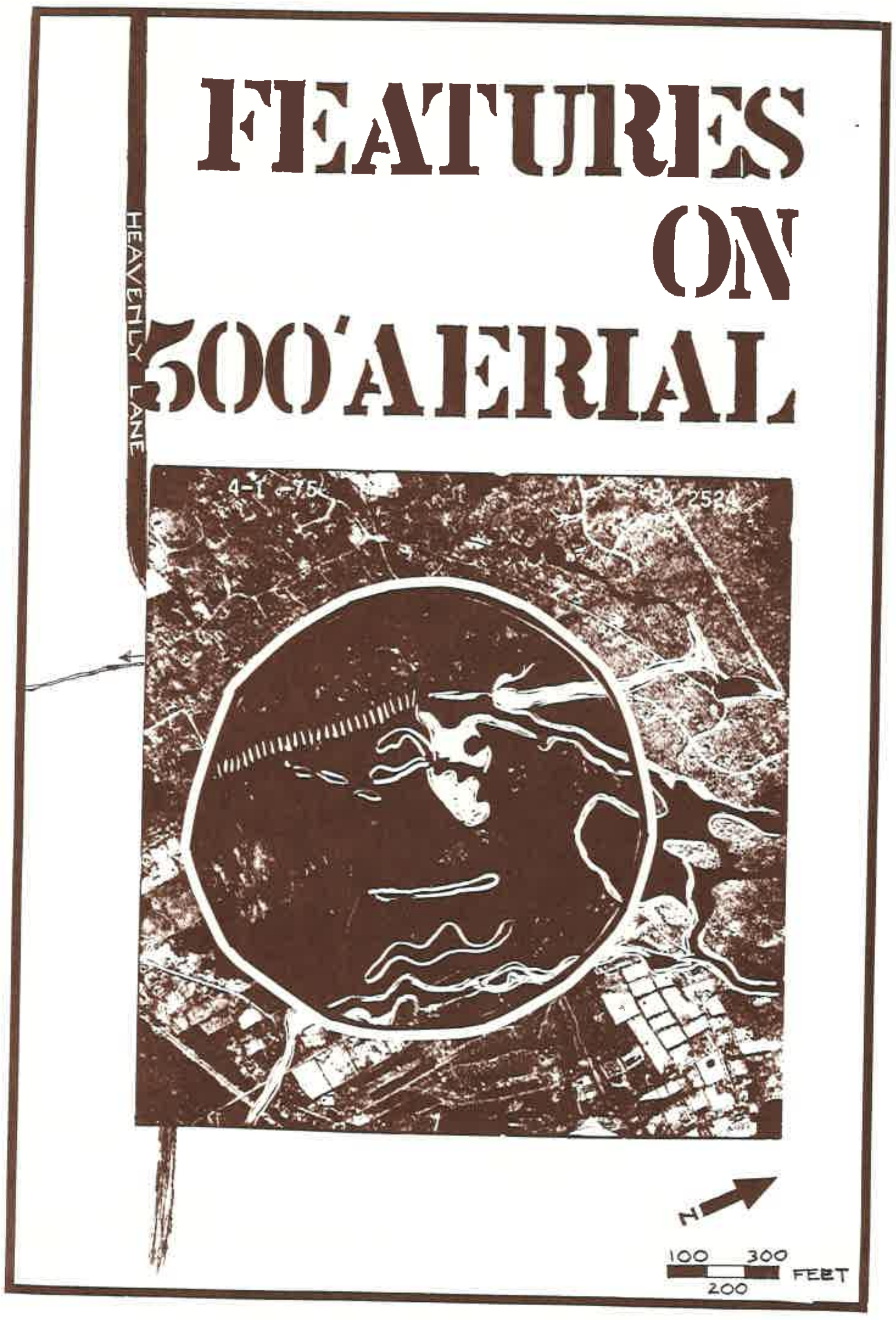
Critical Planning Units are transferred from Map 5, CRITICAL PLANNING UNITS, to site map.

STEP 7. IDENTIFY CRITICAL PLANNING UNIT, IF ANY.

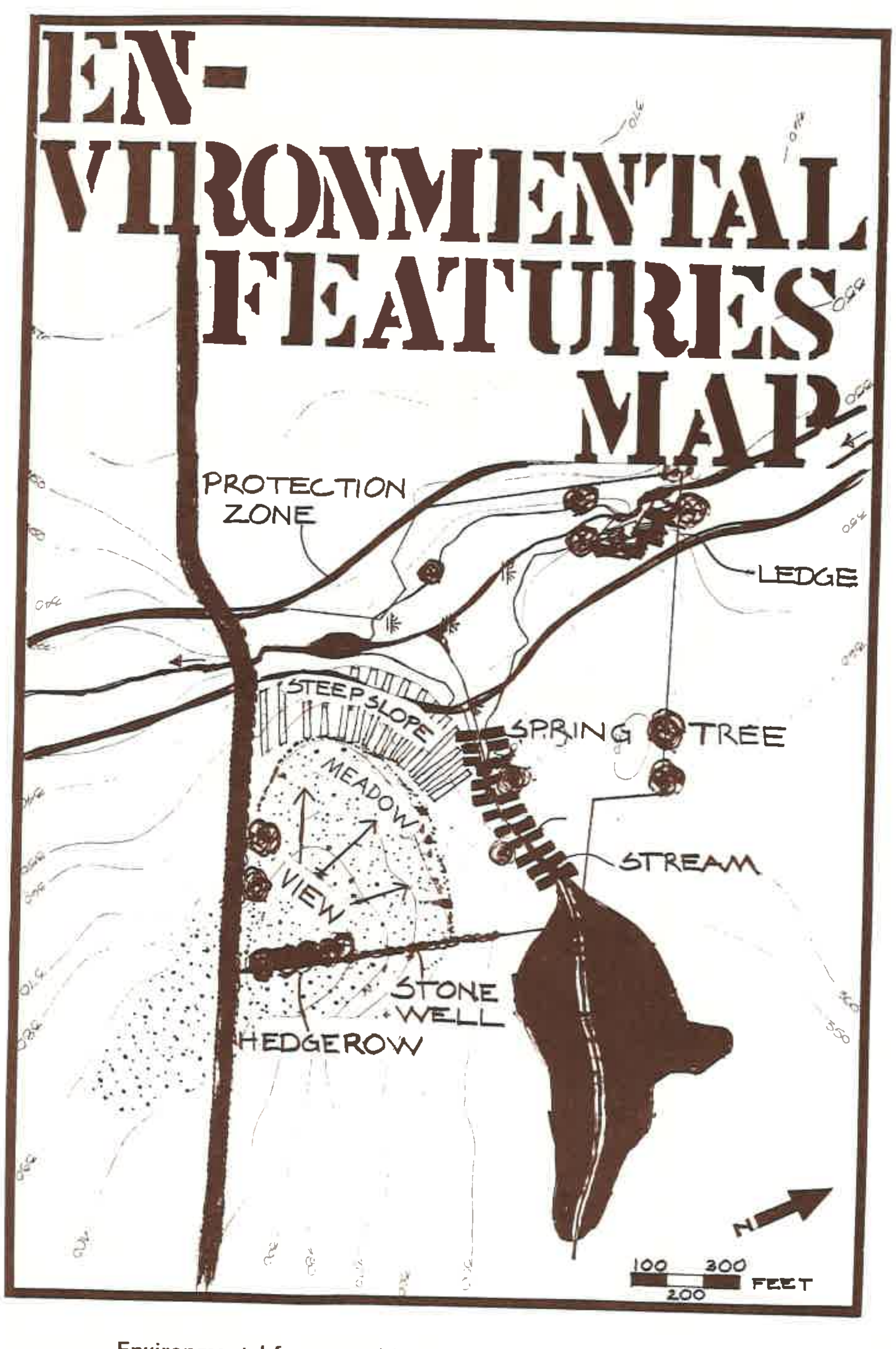
Placing the acetate over MAP 5 will reveal whether a natural carrying capacity, specified in the form of a maximum septic rating has been derived for the locale of the site in question. The CRITICAL PLANNING UNITS MAP identifies areas of undeveloped upland, by landscape type which are considered most suitable for development in the Town as a whole. The areas which appear in color are those which, upon development, are subject to the most severe environmental restrictions.



Hydrologic features—wetlands, streams, culverts, flood prone areas, springs—are mapped. These features need to be examined in the context of MAP 6, HYDROLOGY to determine how the site relates to its macro-watershed context.



Environmental features are transferred to 1" = 500' scale print of aerial photo. Included are features in the environmental impact locus and hydrologic features extending from the locus.



Environmental features which give the site its unique character are mapped for presentation to Town Commissions.

STEP 8. DETERMINE GENERAL HYDROLOGIC PICTURE.

Place the acetate over MAP 6, HYDROLOGY to determine the watershed in which the locus lies. Streams and bodies of water also appear. Each watershed drains as a unit toward its exit. To understand the drainage network, find the stream leading to the exit. All flow will be in the direction toward the exit. All tributary streams will be flowing toward the main channel which empties into the exit. The watershed boundary represents the high points which separate each watershed from the next. Note whether the locus of the site falls near the headwaters or the exit. Refer to the Watershed Recommendations in Section II. A special condition of caution is present if the site is located on a watershed boundary itself. Development should not alter the drainage pattern such that water naturally flowing to one watershed is diverted to another.

Flood zones within or downstream of the locus should be noted. The Weston Flood Hazards Map, soon to be published by Anderson-Nichols, will be useful for this purpose.

Plans for site drainage should be evaluated for conformance to the Zero-Extra-Runoff Goal and to the goals of the Town Drainage Plan, upon its development. Consideration of factors such as culvert size, amount and timing of runoff, and the need for storm-water retention and sedimentation basins are necessary to demonstrate conformance to the Townwide drainage goals.

STEP 9. OBTAIN ALL DATA FROM REMAINING RESOURCE MAPS.

Place the acetate over each of the remaining maps and note all information which falls within or near the locus. The data points from MAP 8 may be retrieved through Town Hall, revealing well logs, seismic information, water tests, and culvert capacities.

Note historic sites, stone walls, landmarks, general septic suitability, depth to bedrock, location of aquifers, proximity of surrounding development, geological features which appear, and the extent of the forest cover.

STEP 10. CONSTRUCT AN ENVIRONMENTAL FEATURES MAP, AND AERIAL FEATURES PICTURE.

Show on the large scale base map of the entire locus all pertinent environmental features, especially including the following:

TOPOGRAPHY— contours at no less than 5 foot intervals, slopes over 10%, rock outcrops, boulder fields. If contours are plotted from a blow-up of United States Geologic Service maps, they should be checked for accuracy and if necessary modified to realistically reflect design conditions on the site.

WETLANDS—surveyed and plotted

HYDROLOGY—all streams, intermittant drainage ways, bodies of water by high water mark, flood prone areas, culverts, dams, man-made channels, designated stream buffer zones with recommended width mapped (See MAP 4), any springs.

PROTECTION ZONES—other than wetlands, with attention to the actual extent of the feature to which the Zone refers. Also unique natural areas, and all trees with a diameter of one foot and above.

LANDMARKS—indicate all stone walls, foundations, known historic sites, indicate direction of view or vista, large hedgerows.

Place in sketch form as many of the above features as can be distinguished on the 500 scale aerial print. Include the locus. Transparent felt markers are useful for this purpose. This becomes the Aerial Features Picture. The base map with all features marked is the Environmental Features Map.

STEP 11. SOILS AND DRAINAGE STUDIES.

A detailed soils study, separate from the environmental features inventory must be prepared. The soils survey should be plotted at the same scale as the Environmental Features Map, also showing depth to bedrock. The property should be gridded and percolation tests reported by grid. The natural (in situ) drainage picture must be established (see Technical Appendix).

STEP 12. THE PRELIMINARY ENVIRONMENTAL REVIEW

The environmental features map, aerial features picture, and soils study alone should be presented at the preliminary environmental review. No subdivision plan should be presented at this time. However, the land-owner or representative should be prepared to inform the Town of the general intent of development plans. The land-owner should expect the appropriate Commission to inform him, as an outgrowth of the preliminary environmental review, of those environmental features which may not be violated, and the specific on-site criteria against which the development plans will be analyzed. These criteria represent the on-site strategy to protect the Townwide environmental resources.

SUBMITTING THE SPECIFIC DEVELOPMENT PLANS

When a land-owner, developer, or representative is ready to submit development plans, following the Environmental Review, he should be prepared to have the plans analyzed and evaluated according to the discussions which follow.

REMARKS TO THE TOWN COMMISSIONS

Farsighted environmental planning requires the ability to prevent the incremental effects of environmental deterioration which are inconspicuous except in the aggregate. Insensitive disposition of the remaining large undeveloped tracts (treated as Critical Planning Units) will cause Weston to lose its rural character and could cause a dramatic rise in the amount of per capita costs needed to provide and maintain environmentally related public services.

Protecting the health and integrity of Weston's forest ecosystem with the resources it safeguards is analagous to protecting the health of the human population through public health programs. The greatest advances in general public health were not due to ability to cure disease, but to avoid it through preventative measures. Just as the supply of clean water to population centers and mass immunization did more to halt disease epidemics than hospitals, so would balanced agriculture have prevented the dustbowls of the American Midwest. Such measures are invariable cheaper and more effective than reversing conditions of deterioration. Overfertilized streams, unpotable groundwater, septic outbreaks, dried up wells, increased flooding, stripped vegetation, are all symptoms of an environmental malaise which has its roots in overstressing natural systems.

Today, the health of Weston's forest ecosystem is excellent, and there is ample opportunity to keep it healthy through the practice of preventative maintenance. The overall blueprint for maintenance on a Townwide scale is embodied in MAP 4, PROTECTION ZONES, MAP 5, CRITICAL PLANNING UNITS and in the ZERO-EXTRA-RUNOFF GOAL.

LOCAL STRATEGY WITHIN THE TOWNWIDE GOALS: PRELIMINARY REVIEW OF LAND-OWNERS' ENVIRONMENTAL ANALYSIS

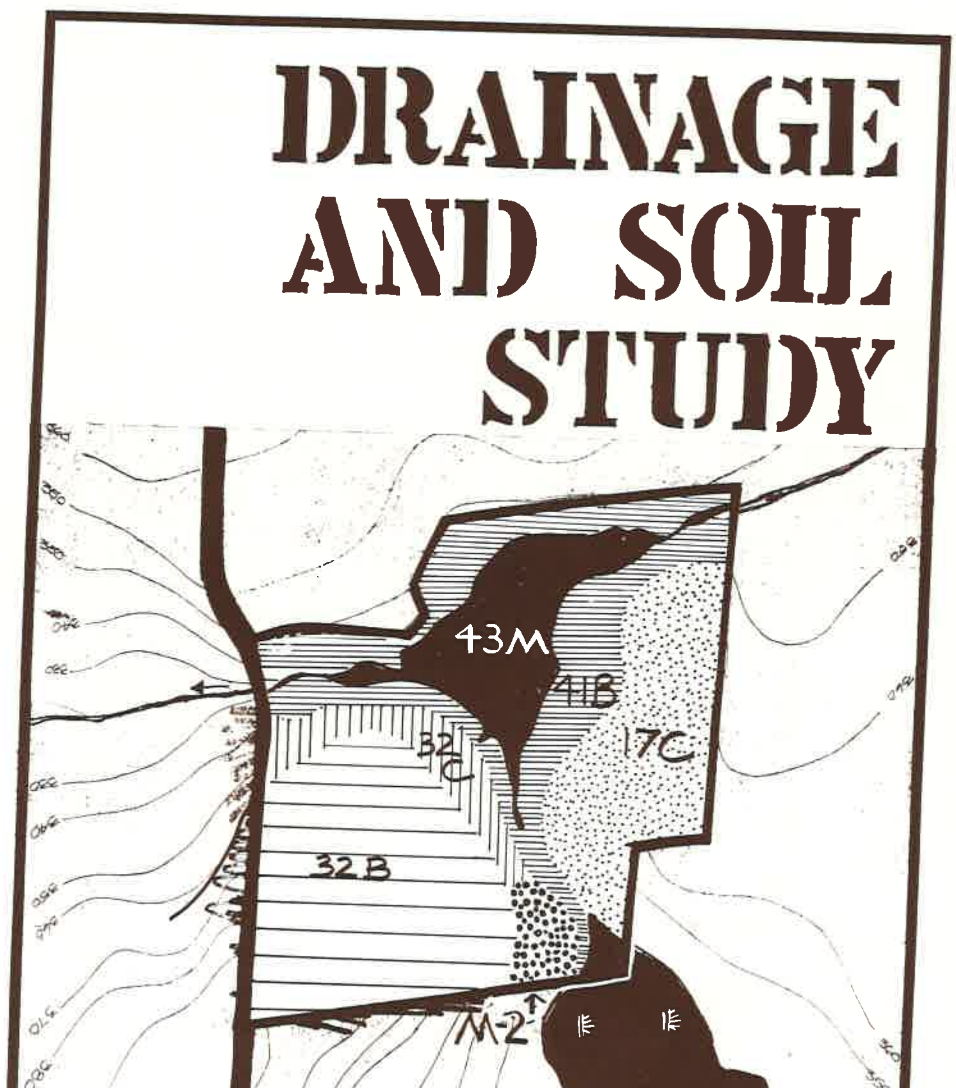
The purpose of the procedure for landowners, presented in the previous discussion, is to provide a scheme to unify, and render presentable, at least that data and information which is available already. At the same time, pushing an individual site through the sieve of DATA RESOURCE MAPS will uncover, automatically, the gaps in the information, thus offering a direction to the researches of either the land-owner or the Town on any particular question.

The sense of the Preliminary Environmental Review, which is the object of the procedure, is to bring together the environmental features accompanied by a general statement of the intent of the developer so that an environmental impact strategy may be derived, by the developer and the appropriate Town officials jointly. The purpose here is to avoid entirely the process of repeated review of development applications, with the large expenditures in fees to professional consultants.

The Environmental Features Map, and the Preliminary Review also remove the temptation from the developer to apply a preconceived plan to a parcel for which it may be ecologically unsuitable. Perhaps the most important aspect of the Preliminary Review is presentation of the land in its natural condition without the superimposition of lines of human development.

RESPONSIBILITY OF THE TOWN COMMISSIONS AT THE PRELIMINARY ENVIRONMENTAL REVIEW

The appropriate Town Commissions shall analyze the Environmental Features Maps and Picture, plus Soils Study and inform the applicant of:
1. The over-riding environmental features on his land which may not be violated in order to maintain the Townwide environmental quality, and
2. The environmental criteria against which specific development plans will be judged.



Soils are mapped in detail. The soils map is the basis for the calculation of the natural drainage characteristics of the site, and together with the subdivision plan is used to calculate runoff after development. (Drainage calculations for the "Heavenly Lane" site are presented in the Technical Appendix.)

ANALYSIS OF A SITE BY TOWN COMMISSIONS

In order to accomplish a meaningful evaluation of environmental impact to a specific locus, the responsibility of data presentation falls to the owner or developer. However, a short form of the Procedure For Local Environmental Strategy should be undertaken by the Commissions independently. Essentially, the interested Commissions should routinely perform STEPS 1 through 9 on the (1" = 1000') DATA RESOURCES MAPS, and note all features and information which are revealed. This will provide a tailored checklist against which to evaluate the precise environmental studies of the developer.

An inspection of the site by the interested Commissions is absolutely necessary to correlate the data with the existing conditions.

CHECKLIST FOR TOWN COMMISSIONS

At the Preliminary Environmental Review.

1. Does Features Map adequately describe slopes, streams wetlands, flood-prone areas, ponds (by high water mark), unique natural areas, cultural landmarks, conservancy corridors, recommended stream buffers, other protection zones, specimen trees, forest cover?
2. Does Soils Study adequately describe existing soils, drainage pattern, test excavations, percolation tests?

At Review of Development Application

1. Does plan adequately reflect environmental features and treatment thereof?
2. Does plan violate over-riding environmental features as established in Preliminary Environmental Review?
3. Does plan realize the design criteria of which applicant was informed during the Preliminary Environmental Review?

This basic checklist should be expanded and formalized after experience has been gained in actual environmental reviews.

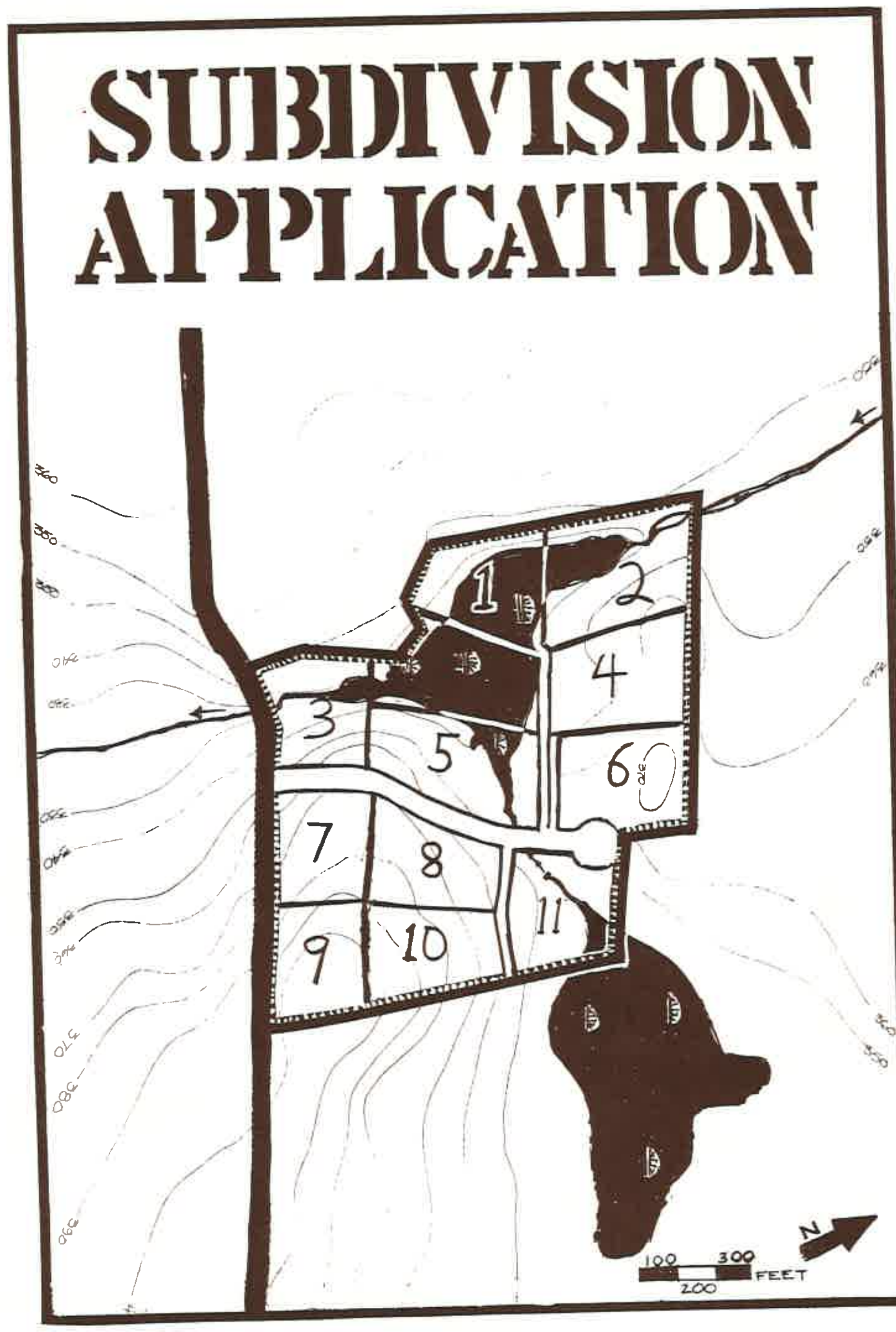
EVALUATING A DEVELOPMENT PLAN

Each site, and proposal, will be different from all others, and the emphasis for protection will change with a subtle differentiation of landscape types. The upland parcels, being least likely to sustain far-reaching degradation under the present development pattern, are most suitable for development.

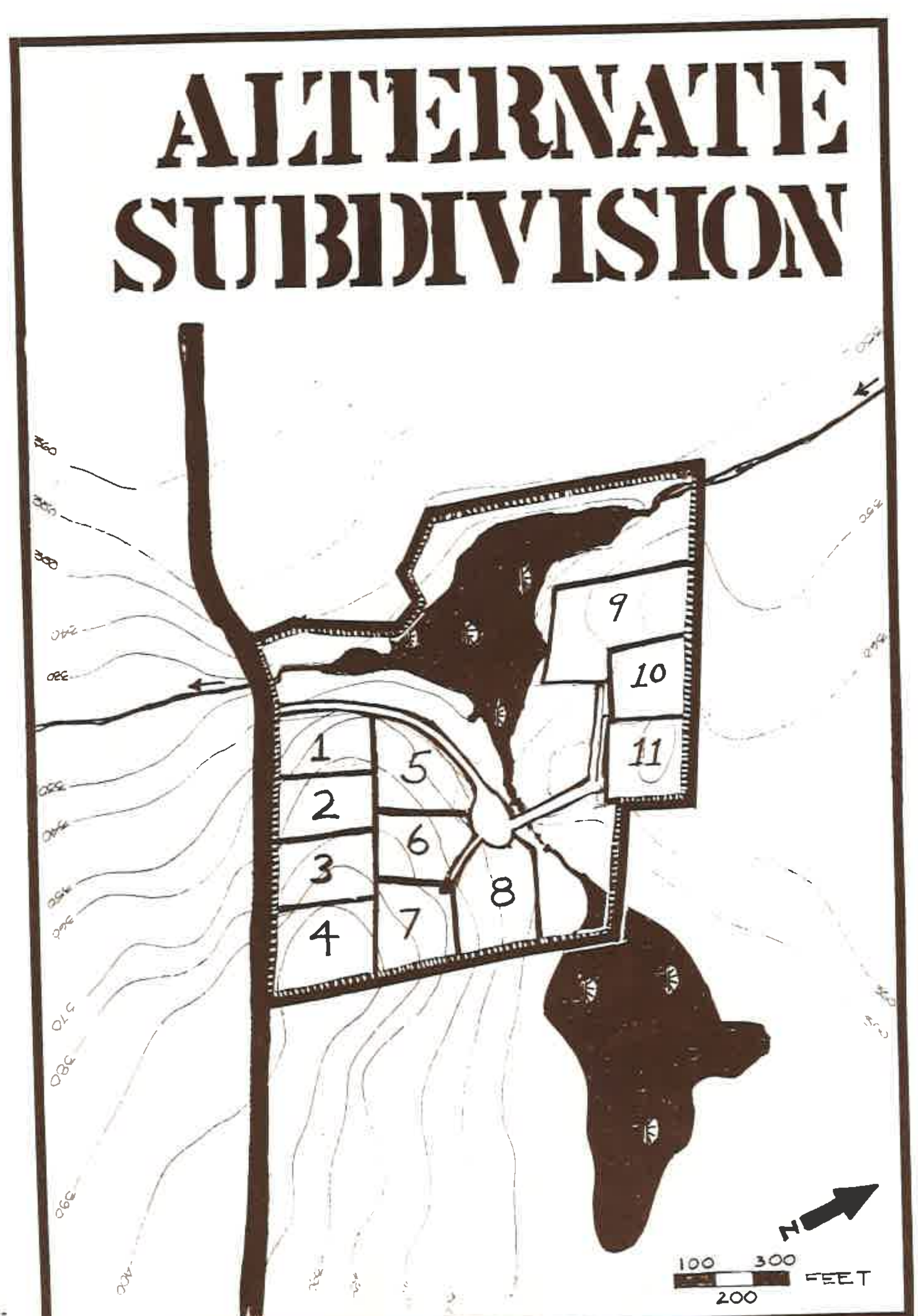
Evaluating a development proposal for its performance within the Townwide environmental goal of maintenance of present quality will be difficult to quantify. The following table gives a comparative rating of the most important components of an ecological site-plan. There is no passing or failing grade; rather, the scorecard is useful to analyze the weakest portion of a plan, and to help elucidate a strategy or trade-off of details so that the over-all environmental performance is enhanced.

TABLE 10
AN ENVIRONMENTAL SCORECARD FOR THE TOWN OF WESTON

20%	How close does the proposed drainage design come to zero-extra-runoff?
20%	Are wetlands disturbed?
10%	Are Protection Zones observed?
20%	Does plan control erosion?
15%	Are watercourses and other bodies of water buffered?
15%	Does the plan preserve in large part the forest ecosystem and natural beauty of the site?
100%	



After a preliminary Environmental Review, a subdivision plan is presented by the applicant. The planis rejected on the basis of violation of wetlands, Protection Zones and excessive length of roads and driveways resulting in unsatisfactory departure from the zero-extra-runoff goal.



An alternate subdivision plan is presented, having the same number of lots as the first proposal. The alternate proposal is made on the basis of "Average Density Zoning" under which overall density remains the same, but development is concentrated on less sensitive portions of the site. This plan overcomes the objections to the first proposal and is environmentally acceptable.

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