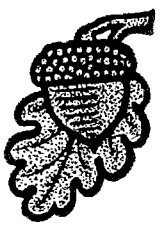
WATERFORD VENTURE

WATERFORD, CONNECTICUT

JANUARY 1989

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.



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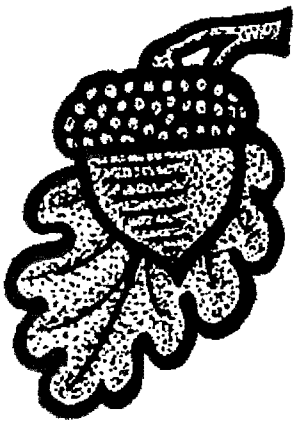

Eastern Connecticut Resource Conservation and Development Area, Inc.

Eastern Connecticut Environmental Review Team
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ENVIRONMENTAL REVIEW TEAM REPORT
ON

WATERFORD VENTURE
WATERFORD, CONNECTICUT

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

The ERT met and field checked the site on Thursday, October 13, 1988. Team members participating on this review included:

Gerry Amt	Regional Planner	Southeastern CT Regional Planning Agency
Nick Bellantoni	State Archaeologist	CT Museum of Natural History
Kevin DesRoberts	Wildlife Assistant	DEP-Eastern District
Steve Hill	Wildlife Biologist	DEP-Eastern District
Dawn McKay	Zoologist	DEP-Natural Diversity Data Base
Brian Murphy	Fisheries Biologist	DEP-Eastern District
Liz Rogers	District Conservationist	USDA-Soil Conservation Service
Elaine Sych	ERT Coordinator	Eastern CT RC&D Area
Bill Warzecha	Geologist	DEP-Natural Resources Center

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, and a soils map. During the field review the Team members were given development plans, biological assessments, an archaeological study and other site information. The Team met with, and were accompanied by the Waterford Environmental Planner, the Assistant Planner, the Town Planner, members of the Conservation Commission, the developers and his engineers and consultants, and a DEP-Water Resources Unit Environmental Analyst. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

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

its significance to the proposed development, and also suggests considerations that should be of concern to the developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

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

If you require additional information, please contact:

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1. SETTING, TOPOGRAPHY AND LAND-USE

The site, which is 122.5 acres in size, is located on the south side of Interstate 95 and South Parkway in western Waterford. The site is bounded on the north by South Parkway, on the east by Cross Road and undeveloped, private land on the west and south. The Boston Post Road (Route 1) lies within 2,000 feet of the southern property line. The major topographical feature on the site is Stony Brook. The brook flows through the western limits of the site enroute to Keeney Cove.

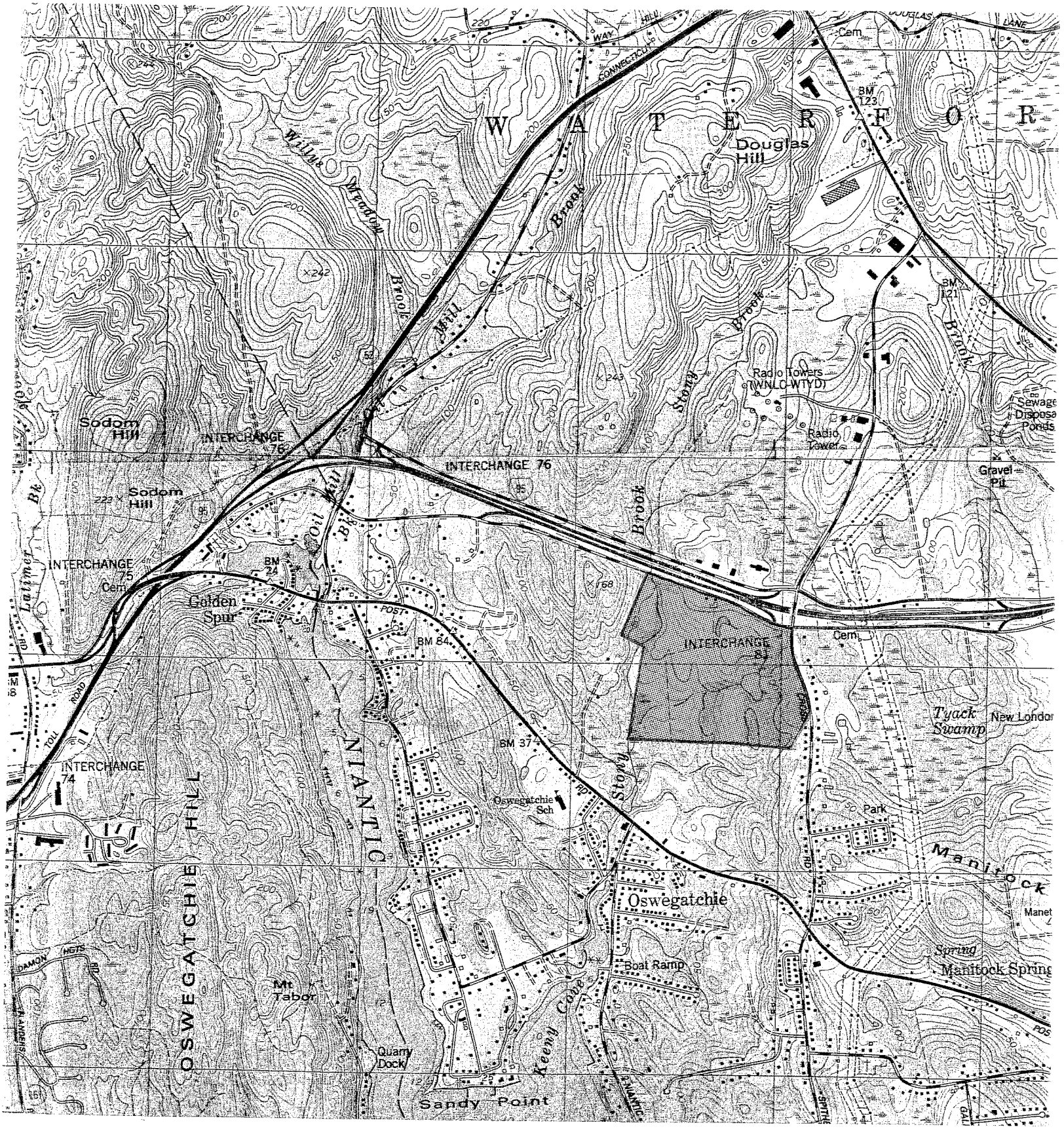
The site is located in a I-MF zone. Permitted uses allowed in this zone include office and multi-family residential developments. Based on proposed plans, the "Waterford Ventures" project would entail these uses. The proposed office and residential buildings would be served by municipal sewers (Town of Waterford) and public water made available by the New London Water Department. Initially, 125 residential units will be served by the extension of the Cross Road sewer system. It is understood that the ultimate plan would be to extend the sewer system northward into the site from Route 1. This sewer system would permit a gravity fed system for the entire project. The initial sewer system will require a pump station.

The site and the surrounding area have been used mainly for agricultural and residential purposes. The interior sections of the site are characterized by large open farm fields. Based on a 1934 air photo that encompasses the subject site, the configuration of these fields have changed very little over the last ±50 years. Two man-made farm ponds are located on the site. Additionally, numerous stonewalls, which verify the site's agricultural past, transect the site. Consideration should be given to the preservation of these man-made features where possible.

Topographically the site is characterized by hummocky terrain that rises eastward from Stony Brook. Site elevations range from about 20 feet above mean sea level near Stony Brook to 107 feet above mean sea level on the hill just south of the farm pond in the eastern parts. Relatively small areas of steep slopes are concentrated at the northwest corner of the site and in the interior sections. The steepest slopes probably range between 8 and 35 percent.

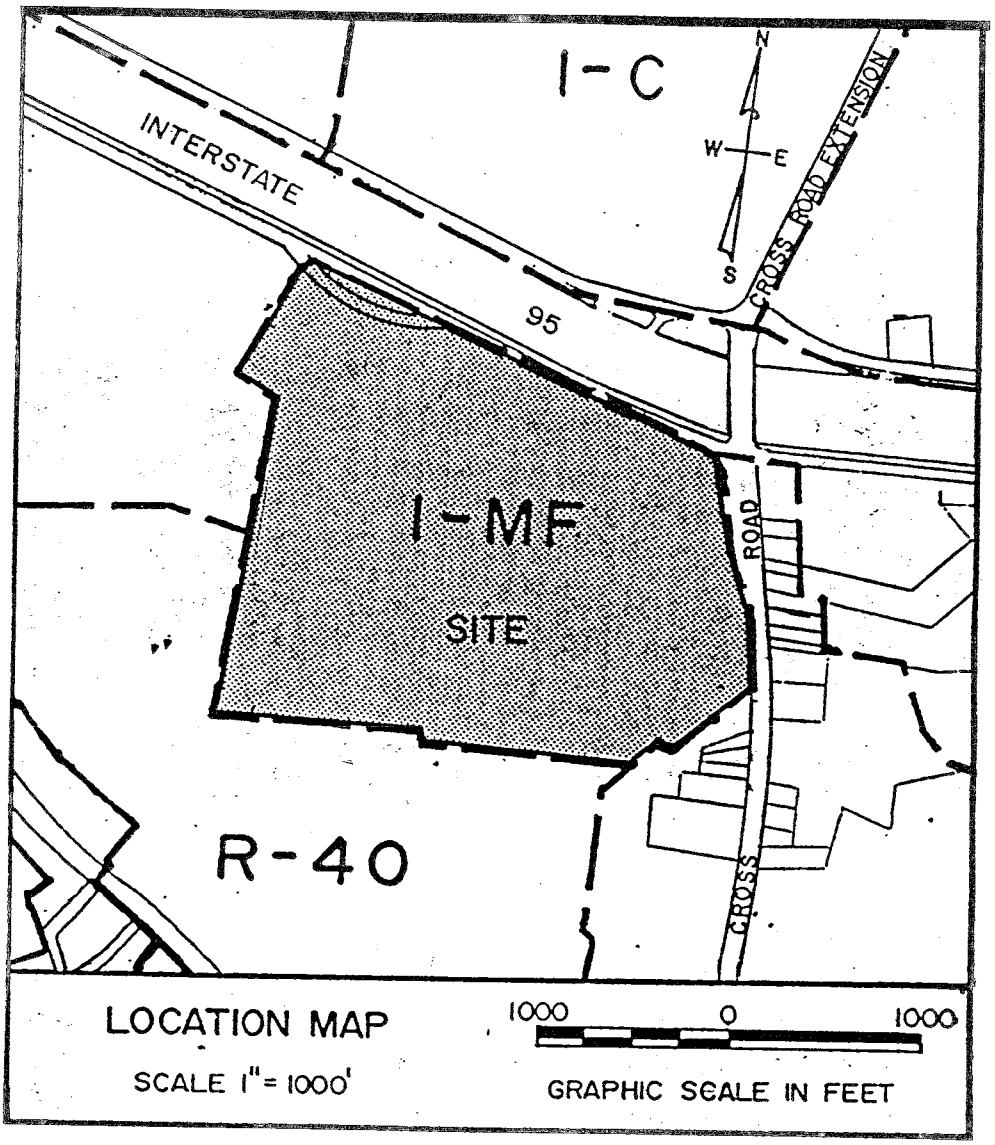
LOCATION MAP

SCALE 1" = 2000'



LOCATION MAP

SCALE 1"= 1000'



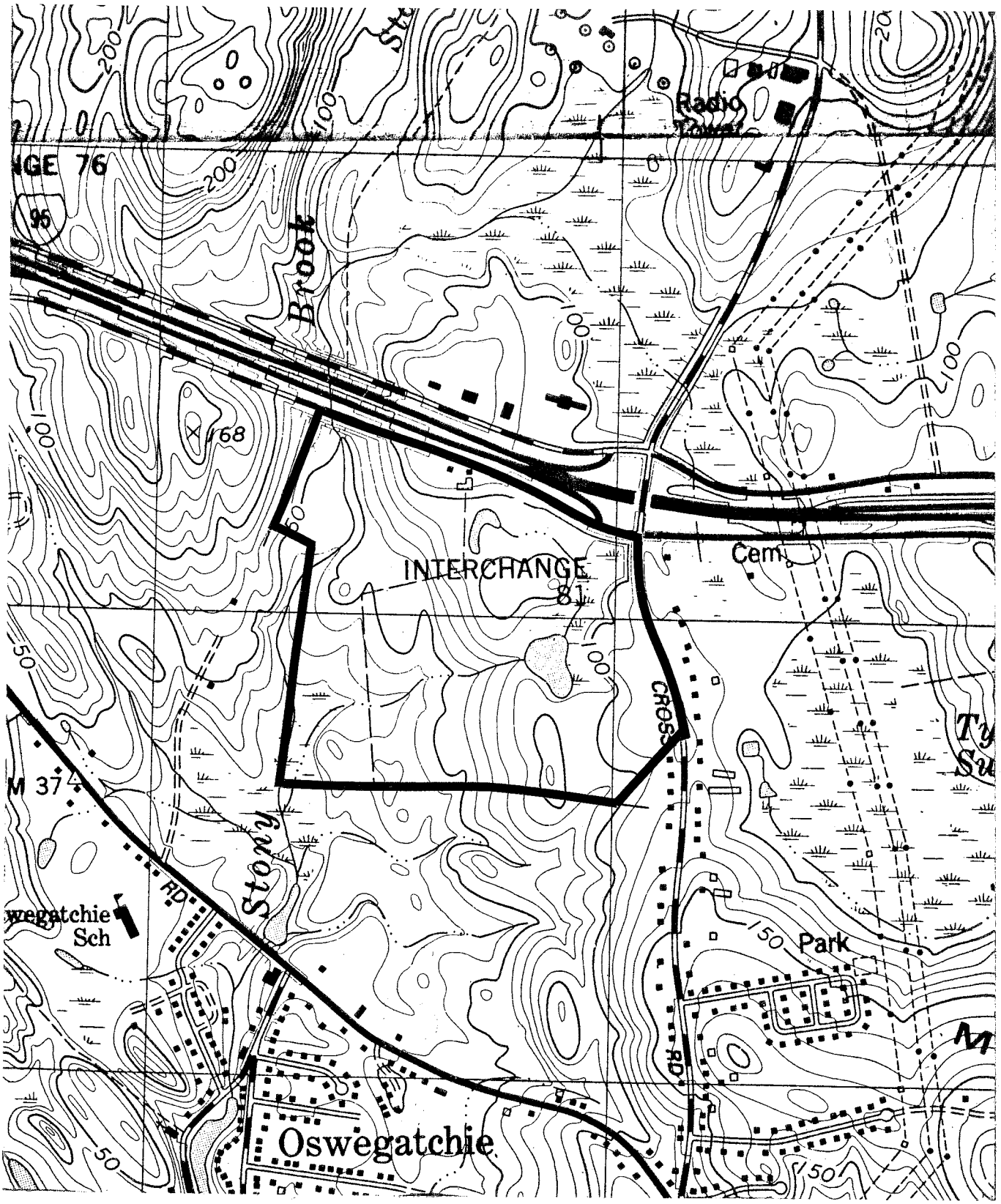
ILLUSTRATIVE SITE PLAN

NO SCALE

TOPOGRAPHIC MAP

SCALE 1" = 1000'

Site Boundary



2. GEOLOGY

The bedrock surface (ledge outcrops) is not well exposed on the site. Nevertheless, based on geologic mapping data and visual observations, small exposures of the bedrock surface occur in the northeast corner of the site.

Bedrock underlying the site consists of a NW/SE trending belt of crystalline, metamorphic rock . Most of the site is underlain by subunits of the Mamacoke Formation. In general, they comprise interlayered light to dark gray, medium grained gneisses. The western limits of the site are underlain by light-colored, fine to coarse grained rock of granite-like composition, which include a high percentage of the minerals quartz and feldspar, but only a few dark minerals.[1],[2]

Regionally, the site is located within an anticline (fold). Because the rocks were subjected to the geologic forces of folding in the past, it is expected that the upper few hundred feet of the bedrock is fractured and weathered to some degree. Since there was no deep test hole information available on the review day, the exact depth to bedrock is unknown.[3]

Except for the western third of the site, which contains sand and gravelly deposits, the site is covered by a relatively thin blanket of glacial sediment called till. The till consists of a light gray to tan mixture of sediments that range in size from clay to large boulders. Based on soil mapping data, the texture of the till on the site is mostly sandy and loose and generally lacks a "hardpan" layer below the rooted and weathered zone. The till sediments were deposited by glacial ice as it moved across the bedrock surface from north to south-southeast. It is 10 feet thick or less in most places on the site.

The sandy, gravelly deposits in the western parts were deposited by glacial meltwater streams during the ice retreat in the Stoney Brook area. The thickness of the sand and gravel deposits probably does not exceed 39 feet. [4]

Regulated inland-wetland areas, which have been delineated by a certified soil scientist, are scattered throughout the parcel. According to a document distributed to Team members, wetland areas comprise 21.1 acres or about 17% percent of the site. They mainly parallel the streamcourses on the site or occupy relatively broad, flat areas. The latter wetlands areas have good flood control attributes providing stormwater retention. Present plans indicate that regulated wetlands need to be crossed by the interior road system in several areas. The crossings are either proposed in areas of existing farm roads where wetland disturbance has occurred or in areas of

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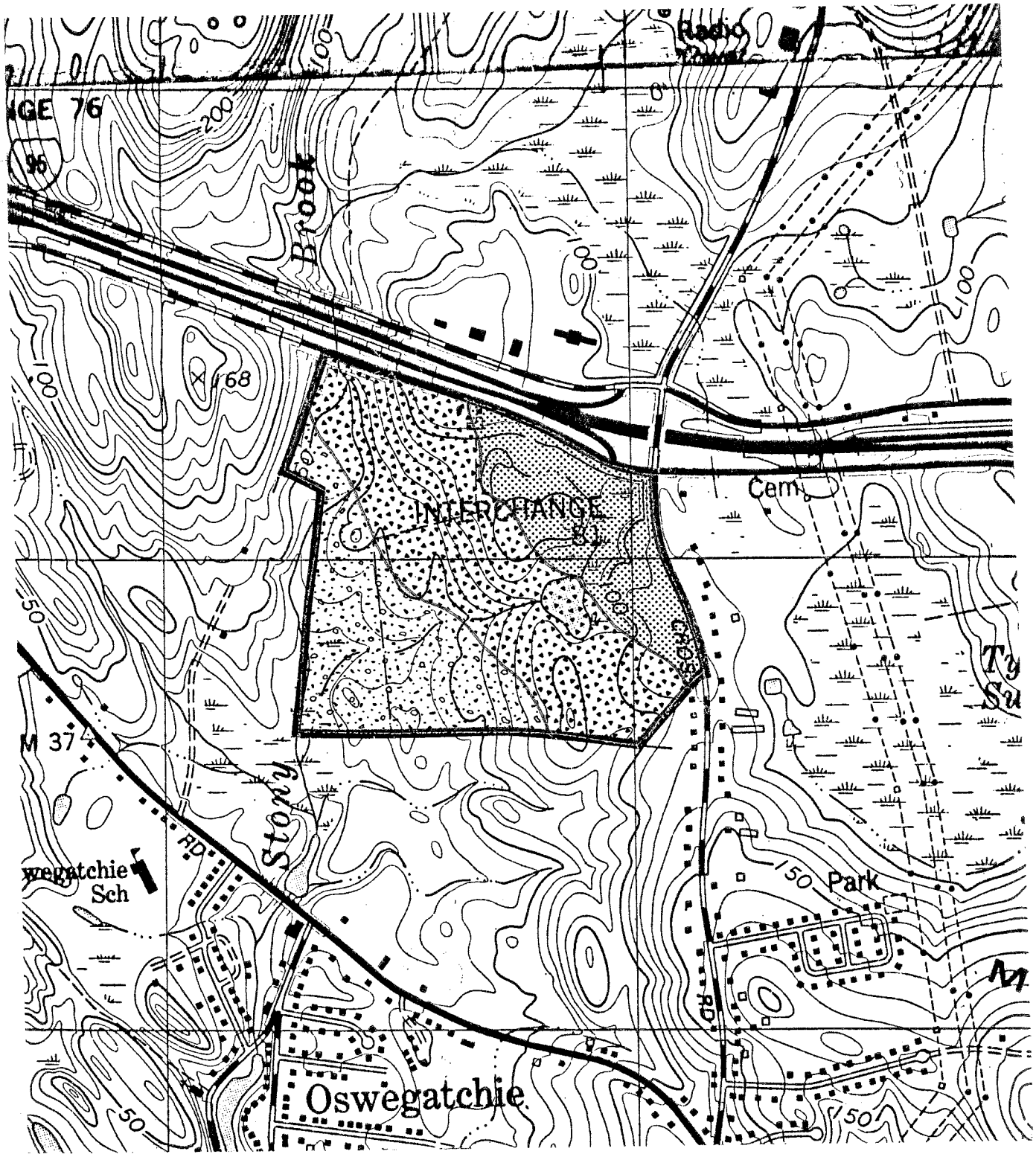
[1]"Bedrock Geologic Map of the Niantic Quadrangle", New London County, Connecticut by Richard Goldsmith, GQ-575, 1967.
[2]"Bedrock Geological Map of Connecticut", John Rodgers, 1985.
[3]Ibid.
[4]"Surficial Materials Map of Connecticut", Stone et al, 1985 (open file).

relatively narrow wetlands. Additionally, it appears that the proposed interior road system, as well as some of the proposed buildings, are in several areas located very close to regulated wetlands. It seems likely that there would be at least some disturbance of wetlands in these areas by fill material.

BEDROCK GEOLOGY MAP

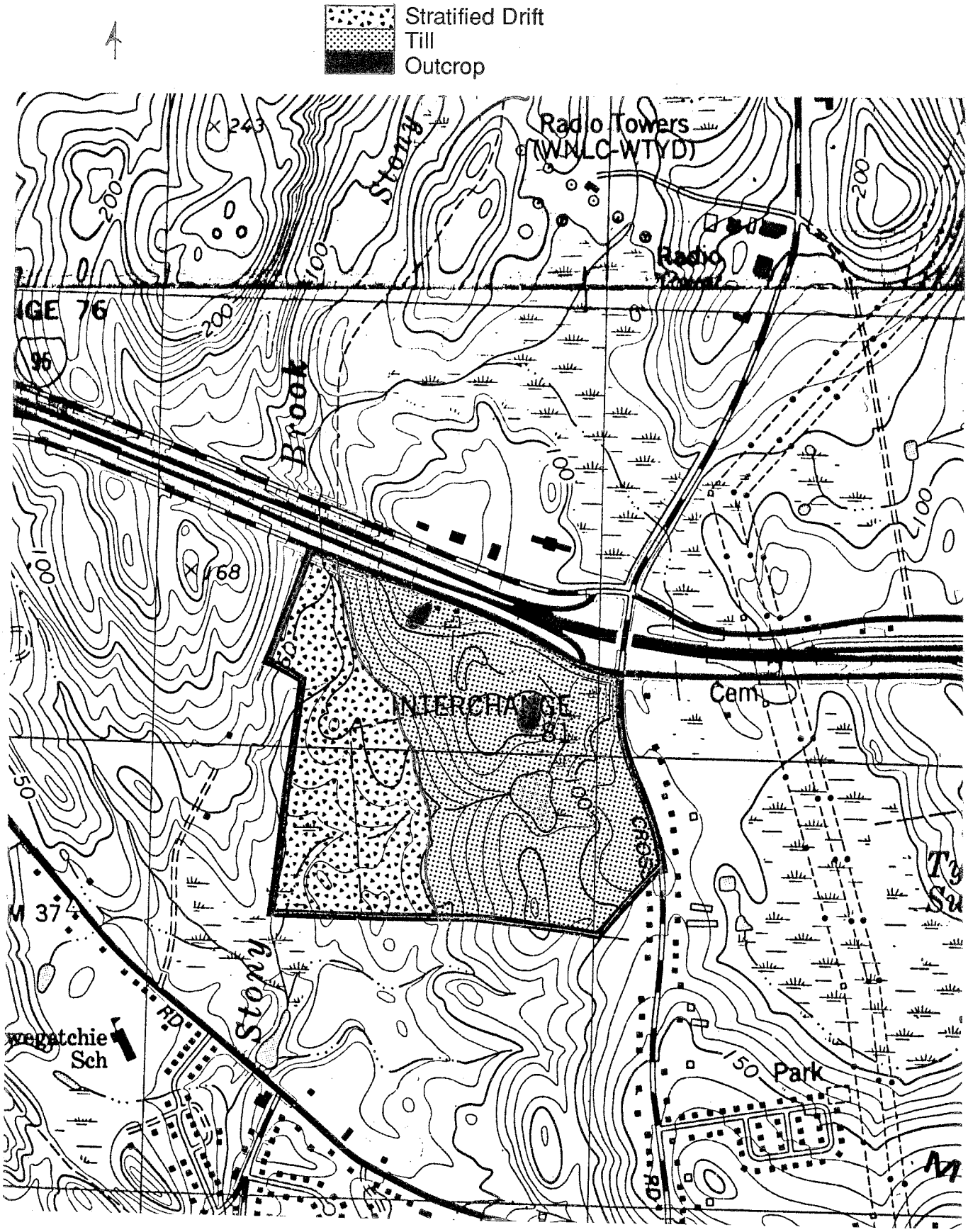
SCALE 1" = 1000'

Alaskite Gneiss
Mamacoke Formation (Subunit)
Mamacoke Formation (Subunit)



SURFICIAL GEOLOGY MAP

SCALE 1" = 1000'



3. SOILS

Aa - Adrian and Palms Mucks

CbB - Canton and Charlton fine sandy loams, 3 to 8 percent slopes

Cdc - Canton and Charlton extremely stoney fine sandy loams, 3 to 15 percent slopes

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

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

Nn - Ninigret fine sandy loam

PdB - Paxton and Montauk very stoney fine sandy loams, 3 to 8 percent slopes

Rn - Ridgebury, Leicester and Whitman, extremely stoney fine sandy loams

SvA - Sutton fine sandy loams, 0 to 3 percent slopes

SwB - Sutton very stoney fine sandy loams, 0 to 8 percent slopes

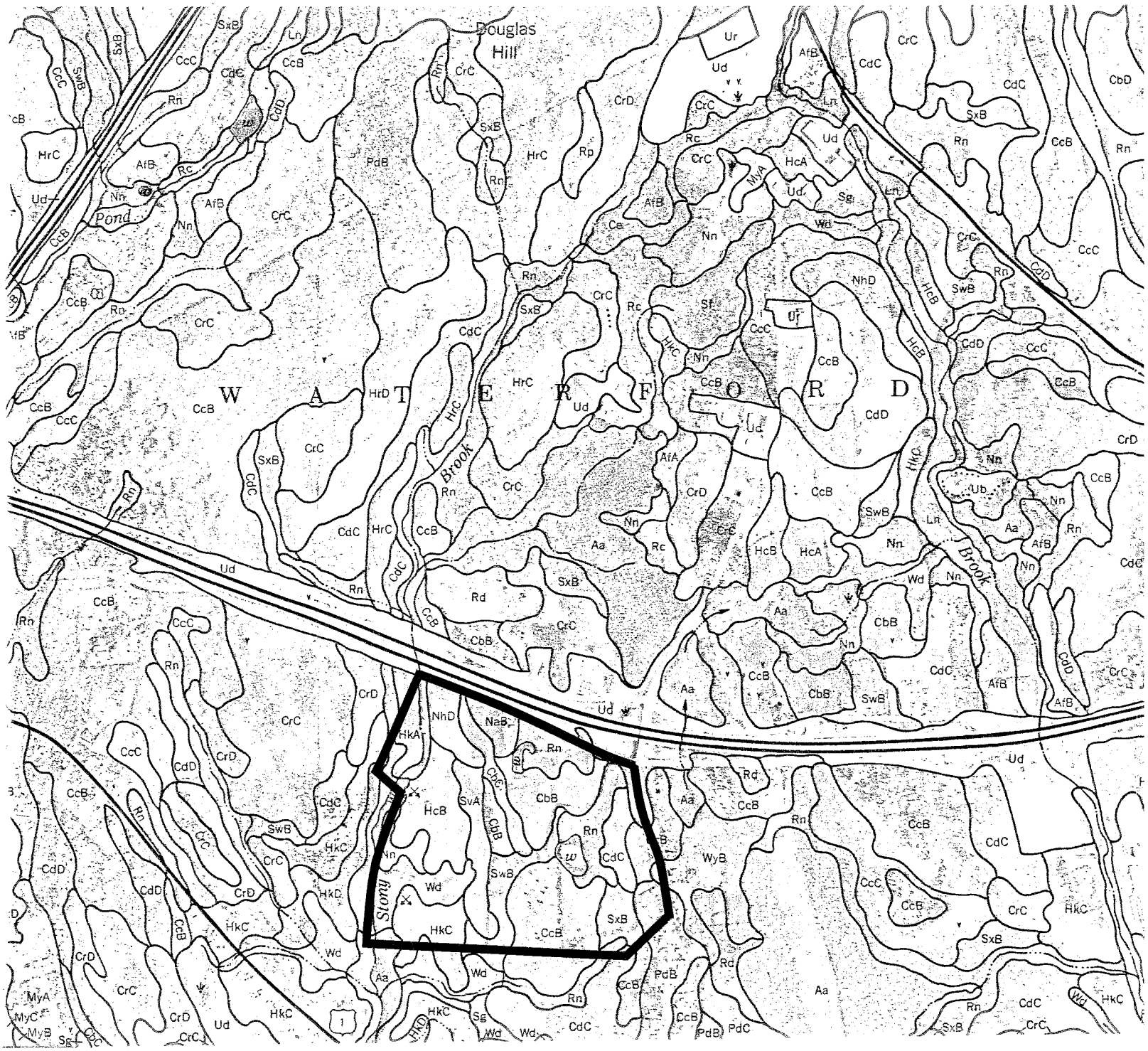
SxB - Sutton extremely stoney fine sandy loams, 0 to 8 percent slopes

Wd - Walpole fine sandy loam

SOILS MAP

SCALE 1" = 1320'

New London County USDA-SCS
562 New London Turnpike
Norwich, CT 06360
887-4163



SOILS LIMITATIONS CHART

Soil Name and Map symbol	Dwellings without Basements	Dwellings with Basements	Small Commercial Buildings	Local Roads and streets	Lawns and Landscaping
* Aa Adrian	Severe: ponding low strength	Severe: ponding	Severe: ponding low strength	Severe: ponding low strength frost action	Severe: excess humus ponding
** CbB Canton	Slight	Slight	Moderate slope	Slight	Slight
CcB Canton	Slight	Slight	Moderate slope.	Slight	Moderate Large Stones
Cdc Canton	Moderate slope	Moderate slope	Severe slope	Moderate slope	Moderate slope Large Stones
** HcB Haven	Slight	Slight	Moderate slope	Moderate Frost Action	Slight
HkA Hinckley	Moderate large stones	Moderate large stones	Moderate large stones	Moderate large stones	Severe: small stones
HkC Hinckley	Moderate slope large stones	Moderate slope large stones	Severe: slope	Moderate slope large stones	Severe: small stones
NaB Narragansett	Slight	Slight	Moderate slope	Moderate frost action	Slight
NhD Narragansett	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
** Nn Ninigret	Moderate: wetness	Severe: wetness	Moderate wetness	Moderate: frost action wetness	Moderate: wetness

SOILS LIMITATIONS CHART

Soil Name and Map Symbol	Dwellings without Basements	Dwellings with Basements	Small Commercial Buildings	Local Roads And Streets	Lawns and Landscaping
PdB Paxton	Moderate wetness	Moderate wetness	Moderate slope wetness	Moderate frost action wetness	Moderate large stones
* Rn Ridgebury	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness frost action	Severe: wetness
** SvA Sutton	Moderate wetness	Severe wetness	Moderate wetness	Moderate frost action wetness	Moderate wetness
SwB Sutton	Moderate wetness	Severe wetness	Moderate slope wetness	Moderate frost action wetness	Moderate large stones wetness
SxB Sutton	Moderate wetness	Severe wetness	Moderate slope wetness	Moderate frost action wetness	Moderate large stones wetness
Wd Walpole	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness frost action	Severe: wetness

* Prime Farmland
** Wetland

4. HYDROLOGY

The entire site lies within the drainage area of Stony Brook. At its point of outlet into Keeney Cove, Stony Brook drains an area 2.19 square miles or about 1,402 acres. The proposed development therefore represents about 9 percent of the drainage area. Surface runoff and to a large degree groundwater, flows downslope toward local discharge areas such as intermittent stream channels, wetlands, springs, ponds, etc. Water is then routed via the stream channels to Stony Brook. Stream channels on the site flow generally westward.

Development of the site for residential and commercial purposes under the proposed densities would be expected to lead to increases in the amount of runoff shed from the site. This is a result of the proposed high density of buildings and the high percentage of paved parking areas for commercial, residential and office space.

The applicant's technical staff has addressed stormwater management for the proposed development in a report made available to Team members on the review day. Stormwater calculations were computed using the Soil Conservation Service TR-55 Computer Program. It is suggested that a written report be compiled that indicates initial conditions, and stormwater frequencies that were analyzed; a summary table showing the pre-development, post-development and designed system peak discharges for all frequencies; and a sketch of the structure outlet system with elevations and dimensions. This report will greatly aid land-use decision makers. The Connecticut Guidelines for Soil Erosion and Sediment Control should be referenced regarding the stormwater management plan.

Based on the size of the proposed project, it seem likely that the water quality of streamcourses on and off site may be noticeably lowered by the project.

Uncontrolled activity could lead to significant amounts of suspended and dissolved solids to surface waterbodies. This may result in strong coloration as well as substantial increase in turbidity to the streamcourses. For this reason, it strongly suggested that a sound erosion and sediment control plan be prepared, implemented and enforced. (refer to EROSION AND SEDIMENT CONTROL section) Because of the large parking lot area required, parking lot debris such as rubbish, sand and salt used in the winter, spilled hydrocarbons and other automobile-related residue may be carried directly into surface water bodies. Although most of the sand and litter should be trapped within ponds, sediment basins, catch basins, etc., salt and other dissolved materials and some suspended particles will probably be transmitted into watercourses. Catch basins and sediment basins will require a regular maintenance program, i.e., removal of silt.

It should be noted that the Water Quality Classification Map of Connecticut, (Murphy, 1985) indicates that Stony Brook and all of its

tributaries that are on the site are classified as A. This means that the surface waters may be suitable for drinking water supply and may be suitable for all other water uses including bathing,the character is uniformally excellent, and may be subject to absolute restrictions on the discharge of pollutants. For this reason it is recommended that the applicant contact DEP's Water Compliance Unit (566-5905) to determine if a permit is required for stormwater discharge to watercourses on the site.

Groundwaters beneath the site have been classified as GA which means that they are suitable for drinking water without treatment.

Town officials questioned on the review day the aquifer potential of Stony Brook. According to the Groundwater Availability in Connecticut, (Meade, 1978), the sand and gravel deposits in the Stony Brook valley are believed to contain coarse grained stratified drift deposits which are known or inferred to be capable of yielding moderate to very large amounts of water (50 - 2,000 gallons per minute). However, hydrogeologic data such as saturated thickness, transmissivity rates, hydraulic conductivity, porosity, etc., are incomplete and verification requires further testing.

Land use can be a major factor in the ability of an aquifer (a geologic formation capable of supplying usable amount of water) to supply water. For example, if impermeable surfaces such as parking lots cover a portion of the recharge areas, in particular the primary recharge areas, and the runoff from those areas flows overland to a stream instead of recharging the groundwater, recharge rates to the aquifer may be lowered to a point where it adversely affects the water supply potential of the sand and gravel deposits. If the Town feels that the Stony Brook aquifer has high potential for future municipal groundwater development, it would be wise to conduct a detailed hydrogeologic study that includes test well(s) and analyzes the potential affects of land-use in the watershed on the aquifer. Primary recharge areas for Stony Brook include the western parts, which are covered by the sand and gravel deposits. The remaining portions (till-covered areas) provide secondary recharge.

Land-use changes can also affect water quality in the Stony Brook aquifer. Current land-use (undeveloped, wooded land) that characterizes the parcel would undoubtedly pose the least threat to ground water quality to the Stony Brook aquifer. The availability of municipal water and sewer lines will also help to minimize the risk for contamination to ground water on the site and ultimately the Stony Brook aquifer, if the site is developed. However, every effort should be made to protect ground water, surface water and Stony Brook from stormwater laden with automobile residue, parking lot runoff, road sand and road salt. This should be addressed in detail in the stormwater management plan.

5. EROSION AND SEDIMENT CONTROL

The erosion and sediment control plan that was provided is incomplete. It is recommended that the following information be included with the plan:

- Complete design calculation and construction details for all components of the stormwater management system. The Tr-55 analysis should include a large scale soils map, tabulation sheet for detention system design, and graphical and tabulation peak discharge calculations.

- The start and completion dates for the project should be included.

- Details should be provided for all proposed erosion and sediment control measures, this should include details for all vegetative and construction measures.

- Location of all proposed stockpiles should be on plans.

- The name of the person responsible for a complete operation and maintenance program for proposed soil erosion and sediment control measures.

- Design details for all proposed wetland crossings and for wetland disturbances are necessary.

The plan proposes disturbances of large areas of wetlands. Measures should be taken to minimize these disturbances. The area where the proposed recreation center is located should be looked at as one potential site to limit these disturbances.

6. GEOLOGIC DEVELOPMENT CONCERNS

As mentioned in the document distributed to Team members on the review day, extension of municipal water and sewer is a key element to the proposed project. The availability of the utilities to the site should help to soften many of the principal hydrogeologic concerns commonly encountered with development where they are not available. Nevertheless, the presence of moderately steep to steep slopes, the potential for some shallow to bedrock areas and the presence of regulated wetland soils will need to be properly addressed by the applicant's technical staff in order to minimize the potential for adverse environmental impacts.

The possibility for shallow to bedrock soils in the northeast corner suggests that blasting may be required in order to place utilities such as electric, water and sewer lines, roads and house foundations. It might be wise to conduct subsurface exploration (borings) in this area to determine depth to bedrock and to isolate areas of potential blasting. Any blasting that takes place on the site needs to be done very carefully and under the strict supervision of persons familiar with state-of-the art blasting techniques. Every effort should be made to minimize the affects of air blast and seismic shock. In general, only when blasting is conducted without regard to airblast and seismic shock are there unusual problems. Also, it would probably be wise to conduct a pre-blast survey in the area.

Construction of the proposed residential units and commercial buildings may require extensive cuts and fills in some places. Of particular concern are; (1) those areas where fill material may extend into regulated soils and (2) cut areas that encounter bedrock or elevated water tables.

Deep cuts or excavations that encounter bedrock will probably necessitate blasting which was discussed earlier. Deep cuts or excavations that intercept the ground water table can also be a problem. An unstable condition may occur just below the seepage line. The weight of the unstable soil causes the soil to flow downslope. Once this begins, the slope is very difficult to stabilize and the establishment of a good vegetative cover is practically impossible. Likewise, steep, sandy and gravelly slopes may be difficult to stabilize. This may be a potential problem in the western parts.

Present plans indicate that the road network will need to traverse or encroach regulated wetlands/seasonal watercourses in several areas. Although undesirable, wetland road crossings are feasible provided that they are properly engineered. These roads need to be constructed adequately above the surface elevation of the wetland. This will permit better drainage of the road and also decrease the frost heaving potential. Road bed preparation needs to include removal of all organic material before the fill material is placed. In cut areas, underdrains should be installed on either side of the road. Road construction through wetlands should preferably be done during the dry time of the year, and should include provisions for effective erosion

and sediment control. Culverts should be properly sized and located so as not to alter the water levels in the wetland or cause flooding problems.

All areas identified as wetland soils are considered "regulated areas" under Chapter 440 of the Connecticut General Statutes. Any proposed activity that impacts regulated areas must be approved by the Waterford's Inland-wetland Commission. In reviewing a proposal, the Commission will need to determine the impact that the proposed activity will have on the wetland. If the Commission feels that the regulated areas are serving an important hydrologic or ecologic function and that the impact of the proposed activity will be severe, they may deny the activity altogether or, at least, require measures that would minimize the impact.

7. THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding Waterford Venture have been reviewed. According to the information, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Concern" occurring at the site.

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

8. WILDLIFE RESOURCES

Wildlife Habitat Description:

The area of the proposed subdivision is composed of four major habitat types; mixed hardwoods, wetland/riparian areas, old field/reverting areas, and agricultural fields. This area currently provides a variety of cover types that supports a diversity of wildlife species. A detailed discription of wetland vegetation is provided by Priscilla W. Baillie, Marine and Freshwater Research Service.

The majority of the area is agricultural fields presently being used for hay crop production. These large open areas consist of a variety of grasses and provide habitat for field dwelling species. Hedgerows consist of multiflora rose, common winterberry, bittersweet, and greenbriar with common privot, white pine, and red pine occurring in the hedgerow centrally located.

Old field/reverting areas are dominated by multiflora rose, blackberry, red cedar, ragweed, dewberry, Queen Annes lace, and a variety of grasses and sedges.

Wooded upland habitat consists of mixed harwoods. Red oak and white oak are the dominant species in the overstory. Mountain laurel, muscle wood, and greenbriar dominate the understory. Ground vegetation is sparce in many areas and consists of a variety of grasses and ferns. In the area adjacent to Stony Brook, red maple and white oak dominate the overstory. Understory species consist primarily of bittersweet, greenbriar, black birch seedlings, mountain laurel, viburnum, high bush blueberry, spice bush, and sweet pepperbush.

Wildlife Species:

Bird species observed inhabiting the area include bluejays, black-capped chickadees, mockingbirds, flickers, cedar waxings, eastern wood pewees, purple finches, sparrows, ruffed grouse, kestrals, and a variety of other songbirds. A pair of black ducks were observed in the small pond behind the farm and one black duck was observed in the larger pond.

Mammalian species consist of white-tailed deer, eastern cottontail, gray squirrels, raccoons, red fox, muskrat, mink, and variety of other small mammals.

With the abundance of wetland/riparian habitat this area also supports a diversity of amphibian and reptilian species.

Effects of Proposed Activity on Wildlife:

As indicated on the site plan all areas except wetlands will be developed. This will eliminate the present diversity of wildlife habitat, which

will in turn reduce species diversity and richness. Species that are intolarable to man will be forced to emigrate into adjacent habitat. Species dispersion into adjacent habitats may result in competition with species already occupying the area. Many species will also be forced to inhabit less desirable habitat; decreasing survivorability. Species more tolarable to man such as starlings, robins, house sparrows, and raccoons may increase in number and become a nuisance.

The wetlands presently provide important habitat for a number of wildlife species and function as areas for absorbtion of natural runoff. The planned diversion of stormwater into wetlands will increase water flow, sedimentation, and pollution. This will alter the present ecological structure and reduce species diversity. Even though a stormwater retention and filtration plan has been devised, the long term effects of stormwater diversion into wetlands tends to be negative. There will also be a negetative impact on wetlands if there is any clearing or removal of vegetation. Vegetation removal in wetlands would have severe impacts on wildlife, especially reptiles and amphibians. Soil and water types, cover, food, breeding grounds, and hibernation areas may be altered so that species dependant on specialized habitats are eliminated and more adaptable species reduced. Barriers to seasonal movement and population dispersal, such as roads, are also serious threats.

Mitigation of Impacts on Wildlife:

Several measures can be taken to minimize the affects of development on wildlife. With the abundance of wetlands, erosion control measures will have to be implemented during and prior development to limit siltation. Vegetation removal at road crossings should be kept to a minimum. There should also be no removal of vegetation within 100 ft of wetlands. These buffer strips will limit disturbance to wetlands and provide important corridors for a number of wildlife species.

9. FISH RESOURCES

Site Description:

The proposed high density development will be a mixture of office and multi-family buildings. The development will be served by town sewer and water facilities. This section of the report will address anticipated impacts to the wide array of aquatic habitats and wetlands that exist on this 122 acre parcel.

Stony Brook is an important aquatic habitat of fisheries concern on this property. It flows southerly before emptying into Keeny Cove on the Niantic River. This brook contains excellent and diverse forms of instream habitat for resident fishes; pool habitat is predominant in the upper section while expansive riffle habitat exists in lower areas. Pools provide beneficial cover "hiding and resting areas" for stream fishes. Upper reaches of riffles are commonly used as feeding areas by fish since aquatic insects, their primary food source, reside in this type of habitat. Stream width varies from approximately 5 to 12 feet. Streamside riparian zones are comprised of mixed hardwoods and shrubs. This vegetation provides vital shading and cooling of stream waters.

Dominant stream substrate exists in the form of sand, gravel, and small cobble. Although, Stony Brook and downstream areas (Keeny Cove) have historically developed siltation problems due to expanding suburban development within its watershed (Anderson-Nichols & Co., date unknown), the stretch along the Waterford Venture site examined by the Team's Fisheries Biologist contained clean and natural substrate free of excess silts and sediments. The report also states that siltation is most significant in the narrow upper reaches of the Keeny Cove where glacially deposited rocks located at the narrows reduce tidal exchange with the Niantic River. Consequently, the upper cove area has turned into a settling basin for silt that is transported to the embayment by Stony Brook.

Surface waters of Stony Brook are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for a "Class A" watercourse are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

The proposed development contains two small ponds. Both are shallow and nutrient-enriched The larger pond on the eastern portion of the property contains a dense accumulation of floating aquatic weeds (water lilies and watershield). This pond outlets into Stony Brook.

A total of 21 acres (17% of the total area) has been designated as inland wetlands which are primarily associated with Stony Brook and the two ponds. Protection of these wetlands is critical to the protection of Stony Brook and ultimately to downstream areas such as the Niantic River.

Aquatic Resources:

Stony brook is not stocked with trout by the DEP Bureau of Fisheries; however, it is expected to support a native brook trout population. Other important fish species expected to live in the brook are: blacknose dace, longnose dace, white sucker, creek chubsucker, fallfish, common shiner, tesselated darter, and American eel. The Team's Fisheries Biologist (contact at 295-9523) is willing to conduct an electrofishing survey of Stony Brook if the Town of Waterford would like more definitive information concerning fish species composition and relative abundance.

The exact fish species composition of the ponds is not known. According to the "Ecology of Waterford Venture Pond" report provided to Team members, dissolved oxygen levels in this pond drop to less than 1 mg/1 in July. Extremely low dissolved oxygen levels (if reported data are representative of conditions throughout the pond) would severely limit fish survival.

The Niantic River supports a diverse population of shellfish and a recreational fishery exists for scallops, hard clams, and soft clams. The river also supports seasonal, as well as year round populations of commercially and recreational important finfish species including: striped bass, summer flounder, juvenile and adult bluefish, and blackfish. The Niantic River is an important spawning and nursery area for winter flounder. The Niantic River also supports abundant populations of forage fish. Although not of direct commercial or recreational importance, forage species are extremely important components of the estuarine food web.

Impacts:

The following impacts of the Waterford Venture Development on Stony Brook can be expected if proper mitigation measures are not implemented:

1. Aquatic habitat degradation in Stony Brook due to the influx of stormwater drainage from nearby residential housing and office complexes : Stormwater runoff is a **serious concern** at this site since 47.2 acres or 38.5% of the total area to be developed will be converted to impervious areas in the form of rooftops, roads, and parking lots. Hence, rainfall will quickly run off these surfaces instead of percolating down through soils! The developer has proposed a stormwater management plan which includes: a system of hooded catch basins along the proposed road network, conveyance of runoff into grassy swales and the construction of a detention basin. Runoff will then be discharged to Stony Brook and surrounding wetlands. These stormwaters can contain a variety of pollutants that aredetrimental to aquatic organisms. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Once introduced into stream environments, stormwater runoff will fertilize stream waters causing water quality degradation. Additionally, fine silts in stormwaters that remain in suspension for prolonged periods of time often cannot be

effectively removed from stormwater detention basins. More harmful still are spilled petroleum based chemicals or other toxicants that can precipitate partial or complete fishkills. Stormwater drainage from this property will increase stream flows. Increased volumes of water in Stony Brook will compound stream sedimentation problems that have occurred downstream in Keeny Cove.

2. Construction site soil erosion and sedimentation of Stony Brook through increased runoff from unvegetated areas : During construction topsoil within the proposed building lots will be exposed and susceptible to runoff events.Erosion andsedimentation due to construction has long been regarded as a major cause of stream degradation Nationally, silt is considered a major stream pollutant. As previously mentioned, downstream areas of Stony Brook have experienced prior sedimentation problems. Excessive sediment deposition could damage the Stony Brook aquatic ecosystem in the following ways:

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

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

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

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

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

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

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

(8) Sediment could degrade important shellfish habitat in Keeny Cove and the Niantic River. Shellfish need to attach to firm bottoms, free from heavy silt and sediment.

3. Transport of lawn fertilizers and chemicals to Stony Brook : Runoff and leaching of nutrients from fertilizers on lawns will stimulate filamentous algae growth in this stream and degrade water quality. Introduction of lawn herbicides can result in "fish kills" and overall water quality degradation.

4. Degradation of wetland habitat : Proposed building lots will be constructed adjacent to vital wetland habitat. Wetlands are critical to water quality maintenance and the ultimate health of Stony Brook. Wetlands are beneficial in many ways. They serve to: (1) control flood waters by acting as a water storage basin, (2) trap sediment from natural and man-made sources of erosion and (3) help filter-out pollutants from runoff before they enter watercourses. Development which brings about polluted stormwaters, excessive stream sedimentation, lawn fertilizers, and lawn herbicides can negatively impact these wetland complexes by hindering their ability to properly function Negative impacts observed in wetland habitat will be observed in Stony Brook as well.

5. Impacts to downstream environments : Water quality problems and habitat degradation that directly occurs within Stony Brook will be immediately observed downstream in the fragile marine environment of the Niantic River.

Stony Brook flows into Keeny Cove which is located on the eastern shore of the Niantic River approximately 1.7 miles from the mouth of the river. Keeny Cove is only 0.5 river miles downstream from the most southerly portion of the proposed development site.

In 1987, a Sediment Source Analysis for the Keeny Cove Drainage Basin was submitted to the Waterford Flood and Erosion Board (Rowley Engineering & Associates, 1987). According to this report, upland erosion is a significant contributor to siltation problems within Keeny Cove. The report also mentions that further suburban development in areas south of I-95 could lead to future siltation of the Keeny Cove. In particular, local zoning of areas between I-95 and Boston Post Road can allow development which will create large expanses of impervious surfaces to be placed in areas now naturally absorbing rainfall in soils and vegetation. Sedimentation would be of particular concern because of the presence of sensitive marine resources including shellfish beds in Keeny Cove and the Niantic River.

Recommendations:

The wide ranging impacts on Stony Brook and the Niantic River may be reduced by implementing the following recommendations:

1. An effective stormwater management plan must be developed to ensure the proper management of stormwaters. The developer has prepared a stormwater plan for this site; however, the suitability of this plan must be reviewed by appropriate DEP personnel. Therefore, due to the serious concern for stormwater runoff at this site, expert personnel at the Water Compliance Unit who are responsible for reviewing stormwater management have requested that they review the Waterford Venture Project. Please contact Dick Mason at 566-5903 for more details. A major concern of the Team's Fisheries Biologist is the proper management of waters from the proposed detention basin.

Stormwaters should be released after Stony Brook stream flows have peaked; otherwise, increased scouring of stream materials from excessive stormwater flows will lead to further siltation problems in Stony Brook and Keeny Cove.

2. The proposed development has no provisions for "open space" except for existing ponds on the property. Considering the high density of buildings that are proposed, it is highly recommended that at the minimum a 100 foot open space buffer zone be maintained along wetland boundaries that border Stony Brook and the two ponds. This buffer can be an effective mitigation measure at this development location. No construction and alteration of existing habitat should be allowed in this zone. Research has shown that 100 foot buffer zones help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life (USFWS 1984;USFWS 1986;0DFW 1985). These buffers will absorb surface runoff and other pollutants before they can enter wetlands, ponds, and stream ecosystems. Additionally, buffer zones can improve the quantity of instream habitat for fishes. For example, research has shown that brook trout habitat units can increase 2,400% when well-vegetated buffer zones are used for stream corridor protection (HEP Notes, 1988).

3. It is strongly recommended that the proposed development west of Stony Brook be eliminated from the proposal. Development plans call for buildings and recreational facilities to be located between the brook and a drainage swale. Thus, this part of the development proposal will create an "island" bordered by the wetland swale and Stony Brook and require the crossing of Stony Brook. There is a high probability that severe aquatic habitat damage will occur in this area since proposed buildings will be located extremely close to Stony Brook. Anticipated impacts to the brook would be: introduction of stormwater effluent, erosion and sedimentation during the construction phase, and the permanent elimination of riparian (streamside) vegetation. Additionally, loss of natural stream habitat and unrestricted passage of resident fish may be denied if culverts are used to cross Stony Brook at this juncture. Mitigation measures suggested to offset the previously mentioned impacts will be generally ineffective in this very sensitive area.

4. Install and maintain proper erosion and sedimentation controls during site construction activities including silt fences and staked hay bales along the perimeter of all wetland, stream, and pond habitats. Proper installation of haybales and silt fences requires that they be placed within excavated trenches. Only small areas of soil should be exposed at one time and these areas should be reseeded as soon as possible (see Erosion and Sediment Control Section for specific recommendations). The Town of Waterford should have an appointed official that would be responsible for inspecting this development on a daily basis to ensure that contractors have complied with all stipulated mitigation devices. Past lake and stream siltation disturbances in Connecticut associated with residential housing developments have occurred when contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis.

5. Limit liming, fertilization, and the introduction of chemicals onto lawns to abate the amount of additional nutrients to Stony Brook. The likelihood of fishkills due to lawn herbicides will be reduced if harmful chemicals are not applied at this site. Also, non-phosphorus lawn fertilizers are currently available from various lawn care distribution centers.

6. It is suggested that no pond construction occur in the western section of Waterford Venture because ponds in high density developments require intensive management efforts. Water quality can rapidly degrade due to roadway runoff and poor lawn management practices. Additionally, increased nutrient enrichment of pond waters commonly occurs in ponds located within high density housing developments. Increased nutrient enrichment often leads to uncontrollable growth of problematic aquatic weeds.

Summary :

Future development is likely to compound stream siltation within Stony Brook and Keeny Cove. Additional development within this watershed may lead to a situation in which stream protection measures are no longer effective against the prevention of nonpoint sources of pollution. Rehabilitation of freshwater and marine environments is extremely difficult once water quality and habitat degradation has occurred. In reviewing the Waterford Venture Complex, it will be extremely important to weigh the need for additional development within the Stony Brook watershed versus potential damage to fragile aquatic and marine ecosystems.

Bibliography:

Anderson-Nichols & Co., Inc. Date unknown. Coastal Analysis, Coastal Planning, Coastal Engineering. Phase I - Procedure and Summary.

Habitat Evaluation Notes. 1988. Nonpoint Source Pollution: Linking Land Use and Fisheries Potential in the Upper Milwaukee River. Vol. 1 No 4.

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

Rowley Engineering & Associates. 1987. Sediment Source Analysis for the Keeny Cove Drainage Basin.

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

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

10. PLANNING COMMENTS

Planning comments concerning the proposed development relate primarily to traffic since it is assumed that the project conforms to the Zoning Regulations in terms of use and density and that public utilities eventually will be available to serve the site.

In lieu of a traffic study for the entire development and detailed information concerning the amount and location of office space, rough estimates were made to determine traffic generation, based on the proposed number of residential units and the estimated floor area for office use. Since a mix of apartment types is planned, a figure of 6.1 vehicle trips per unit per day was used, as prescribed for apartments, generally, in Trip Generation. Institute of Transportation Engineers (ITE), Third Edition, 1983. This would produce a total of 4,233 vehicle trips per day generated by the 694 residential units.

The site plan shows about 100,000 square feet of the site occupied by office building, half of which are presumed to be two stories, indicating 150,000 square feet of building area used for offices. Again, using ITE trip generation rates, the offices would produce 14.3 trips per 1,000 gross square feet of building area, or 2,145 vehicle trips per day. The total estimated traffic generated by the proposed development would be 6,378 vehicles per day.

The north/south collector road through the approximate center of the site is proposed for eventual construction through to Route 1 to the south. This is highly desirable, but the timing is quite indefinite. The same is true for the relocation of the I-95 exit/entrance. Consequently, a heavy burden is likely to be placed on the proposed east/west road connecting with Cross Road. It should be constructed to the same standard as the north/south collector road.

The driveway to Parkway South proposed near the northeastern corner of the site should be limited for use by the office complex in that area. The residential traffic from the terraced housing area should be directed toward both of the interior collector roads. This implies construction of a direct link between the terraced housing area and the east/west collector road. Contour information suggests that this might best be accomplished opposite the western driveway serving the housing in the southeastern quadrant of the site. The purpose of this arrangement is to direct as much traffic as possible toward intersections which are more likely to be controlled by traffic signals in the future, that is, on Parkway South, opposite the proposed new ramps, and on Cross Road, where it will intersect with the proposed east/west roadway into the site.

Each of the 4 residential villages is to be served by a looping driveway which serves two-way traffic and widens in numerous locations to allowperpendicular parking along one or both sides. Thus, the roadway itself becomes the maneuvering area for the roadside parking spaces. Because of the high number of vehicles these villages will generate, better separation of parking and major accessways appears desirable.

The site plan shows that recreation facilities will be provided in the northwestern corner of the site. If these are to be for use by residents of the villages, they should be more easily accessible. A central location, connected to the residential areas by sidewalks or walkways, would be appropriate. The users of neighborhood recreation facilities should not have to travel by motor vehicle to get to them.

11.ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site Files and Maps indicate the presence of a series of prehistoric sites located along the eastern border of Niantic Bay and the Niantic River, Waterford, Connecticut. However, no archaeological sites are listed for the project area along Stony Brook. Environmental conditions, such as, excessive wetlands and degree of slope, appear to warrant a moderate sensitivity for both prehistoric and historical archaeological resources. However, elevated knolls within the project area should be tested for their archaeological resources as these natural features would have a high potential for prehistoric campsites.

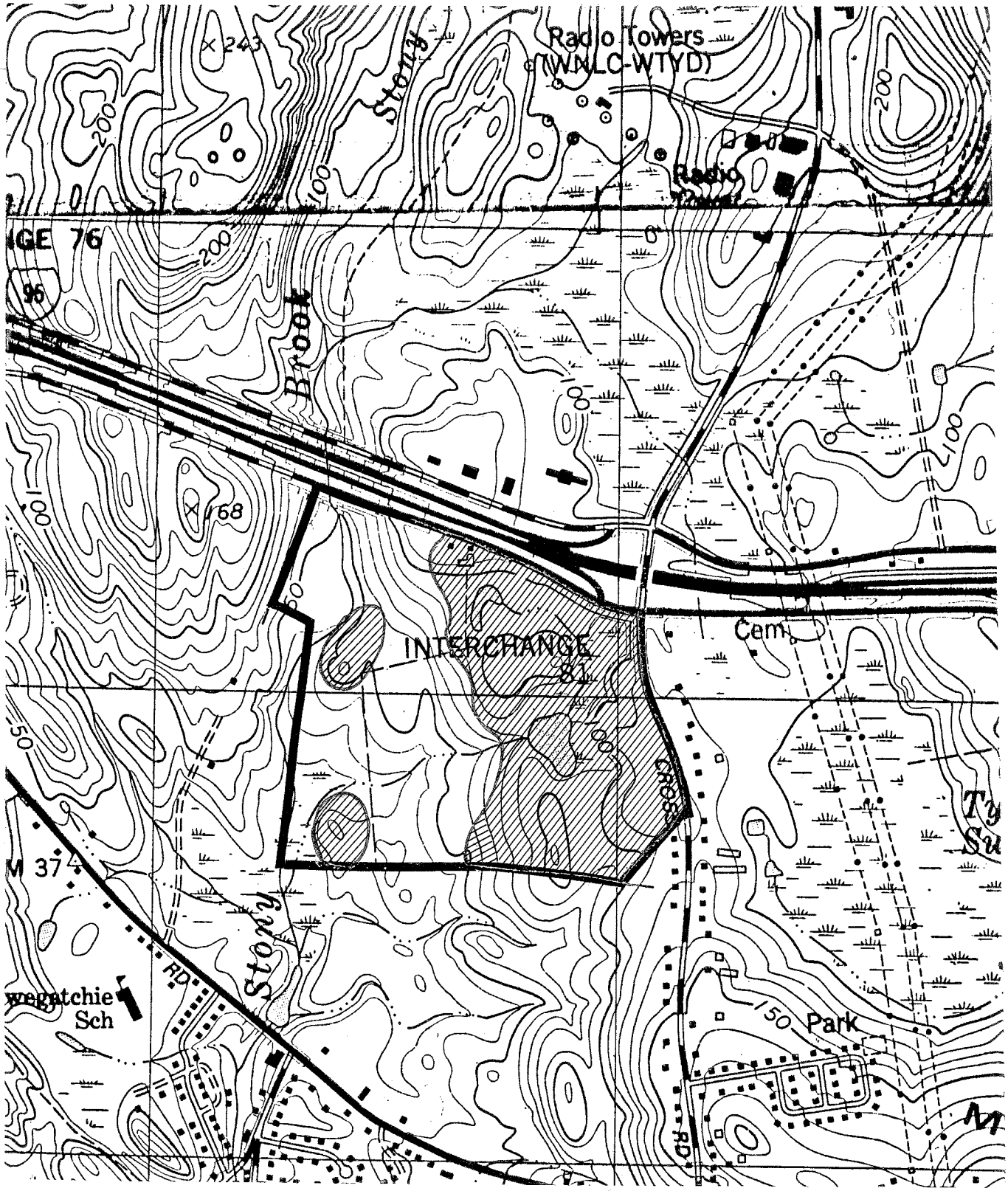
It is recommended that an archaeological reconnaissance survey be conducted in sections of the project area that may have a high sensitivity to cultural resources. All archaeological studies should be undertaken in accordance with the Connecticut Historical Commission's Environmental Review Primer for Connecticut's Archaeological Resources.

In summary, the project area has a moderate-to-high sensitivity for prehistoric archaeolgical sites. It is recommended that all feasible efforts be undertaken to identify and ensure the preservation and conservation of the cultural resources in the project area.

AREAS OF POTENTIAL

SCALE 1" = 1000'

Areas of high potential for prehistoric campsites



ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialsits, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area --- an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Soil and Water Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.