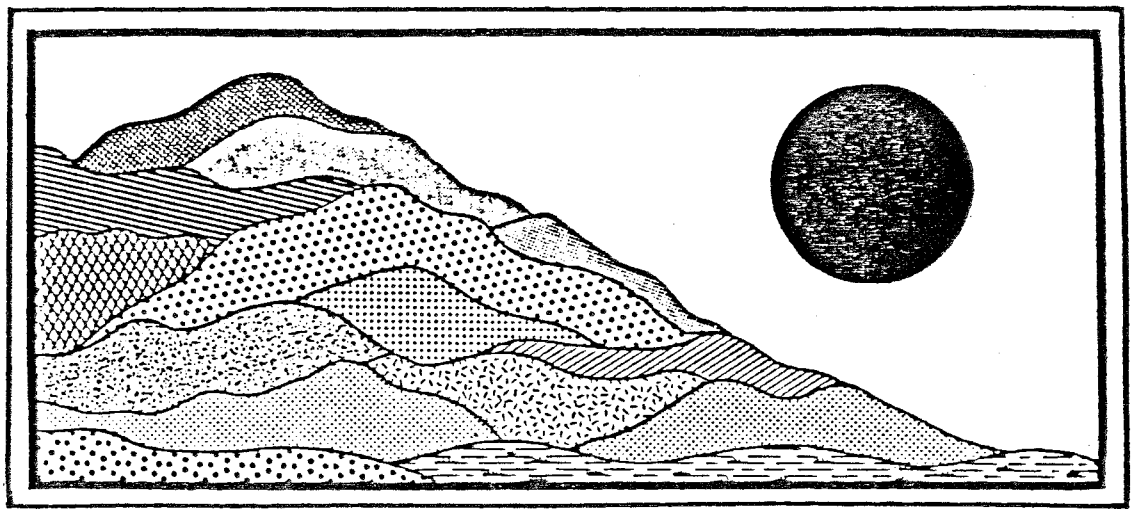
Nutmeg Industrial Park

Waterford Connecticut



February 1988

ENVIRONMENTAL REVIEW TEAM REPORT

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Nutmeg Industrial Park

Waterford

Connecticut

Review Date: DECEMBER 8, 1987

Report Date: FEBRUARY 1988

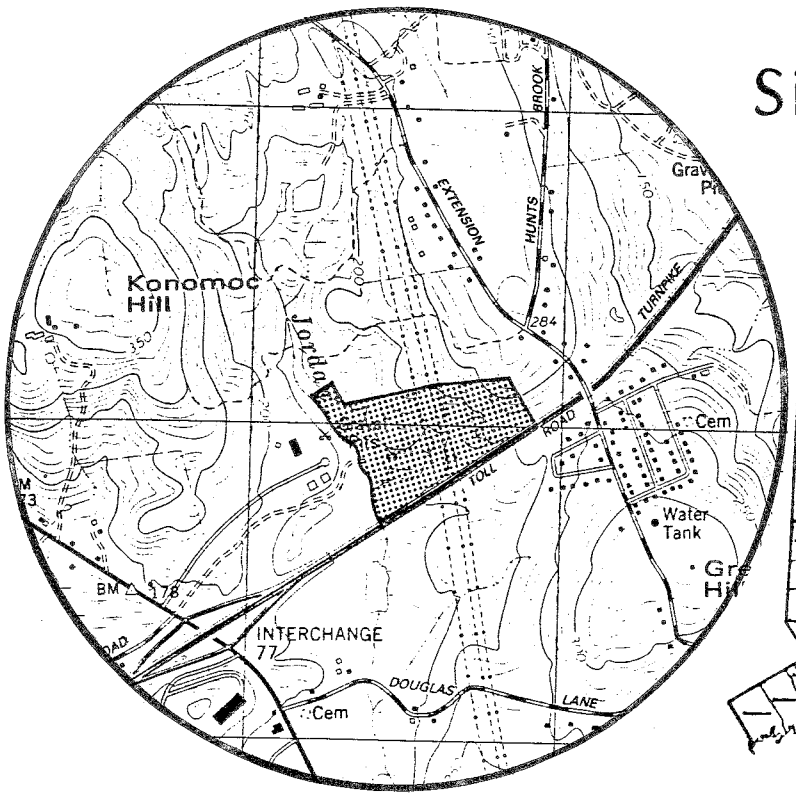
RC&D

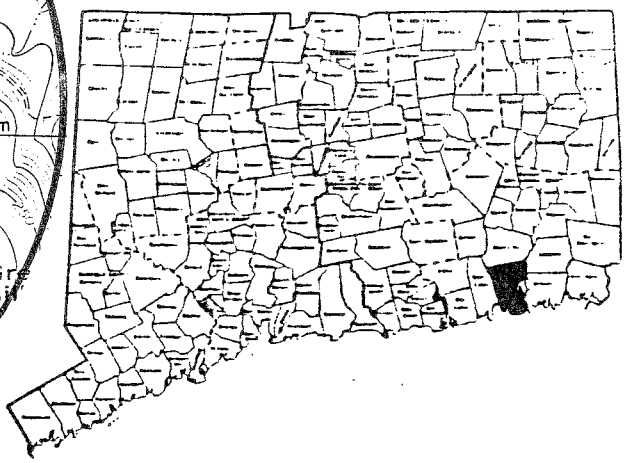
ENVIRONMENTAL REVIEW TEAM
PO BOX 198
BROOKLYN, CONNECTICUT 06234

Site Location

NUTMEG INDUSTRIAL PARK
SECTION II

WATERFORD, CONNECTICUT





EASTERN CONNECTICUT

RESOURCE CONSERVATION

& DEVELOPMENT AREA

Granby
Suffield
Enfield
Somers
Stafford
Union
Woodstock
Thompson
East Granby
Windsor Locks
Ellington
Putnam
Simsbury
Windsor
East Windsor
Willington
Ashford
Eastford
Pomfret
Canton
Tolland
Killingly
South Windsor
Vernon
Bloomfield
Chaplin
Avon
West Hartford
Hartford
East Hartford
Manchester
Bolton
Coventry
Mansfield
Hampton
Brooklyn
Farmington
Andover
Windham
Scotland
Canterbury
Plainfield
Sterling
Newington
Wethersfield
Glastonbury
Hebron
Columbia
Rocky-hill
Marl-borough
Lebanon
Sprague
Voluntown
Cromwell
Portland
Franklin
Lisbon
Griswold
East Hampton
Colchester
Middletown
Bozrah
Norwich
Preston
Middlefield
Durham
Haddam
East Haddam
Salem
Montville
Ledyard
North Stonington
Chester
Lyme
Killing-worth
Deep River
East Lyme
Groton
Stonington
Essex
Old Lyme
Clinton
West-brook
Old Saybrook
New London
5

ENVIRONMENTAL REVIEW TEAM REPORT

ON

NUTMEG INDUSTRIAL PARK SECTION II

WATERFORD, CONNECTICUT

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

The ERT met and field checked the site on Tuesday, December 8, 1987. Team members participating on this review included:

Don Capellaro	--Sanitarian - CT Department of Health
Brian Murphy	--Fisheries Biologist - CT Department of Environmental Protection
Liz Rogers	--Soil Conservationist - U.S.D.A., Soil Conservation Service
Tom Seidel	--Regional Planner - Southeastern CT Regional Planning Agency
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 and a soils map. During the field review the team members were given topographic maps and plans. The Team met with, and were accompanied by the First Selectman, the Town Sanitarian, the Town Planner and Environmental Planner, the Conservation Commission Chairman, a representative of the developer and his engineers and specialists. Following the review, reports from each team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project -- all final decisions and conclusions 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.

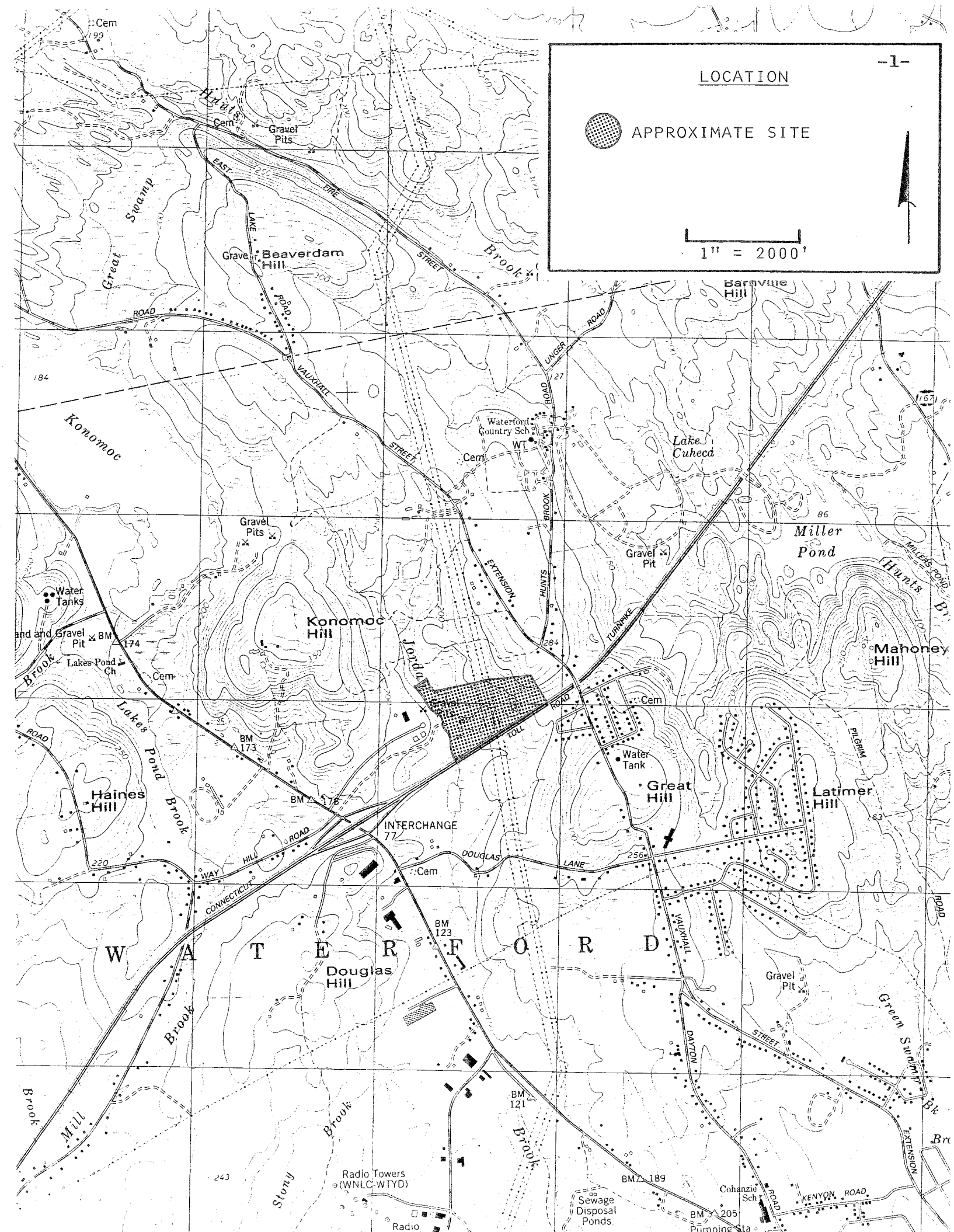
The Eastern Connecticut RC&D Executive Committee hopes you will find this report of value and assistance in making your decisions on Section II of this proposed industrial park.

If you require any additional information, please contact:

Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P. O. Box 198
Brooklyn, CT 06234

TABLE OF CONTENTS

TABLE OF MAPS AND CHARTS


-1-
LOCATION
APPROXIMATE SITE
1" = 2000'
Cem
Hunts
Gravel Pits
EAST
FIRE
STREET
Great Swamp
LAKE
Gravel
Beaverdam Hill
ROAD
Brook
Barnville Hill
UNGER
ROAD
VAUXHALL
STREET
Konomoc
Waterford Country Sch
WT
Cem
Lake Cuheca
BROOK
Gravel Pits
EXTENSION
HUNTS
Gravel Pit
Miller Pond
MILLERS POND
Water Tanks
Konomoc Hill
Jordan
TURNPIKE
Mahoney Hill
Lakes Pond Ch
Cem
Gravel Pits
TOLL
ROAD
Cem
Water Tank
Great Hill
PILGRIM
Latimer Hill
Haines Hill
Lakes Pond Brook
BM 173
BM 178
INTERCHANGE 77
HILL
WAY
ROAD
DOUGLAS
LANE
Cem
CONNECTICUT
BM 123
WATERFORD
Douglas Hill
VAUXHALL
Gravel Pit
Green Swamp
DAYTON
STREET
Brook
Mill Brook
Stony Brook
BM 121
Radio Towers (WNLC-WTYD)
BM 189
Cohanzie Sch
KENYON ROAD
Sewage Disposal Ponds
BM 205
Pumping Sta
Radio

1. INTRODUCTION

The Waterford Conservation Commission has asked for assistance from the Environmental Review Team (ERT) in reviewing proposed Section II of an industrial park. This report contains information about the natural resource base of the site and an analysis of the proposed development, with concerns and recommendations highlighted.

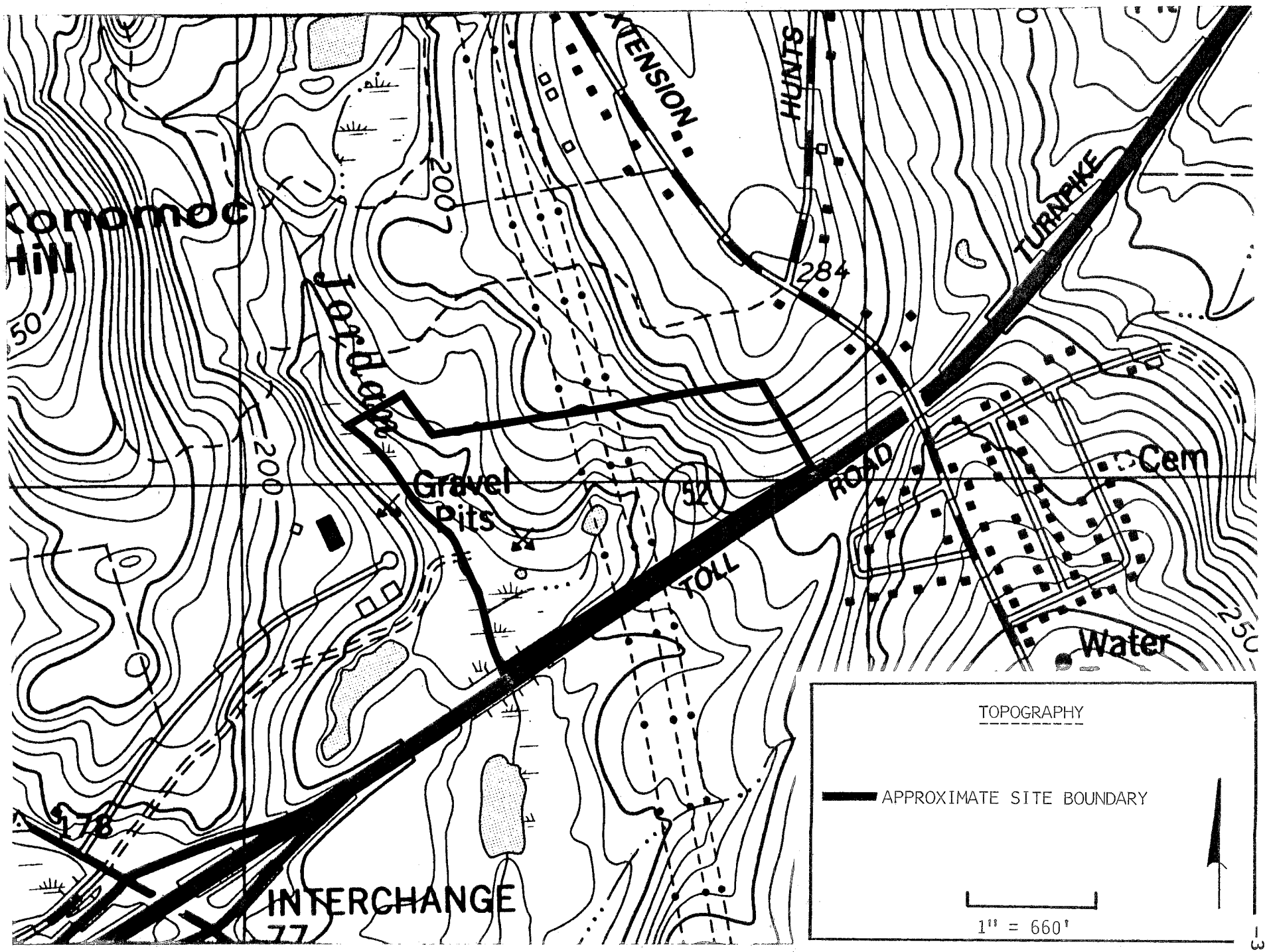
The Section II site consists of a little over 36 acres located east of the existing cul-de-sac at the present termination of Industrial Drive. The Drive begins at Route 85. The southern end of the property is bounded by Interstate 395. Vauxhall Street Extension lies somewhat further towards the east of that side of the property. The major features (natural and man-made) of the property are: Jordan Brook and associated wetlands which cross in a north-south direction and which are near the beginning of Section II; the lower southern side which also has a considerable area of wetlands; the rising, higher terrain at the north, north-east sides; a wide (415 foot) power line right-of-way having a series of pole towers which conduct a number of overhead transmission lines. A considerable portion of the landscape has been previously disturbed being the borrow area for a sand and gravel operation.

DiCesare-Bentley, consulting engineers for the owners, have prepared a subdivision plan indicating eight (8) possible lots ranging in size from 1.3 acres to 10.5 acres. The two (2) largest lots include land area in the Connecticut Light and Power right-of-way. The extension of Industrial Drive is to cross Jordan Brook and end at a new cul-de-sac which is also located in and at the beginning (westside) of the power line right-of-way.

2. TOPOGRAPHY AND SETTING

The 36.3 acre site is located east of Industrial Drive. Jordan Brook, which forms the western boundary of the parcel will need to be crossed by the new road. In addition, the parcel is bordered on the south by I-395 and is bisected (N to S) by overhead power lines in the central part.

As mentioned earlier, Jordan Brook and its accompanying wetland floodplain flows southward near the western boundary. A


Toronoc Hill
250
200
200
XTENSION
HUNTS
284
TURNPIKE
Jordan
Gravel Pits
52
ROAD
Cem
TOLL
Water
250
178
INTERCHANGE
77
TOPOGRAPHY
APPROXIMATE SITE BOUNDARY
1" = 660'

small, unnamed tributary (outlet stream for the man-made ponds in the central part) joins Jordan Brook in the wetlands at the southwest corner. Jordan Brook continues to flow southward under I-395 enroute to Long Island Sound.

Approximately 140 feet of relief separate the upland areas in the northern parts of the parcel from Jordan Brook Valley and its accompanying wetlands in the southwest corner.

The water table is at or near the surface and a broad wetlands occurs in the southwest corner of the site. Wetlands, also parallel Jordan Brook along the western boundary.

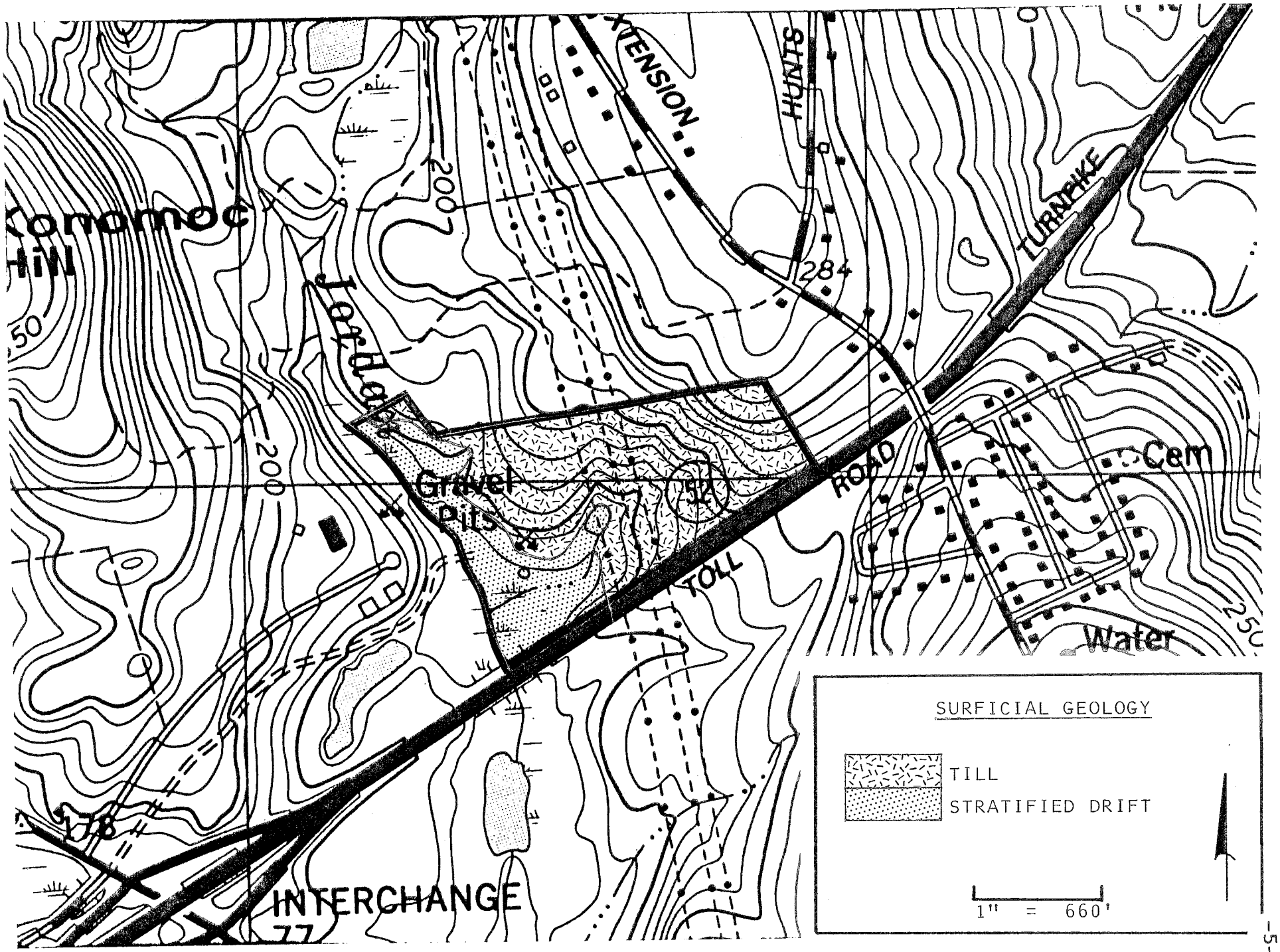
Based on the subdivision map supplied to Team members, which includes wetland boundaries delineated by a certified soil scientist, it estimated that about 28 percent, or 10 acres of the property is designated regulated land. There are several man-made ponds on the site; the water levels in the ponds appear to be coincident with the local water table.

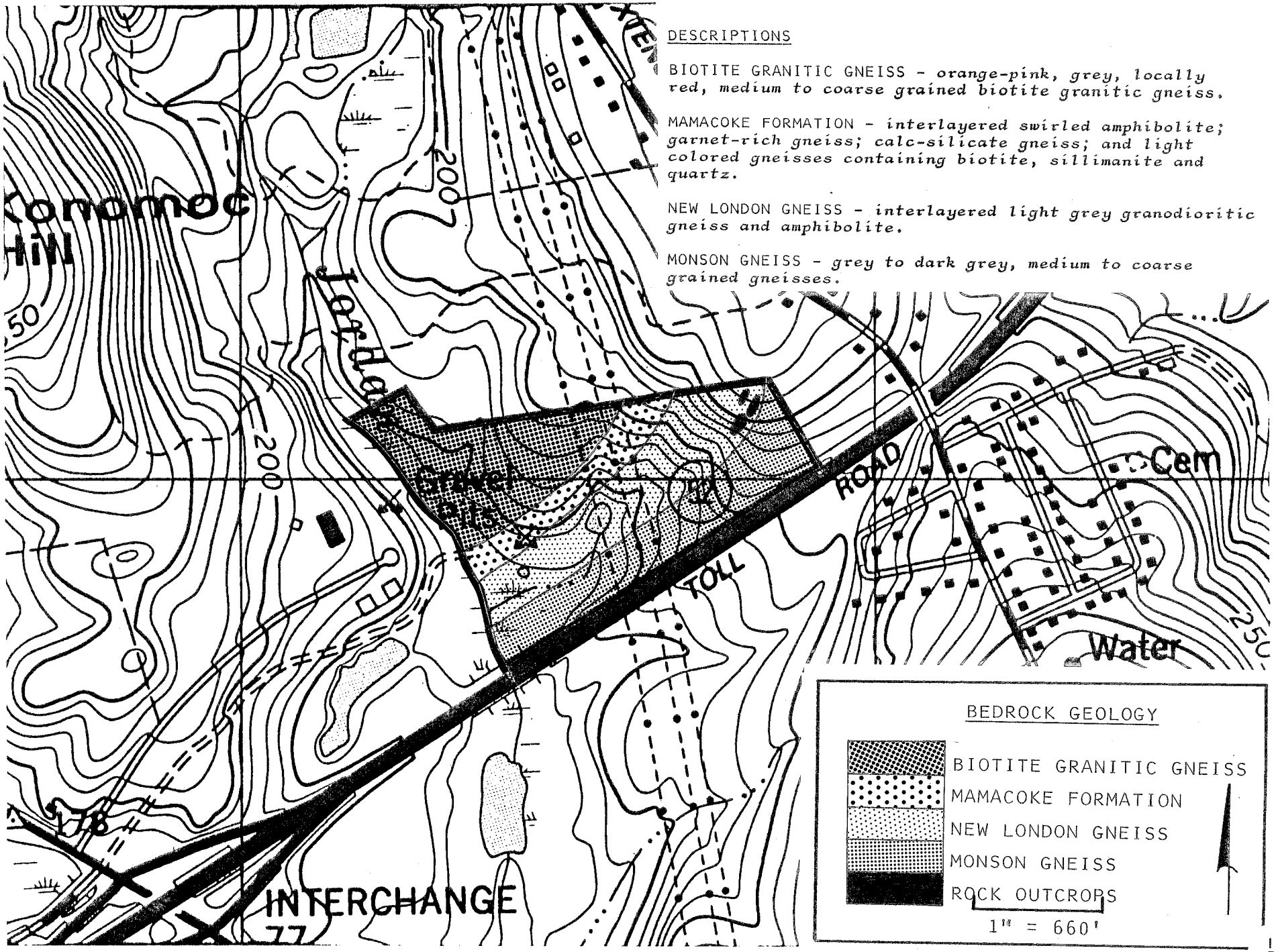
It should be pointed out that sand and gravel was mined from the property at some point between 1934 and 1965. In all likelihood, the material was used for road base material during the construction of I-395. I-395 was opened to traffic in January 1958, so it is possible that sand and gravel extraction on the site took place in the early to mid 1950's.

Based on a 1965 air photo, it appears most of the mining operation took place on upland areas of the site in the west central parts but the excavation had intercepted the ground-water table along the southern limits; hence, wetlands in this part of the site appears to be man-made. As a result of mining activity the land was extensively disturbed and retains features resulting from the operation. These include stock-piled areas, ponds and a large area of stripped top-soil and subsoil. The mining activity along with the construction of I-395 has disrupted the natural drainage of the parcel.

3. GEOLOGY

The parcel contains two types of glacial sediments; stratified drift and till. Stratified drift deposits cover or covered the areas in Jordan Brook Valley and beneath the wetlands in the south-west corner. These materials were deposited by meltwater streams flowing from a wasting mass of glacier ice in Jordan Brook Valley. The major components of stratified drift are sand and gravel. As mentioned earlier an indeterminable amount of sand and gravel


Kenmore
Hill
Jordan
EXTENSION
HUNTS
TURNPIKE
284
200
250
Gravel
Pits
ROAD
Cem
TOLL
Water
INTERCHANGE
77
SURFICIAL GEOLOGY
TILL
STRATIFIED DRIFT
1" = 660'



DESCRIPTIONS

BIOTITE GRANITIC GNEISS - *orange-pink, grey, locally red, medium to coarse grained biotite granitic gneiss.*

MAMACOKE FORMATION - *interlayered swirled amphibolite; garnet-rich gneiss; calc-silicate gneiss; and light colored gneisses containing biotite, sillimanite and quartz.*

NEW LONDON GNEISS - *interlayered light grey granodioritic gneiss and amphibolite.*

MONSON GNEISS - *grey to dark grey, medium to coarse grained gneisses.*

had been mined from this portion of the site probably 30 years ago.

The thicknesses of the remaining sand and gravel on the site is unknown. Test borings would be required in order to determine its thicknesses.

The remainder of the site is covered by relatively thin till. The underlying, bedrock controls the topography in this area. Till is a sediment that was deposited directly from glacier ice. The sediment consists of varying proportions of sand, silt, gravel, clay and boulders. Particles of different sizes are generally mixed together in a complex fashion.

Based on the soils map for New London County, the texture of the till on the site ranges from sandy, stony and loose in the central parts to a siltier, more compact variety along the northern parts of the site. The latter variety of till is commonly characterized by a seasonal perched groundwater table due to the low permeability of the compact layer. Also, they commonly have slow percolation rates. Percolation tests conducted on Lots 15-17 and 19 confirmed moderately slow to slow seepage rates.

The thickness of the till is not known, but it probably does not need much more than 10 feet in most places.

Bedrock beneath the stratified drift and occurring on the upland knobs is very old metamorphic rock known as granitic gneisses, gneisses and amphibolites. The granitic gneisses and gneisses are generally light-colored while the amphibolite are dark-colored. All of these rocks are foliated and fractured to some degree. (See **Bedrock Geologic Map** for detailed rock descriptions.)

4. SOILS

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

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

CcB - Canton & Charlton very stony fine sandy loams, 3-8 percent slope

These gently sloping, well drained soils are on glacial till, upland hills, plains and ridges. Stones and boulders cover 1-8 percent of the surface.

Typically, the Canton soil has a black, fine sandy loam surface layer 1 inch thick. The subsoil is dark yellowish-brown, fine sandy loam and sandy loam 23 inches thick. The substratum is grayish-brown gravelly sand to a depth of 60 inches or more.

Typically, the Charlton soil has a very dark grayish-brown, fine sandy loam surface layer 3 inches thick. The subsoil is dark yellowish-brown, yellowish-brown and light olive brown fine sandy loam 26 inches thick. The substratum is grayish-brown fine sandy loam to a depth of 60 inches or more.

Permeability in the Canton soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. The available water capacity is moderate. Runoff is medium. The soil warms up and dries out rapidly in the spring.

Permeability of Charlton soil is moderate to moderately rapid. The available water capacity is moderate. Runoff is medium. This soil warms up and dries out rapidly in the spring.

These soils are in capability subclass VIs.

CrC-Charlton-Hollis fine sandy loams, very rocky, 3 to 15 percent slopes

This gently sloping to sloping complex consists of somewhat excessively drained and well drained soils on glacial till uplands. Rock outcrops cover up to 10 percent of the surface. Stones and boulders cover 1 to 8 percent of the surface. The soils of this complex are so intermingled on the landscape that it was not practical to separate them in mapping at the scale used. Permeability of the Charlton soil is moderate or moderately rapid. The available water capacity is moderate. Runoff is medium or rapid. Charlton soil warms up and dries out rapidly in the spring. It is strongly acid or medium acid.

Permeability of the Hollis soil is moderate or moderately rapid above the bedrock. The available water capacity is low. Runoff is medium or rapid. Hollis soil warms up and dries out rapidly in the spring. It is strongly acid or medium acid.

These soils are not suited to cultivated crops. Stoniness and rock outcrops generally make the use of farming equipment impractical. The Hollis soil has a shallow rooting depth and is droughtly. The hazard of erosion is moderate to severe. These soils are in capability subclass VIs.

PbB-Paxton and Montauk fine sandy loams, 3 to 8 percent slopes.

These gently sloping, well drained soils are on drumloidal, glacial till, upland landforms. Mapped areas consist of Paxton soil or Montauk soil, or both. These soils were mapped together because there are no major differences in their use and management.

Typically, the Paxton soil has a very dark grayish-brown, fine sandy loam surface layer 8 inches thick. The subsoil is dark yellowish brown, yellowish brown, and light olive brown fine sandy loam 19 inches thick. The substratum is firm, very firm, and brittle, olive brown fine sandy loam to a depth of 60 inches or more.

Typically, the Montauk soil has a very dark grayish brown, fine sandy loam surface layer 7 inches thick. The subsoil is dark yellowish brown fine sandy loam and yellowish brown sandy loam 16 inches thick. The substratum is brown loamy sand and firm, very firm, and brittle, grayish brown loamy sand to a depth of 60 inches or more.

Permeability of the Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is medium. The Paxton soil warms up and dries out rapidly in the spring.

Permeability of the Montauk soil is moderate or moderately rapid in the surface layer and subsoil and slow or moderately slow in the substratum. The available water capacity is moderate. Runoff is medium. The Montauk soil warms up and dries out rapidly in the spring.

These soils are in capability subclass IIe.

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

These nearly level, poorly drained and very poorly drained soils are in drainageways and depressions of glacial till upland hills, ridges, plains, and drumloidal landforms. Stones and boulders cover 8 to 25 percent of the surface. These soils were mapped together because there are no major differences in use and management. The Ridgebury soil has a seasonal high water table at a depth of about 6 inches. Permeability is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is very slow or slow. Ridgebury soil warms up and dries out slowly in the spring. It is strongly acid through slightly acid.

The Leicester soil has a seasonal high water table at a depth of about 6 inches. Permeability is moderate or moderately rapid. The available water capacity is moderate. Runoff is very slow or slow. Leicester

soil warms up and dries out slowly in the spring. It is very strongly acid through medium acid.

The Whitman soil has a high water table at or near the surface for most of the year. Permeability is moderate or moderately rapid in the surfacelayer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is very slow, or the soil is ponded. Whitman soil warms up and dries out very slowly. It is very strongly acid through slightly acid.

These soils are not suited to cultivated crops. Stoniness makes the use of farming equipment impractical. These soils are in capability subclass VIIs.

Ro - Rippowam fine sandy loam

This nearly level, poorly drained soil is on flood plains of major streams rivers, and their tributaries.

Typically, this rippowam soil has a black, fine sandy loam surface layer 8 inches thick. The subsoil is dark grayish brown and dark gray mottled fine sandy loam 27 inches thick. The substratum is dark grayish brown gravelly coarse sand to a depth of 60 inches or more.

The rippowam soil has a seasonal high water table at a depth of about 6 inches. It is subject to frequent flooding. Permeability is moderate or moderately rapid in the surface layer and subsoil, and rapid or very rapid in the substratums. The available water capacity is moderate. Runoff is slow. Rippowam soil warms up and dries out slowly in the spring. This soil is poorly suited to community development because of flooding and the seasonal high water table. Areas used for onsite septic systems require extensive filling, special design and installation. This soil is in capability subclass IIIW.

Ub - Udorthents-Pits complex, gravelly

This complex consists of excessively drained to moderately well drained soils that have been disturbed by cutting or filling, and areas of gravel pits. Slopes range from 0 to 15 percent. Permeability of the Udorthents is moderately rapid to very rapid. The available water capacity and runoff are variable. This complex requires onsite investigation and evaluation for most uses. This complex is not assigned to a capability subclass.

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

This nearly level to gently sloping, moderately well drained soil is on drumloidal, glacial till, upland landforms. Stones and boulders cover 1 to 8 percent of the surface. Typically, this Woodbridge soil has a very dark brown, fine sandy loam surface layer 6 inches thick. The subsoil is

yellowish brown, light olive brown, and grayish brown, mottled fine sandy loam and sandy loam 22 inches thick. The substratum is very firm, brittle, olive sandy loam to a depth of 60 inches or more. The Woodbridge soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The available water capacity is moderate. Runoff is medium. This Woodbridge soil warms up and dries out slowly in the spring. It is strongly acid or medium acid in the surface layer and subsoil and strongly acid through slightly acid in the substratum. This soil is in capability subclass VIs.

PRINCIPAL SOIL LIMITATIONS CHART FOR BUILDING SITE DEVELOPMENT

Soil name and map symbol	Dwellings without basements	Dwellings with basements	Local roads and streets	Lawns and landscaping	Septic tank absorption fields
#AfB - Agawam	Slight	Slight	Slight	Slight	Severe: poor filter
CcB - Canton	Slight	Slight	Slight	Moderate: large stones	Slight
Charlton	Slight	Slight	Slight	Moderate: large stones	Slight
CrC - Charlton	Moderate: slope	Moderate: slope	Moderate: slope	Moderate: slope, large stones	Moderate: slope
Hollis	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: thin layer	Severe: depth to rock
#PbB - Paxton	Moderate: wetness	Moderate:wetness	Moderate: frost action, wetness	Slight	Severe: percs slowly
Montauk	Moderate: wetness	Moderate:wetness	Moderate: wetness, frost action	Slight	Severe: percs slowly, slope
*Rn - Ridgebury	Severe: wetness	Severe: wetness	Severe: wetness, frost action	Severe:wetness	Severe: percs slowly,wetness
Leicester	Severe: wetness	Severe: wetness	Severe: wetness, frost action	Severe:wetness	Severe: wetness
Whitman	Severe: ponding	Severe: ponding	Severe: frost action, ponding	Severe:ponding	Severe: percs slowly,ponding
*Ro - Rippowam	Severe: flooding, wetness	Severe:flooding, wetness	Severe: flooding, wetness, frost action	Severe:wetness, flooding	Severe: flooding, wetness, poor filter
+Ub - Udorthents Pits					
WyB - Woodbridge	Moderate: wetness	Severe: wetness	Severe:frost action	Moderate: large stones, wetness	Severe:percs slowly, wetness

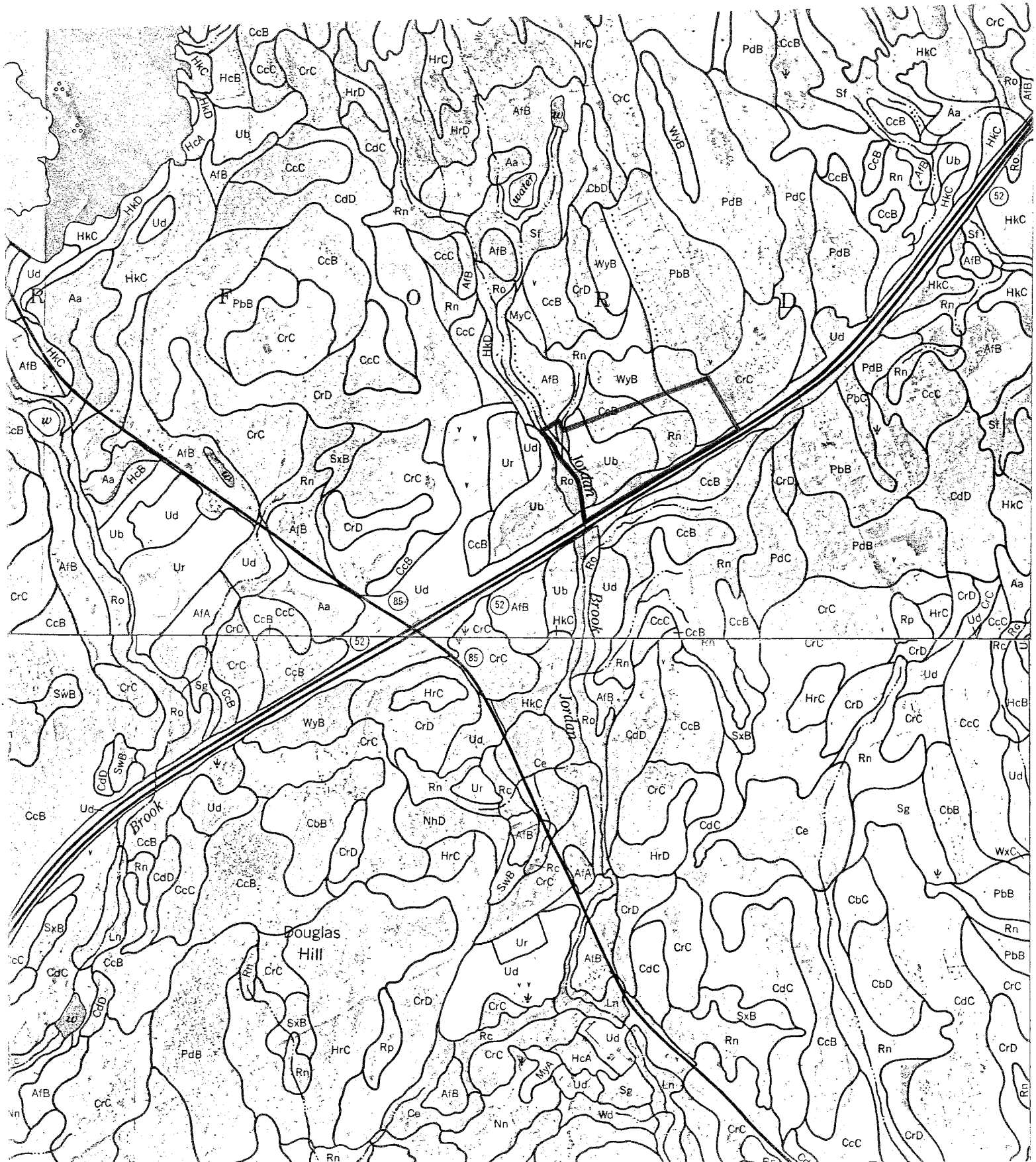
#Designated map units that qualify as Prime Farmland
*Designated Wetland Soils regulated under P.A. 155
+See description of the map unit for composition and behavior characteristics of this map unit. This soil should be evaluated on-site.

United States Department of Agriculture

Soil Conservation Service

NEW LONDON COUNTY USDA-SCS
562 NEW LONDON TURNPIKE
NORWICH, CT 06360
887-4163

SCALE 1" = 1320'



5. EROSION AND SEDIMENT CONTROL

An Erosion and Sediment Control Plan was submitted with the project. It is recommended that the following information be included with the plan:

--Detailed erosion and sediment control information for the proposed crossing of Jordan Brook to minimize any detrimental effect on the environment during construction of the crossing.

--At the site walk, the project engineer stated that a system of detention basins is planned for the site. However, details for this project were not provided. The design criteria, installation procedures and location for the detention basins should be included with the proposal.

--All wetland soils should be delineated in the field by a Soil Scientist and located by survey on to the site map.

6. GEOLOGIC DEVELOPMENT CONCERNS

The major hydrogeologic limitations of the site include the following: (1) the presence of till-based soils which have moderately slow to slow percolation rates and seasonally high water tables; (2) shallow to bedrock areas, which are mainly in the eastern part; (3) the presence of moderately steep slopes, which predominate in the eastern part; and (4) the presence of regulated wetlands areas. In addition, the former sand and gravel pit area will require significant re-grading in order to make it developable and aesthetically pleasing. A detailed grading plan for this phase of the project should be made available for town review and comments.

The above hydrogeologic limitations will weigh heaviest on the ability to provide adequate subsurface sewage disposal systems. Based on subsurface data submitted to Team members, it appears that while it may be possible to develop the land for industrial sites, the developments will need to be generally small in size. Construction of large subsurface sewage disposal system for flows in excess of 2,000 gallons per day or more will require large land areas and extensive soil testing in order to determine feasibility. It does not appear that proposed lots are large enough nor subsurface conditions favorable enough for large scale subsurface sewage disposal systems.

Sewage disposal system for each lot will need to be carefully planned and engineered. Sufficient leaching area needs to be identified and preserved on each individual site. (See **Sewage Disposal Section** for further information)

Interior roads and buildings constructed in shallow to bedrock areas may require some blasting. Any blasting, which takes place on the site should be done only under the supervision of personnel familiar with the latest technology in blasting. This will hopefully reduce the chance for damage from undue seismic shock. A pre-blast survey of the area would also be wise so as to reduce the chance for damage claims.

7. SEWAGE DISPOSAL

Like the first phase of the industrial park, this part of the park would also be served by on-site subsurface sewage disposal facilities. In terms of possible long range plans for the extension of sewers to the area, it was indicated that the south (west) side of Jordan Brook would be sewered, while land to the north (east) side of the brook would not.

Jordan Brook, particularly in this general area, would be expected to have good water quality along with significant wetland areas. Therefore, the development, design and installation of on-site sewage disposal systems needs to be carefully done in order to avoid any possible serious degradation to water quality.

Factors to consider are the relatively steep sloping terrain at the east and north easterly sides with indications of having a seasonal perched high water condition. Also, surface stones and boulders are present with possible areas of shallow ledge rock. In the upper and more central portion several of the deep test holes encountered ledge rock. The one located on lot 14 was particularly shallow at only 26 inches. The higher portions of lots 15 and 16 appear to be too steeply sloped for practical industrial development. Extensive cutting and regrading along with considerable draining would probably be necessary. The three lower lots on the south side have about 1/2 of each lot taken up by wetlands and at least a portion of one (lot 19) being previously filled with mixed materials, some being of an unsuitable variety. Lot 12 and 13 on the upper side have indications of better soils, but lot 12 also has relatively high groundwater.

All soils tested at given (shallow) depths were permeable. However, it is apparent that other factors cited are of more concern in regard to suitability for subsurface sewage disposal.

Overall it appears that additonal testing and/or monitoring to provide further data on maximum groundwater levels, underlying fill and/or ledge rock is needed before possible subdivision approval as presented (total number of lots). Also before possible approval of any individual sewage disposal system, detailed engineered plans should be required for review purposes.

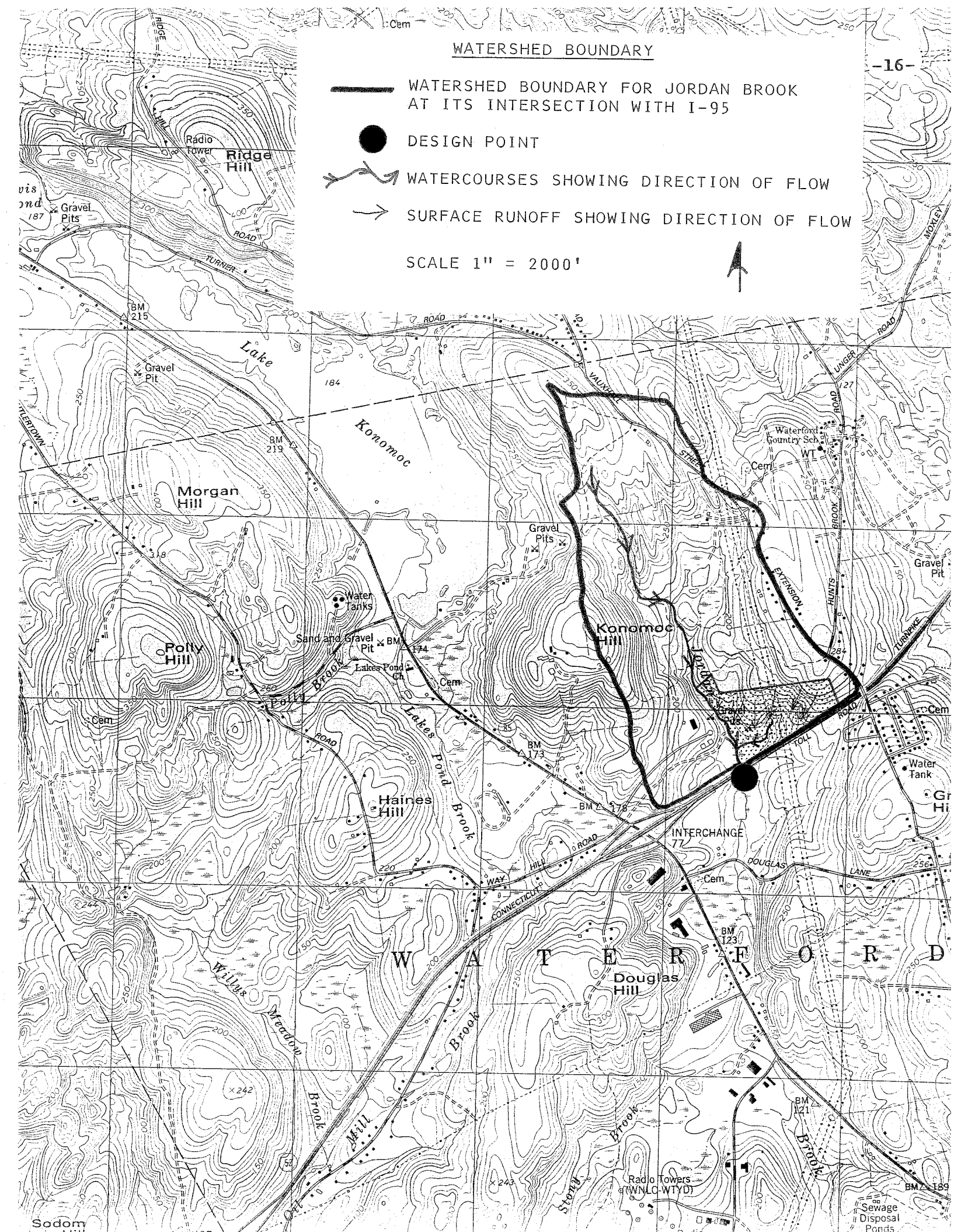
It would seem prudent that industrial development of this section should be limited to commercial or manufacturing operations which do not generate significant volumes of sewage/waste water.

8. HYDROLOGY

The site is located in the headwater regions of Jordan Brook. At its intersection with I-395, Jordan Brook drains an area of about 500 acres. This represents about 8 percent of its total drainage area (about 6,400 acres). Jordan Brook ultimately empties into Long Island Sound.

Development of the site for industrial purposes would be expected to lead to increases in the amount of runoff shed from the site. These increases would result from soil compaction, removal of vegetation, and placement of impervious surfaces such as rooftops, parking lots, roads, etc., over permeable soil. Industrial uses tend to require more impervious surface area because of parking lots and bigger buildings; hence, runoff rates will be greater for this type of land use than for other types such as low to medium density residential use.

Present plans indicate that road drainage from Industrial Drive will be artificially collected by catch basins and routed to Jordan Brook. Because plans are preliminary, it is not known how storm drainage will be handled from individual lots or what the hydrologic impacts will be once they are developed. Obviously, the latter will depend upon the ultimate densities and the amount of impervious surfaces created. In order to address these hydrological concerns, it is recommended that the applicant be required to prepare a detailed stormwater management plan that includes pre-and post-development computations. Efforts should be made to protect Jordan Brook as well as wetlands and surface water bodies from sand and other road or parking lot debris. Discharge points for drainage pipes should have energy dissapators. A check of all downstream culverts, especially the one which is under I-395 is warranted.


WATERSHED BOUNDARY
WATERSHED BOUNDARY FOR JORDAN BROOK AT ITS INTERSECTION WITH I-95
DESIGN POINT
WATERCOURSES SHOWING DIRECTION OF FLOW
SURFACE RUNOFF SHOWING DIRECTION OF FLOW
SCALE 1" = 2000'
Ridge Hill
Morgan Hill
Konomoc
Konomoc Hill
Polly Hill
Haines Hill
Douglas Hill
Lake
Polly Brook
Lakes Pond Brook
Jordan Brook
Willys Meadow Brook
Mill Brook
Stony Brook
Otter Brook
WATERFORD
INTERCHANGE 77
Gravel Pits
Gravel Pit
Sand and Gravel Pit
Water Tanks
Water Tank
Radio Tower
Radio Towers (WNLC-WTYD)
Sewage Disposal Ponds
Waterford Country Sch
Lakes Pond Ch
Cem
BM 215
BM 219
BM 174
BM 173
BM 178
BM 123
BM 121
BM 189
TURNER ROAD
VAUXHALL STREET
UNGER ROAD
HUNTS BROOK ROAD
EXTENSION
TURNPIKE
TOLL ROAD
DOUGLAS LANE
HILL ROAD
WAY
CONNECTICUT
TILERTOWN
MOXLEY ROAD

In order to effectively reduce peak runoff rates and control flooding from the project site, the applicant's technical representatives discussed on the review day, the possibility of utilizing the two man-made ponds in the central part as a detention basin.

Depending upon the actual building location on each lot, the ponds appear to be in a position to handle runoff from about five lots. Besides reducing peaks runoff rates and controlling flooding, the ponds could be designed to alleviate accelerated downstream channel erosion and a sediment retention function. The latter will help to maintain water quality to the wetlands in the southwest corner and ultimately Jordan Brook. It will also help to protect downstream waterbodies. If the ponds are designed to handle sediment, provisions for maintenance will be imperative. If designed and maintained properly these ponds can be used for aesthetic and passive recreational purposes, i.e., picnicking.

According to DEP water quality maps, groundwater on the site is classified as GA, which means that it is suitable for private drinking water supplies without treatment. In order to maintain the existing water quality standards, prospective users of the industrial park will need to be carefully screened as to the types of wastes that they generate. The discharge of industrial waste water, cooling waters, residuals or sludge to ground or surface waters would not be consistent with a GA area. DEP's Water Compliance Unit should be contacted in regards to groundwater or surface water discharge from potential users of the park, especially since on-site septic systems need to be relied upon.

According to DEP the present water quality for Jordan Brook is B/A. It has been degraded from a A classification to a B, because of a former mixed bulky waste landfill in the upper part of the Jordan Brook watershed. DEP's ultimate goal is to upgrade the brook back to an A Classification. An 'A' classification means that its designated uses include potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other legitimate uses. A 'B' classification would be the same except that the water does not meet the standards for a potential drinking water supply.

According to a map entitled "Groundwater Availability in Connecticut" by D.B. Meade (1978), the sand and gravel deposits along Jordan Brook may have potential for yielding large volumes of water to individual wells. However, hydrogeologic data for the deposits (texture, saturated zones, thicknesses, etc.) is incomplete and would require further verification.

9. WATER SUPPLY

Public water supply would be available from the proposed extension of the existing supply on Industrial Drive which presently services the developed portion of the Industrial Park. Plans for Section II indicate the installation of a new 12 inch water main. Based on this concept, water supply should pose no particular problems.

10. FISH RESOURCES

Site Description

The proposed Nutmeg Industrial Park Section II development borders approximately 1,650 feet of a low gradient stretch of Jordan Brook, the primary surface hydrological feature of fisheries concern in the area. Jordan Brook flows southerly approximately 4.6 river miles before emptying into Jordan Cove of the Long Island Sound.

The physical character of Jordan Brook varies considerably within the parcel proposed for development. The upper stretch from the breached dam down to the unimproved road crossing contains alternating pool and riffle habitat. Pools are utilized as resting and hiding locations by resident fishes whereas the lower and upper stretches of riffles are used for feeding purposes. Stream width ranges from 4 to 10 feet. Bottom substrate is comprised of cobble-type rocks (2-12" diameter) intermixed on fine sands and gravels. The stream riparian zone along the Jordan Brook corridor is well vegetated providing beneficial overhead shading. Shading benefits aquatic resources by cooling stream waters.

The lower portion of Jordan Brook from the unimproved road crossing to the Interstate-395 highway flows through large, open wetland habitat. The main channel ranges from 4 to 6 feet in width. Stream substrate is a mixture of a fine sand/wetland soil bottom. Instream fish habitat is mainly in the form of pools. Very little overhead vegetation is present.

One small intermittent watercourse (flowing southwesterly) exists on the southern portion of this property. It drains into the large wetland area before entering Jordan Brook. The intermittent watercourse (flowing at the time of the field review) contains a sand, gravel bottom; average width is approximately 3 feet.

A total of 8 lots are proposed on this 36.3 acre parcel; two lots (numbers 12 and 19) will directly abut Jordan Brook. In order to develop this property, an existing road (Industrial Drive) will be extended from the current cul-de-sac across Jordan Brook.

Fish Population

To assist with the evaluation of this environmental review, a stream survey was conducted on December 10, 1987 in the upper stretch of Jordan Brook, within the area proposed for development. A stretch of Jordan Brook approximately 150 feet in length was sampled with a stream backpack electroshocker, a standard fisheries collection gear type. This study was conducted to determine fish species composition and abundance near the proposed Nutmeg Industrial Section II development. Results of this study indicated that native (naturally reproduced, not stocked) brook trout were the most abundant fish, and American eels and blacknose dace were common. The intermittent watercourse that drains into the large wetland area before entering Jordan Brook was not sampled. This watercourse would not be expected to support a permanent (year-round) fish population.

A more comprehensive fisheries and water quality survey had been conducted on Jordan Brook during August 1987. This field investigation was prompted to obtain baseline information on fish species composition and abundance in light of the increasing amount of urban development occurring within the Jordan Brook watershed.

A wide variety of fish species were collected at three sampling sites (Table 1). Sampling results showed that fish species diversity and abundance varied throughout the stream. This finding is most likely related to the quality of instream fish habitat. For example, cooler water temperatures (less than 75 degrees Fahrenheit) and sufficient overhead vegetation enhance survival of coldwater species such as trout. Conversely, warm water temperatures (greater than 75 degrees Fahrenheit) and decreased amounts of overhead shading promote propagation of warmwater fish such as largemouth bass and sunfish.

Jordan Brook is annually stocked by the Bureau of Fisheries with approximately 500 yearling (6-8") brook trout in the Town of Waterford. Additionally, brown trout fry were stocked in Jordan Brook in the spring of 1987.

Jordan Brook is currently classified by the Department of Environmental Protection (DEP) as "Class B/A" surface water. Designated uses for this classification are: fish and wildlife habitat, recreational use, agricultural and industry supply, and other legitimate uses. Future goals are to upgrade the water quality classification of Jordan Brook to "Class A", where it could be utilized for a potential drinking water source.

The 3.5 acre private pond directly below the proposed development (south of I-395) has been stocked by its owners with fingerling and adult brook, rainbow, and brown trout.

Table 1 indicates water quality and relative abundance of fish species inhabiting three areas of Jordan Brook. Data was gathered during August 1987.

Table 1

Relative Abundance
(S=scarce, C=common, A=abundant)

Species	site #1 Route 85	site #2 Route I-95	site #3 Fog Plain Road
Brook trout	C	A	-
Brown trout	C	A	-
Fallfish	-	C	-
Common shiners	C	-	C
Golden shiners	C	-	C
Blacknosed dace	C	-	-
Tesselated darter	C	S	-
Creekchub suckers	C	-	-
American eel	S	S	-
Largemouth bass	-	-	C
Redfin pickerel	C	-	-
Pumpkinseed sunfish	C	-	C
Water Chemistry			
Temperature (F)	68.0	63.5	77.0
pH	-	6.9	6.8
Dissolved Oxygen	-	11.0	9.5

Impacts

The following impacts on Jordan Brook and its watershed can be expected if proper mitigative measures are not implemented:

(1) Road construction over Jordan Brook - this impact poses one of the greatest threats to stream ecology. The proposed road over Jordan Brook will be approximately 34 feet wide and 100 feet long; a steel culvert will be placed in the main stream channel. This design will accommodate a 100 year flood event. Approximately 8,000 cubic yards of fill will be needed to re-grade the area near Jordan Brook to complete the road crossing. Instream culvert placement in concert with placement of fill alongside the stream will inevitable result in stream sedimentation problems. Stream sedimentation due to construction activities has long been regarded as a major cause of aquatic habitat degradation. If realized, excessive silt deposition can result in the reduction of the following important variables:

* Stream pool depth - pools provide cover, shelter, and resting areas for fish. They are critical to fish survival.

* Fish egg survival - sufficient water flow, free of sediment particles is a basic requirement of egg respiration (biological process of extracting oxygen from water) and successful hatching.

* Aquatic insect production - sediment free water is also a basic need for successful aquatic insect egg respiration and hatching. Aquatic insects are the primary foods consumed by stream fishes. Decreased amount of insects will adversely effect fish growth and survival since excessive energy demands are required to locate preferred aquatic insects when population levels are low.

* Streamwater oxygen levels - organic matter associated with soil particles is decomposed by micro organisms. Decomposition will contribute to the depletion of oxygen in waters overlying deposited sediments.

* Encourage the growth of rooted aquatic plants and filamentous algae in streams - eroded soils contain plant nutrients such as nitrates and phosphates. Although algae and aquatic plans require these nutrients for growth, most aquatic ecosystems contain very limited amounts. Consequently, these nutrients act as fertilizers once they are introduced into aquatic habitats resulting in accelerated plant growth and water quality degradation.

Further, Jordan Brook in this area has no capacity to move find streambed materials due to its low gradient on this property. Consequently, any damage effected by silt deposition could be irreversible.

(2) Erosion and sedimentation of Jordan Brook through increased runoff from unvegetated zones - during construction of the Nutmeg Industrial Park Section II, topsoil within 8 building lots will be exposed and susceptible to runoff. The detrimental effects of stream sedimentation were previously discussed.

(3) Percolation of septic effluent into Jordan Brook - a failure of individual septic sytems to operate properly would be potentially dangerous to stream environments. Nutrients and assorted chemicals that may be placed in septic systems could enter streamwaters in the event of a failure or possibly infiltrate groundwater, especially when water tables are seasonally close to the surface. The introduction of septic effluent could result in a major threat to fish, public health, and overall water quality conditions. Effluent will also stimulate the growth of nuisance aquatic vegetation and algae.

(4) Loss of overhead vegetation along the Jordan Brook riparian zone - the loss of overhead shading in the immediate area of the road crossing will result in a net loss of important stream habitat. Also, increased evaporation of exposed stream waters will occur. Trees help cool stream water temperatures in the summer and provide important cover for resident fishes. Resident fish will be forced to disperse and locate to more suitable areas in other sections of Jordan Brook.

(5) Aquatic habitat degradation due to influx of stormwater drainage - the developer intends to route all stormwater on this property to detention basins in wetland areas before eventual direct release into Jordan Brook. Stormwater can contain enriched nutrients and other materials that can pollute Jordan Brook and result in water quality and habitat degradation.

(6) Introduction of roadway runoff to Jordan Brook - surface drainage from roads may allow salt, sand, sediment, gasoline, oil, and possibly toxic chemicals that may have been spilled to enter Jordan Brook. The introduction of these pollutants to stream environments will lead to water quality degradation and fish kills.

(7) Transport of lawn fertilizers and chemicals to Jordan Brook - runoff and leaching of nutrients from fertilizers placed on manicured lawns of industrial lots will stimulate nuisance aquatic weed growth. Introduction of lawn chemicals may result in "fish kills" and water quality degradation.

(8) Degradation of wetland habitat - Jordan Brook flows through a large open wetland area before it passes under the I-395 highway. This wetland is beneficial in many ways. It serves to: (1) control flood waters by acting as a water storage basin, (2) traps sediments from natural and man-made sources of erosion, and (3) helps filter out pollutants from runoff before they enter Jordan Brook. The existing Industrial Development west of Jordan Brook along with the proposed development east of this watercourse may overload this valuable wetland and hinder its ability to effectively function.

(9) Impacts to downstream environments - any water quality problems and habitat degradation that directly occurs within Jordan Brook will eventually be observed in downstream areas. This scenario will be immediately observed in the private pond south of I-395. Increased eutrophication (aging) or nutrient enrichment will occur over time. Increased pond aging will result in the creation of dense algae blooms, nuisance amounts of aquatic weeds, sediment accumulation, declining dissolved oxygen levels, and increased production of harmful micro-organisms that cause fish disease. Fish kills are also likely to occur. Ultimately, the impacts of this development and others like it within the Jordan Brook watershed will be seen in the fragile marine environment of Jordan Cove and further add to the pollution of the Long Island Sound. Cooperative State and Federal efforts are now underway to identify all sources of pollution to the Long Island Sound and to immediately implement the necessary prevention measures which minimize pollution in marine environments.

Recommendations

The wide ranging impacts that can be observed within Jordan Brook and its watershed may be minimized to some extent by implementing the following precautionary measures:

(1) Investigate the feasibility of constructing a bridge - the impacts due to bridge construction will require less instream construction work, e.g. culverts will not be necessary and less fill will be required decreasing the possibility of stream sedimentation pollution.

(2) If a road crossing is approved, all instream work and land grading/filling should take place during the summer - this will help minimize the impact to the aquatic resources of Jordan Brook. Reduced streamflows and rainfall during the summer provide the least hazardous conditions in which to work near sensitive aquatic environments.

(3) Install and maintain proper erosion and sedimentation controls during both road crossing and site construction activities - this includes such mitigative measures as silt fences, hay bales, and catch basins. The Town of Waterford official responsible for checking this development should make daily visits to ensure that the developer has compiled with all stipulated mitigative devices.

(4) The developer should help offset any losses of important riparian vegetation resulting in a net loss of valuable habitat - this can be accomplished by placing stream enhancement structures in Jordan Brook such as wing deflectors to create pools and riffles. Revegetate areas along Jordan Brook which have been cleared during the development process. Technical assistance concerning stream enhance structures can be obtained from the Team's fisheries biologist; phone at 298-9523.

(5) Maintain at the **minimum** a 100 foot open space buffer zone along the Jordan Brook edge, lots 12 and 19 - no construction and alteration of riparian habitat shall take place in this zone.

(6) Properly design and locate individual septic systems (refer to **Sewage Disposal Section**) - the addition of septic effluent to Jordan Brook can be one of the greatest threats to stream ecology. Septic systems should be maintained on a regular basis.

(7) Limit liming, fertilization, and the introduction of chemicals to industrial building lots - this will help abate the amount of additional nutrients to Jordan Brook. Prevent the disposal of harmful chemicals into septic systems which may negatively effect operation and possibly result in system failure.

(8) Do not outlet stormwater runoff directly onto wetlands and Jordan Brook - direct all runoff away from sensitive aquatic habitats.

Summary

As proposed, the Nutmeg Industrial Subdivision development has a great potential to adversely impact the aquatic resources of Jordan Brook. The Town of Waterford must not only assess impacts within the immediate area of the development but realize that areas downstream will also be negatively affected. The developer may be held liable for any environmental damage that occurs in downstream areas such as the private pond that is immediately below this proposed development. The Jordan Brook

watershed has already undergone a tremendous amount of development, not unlike many other coastal communities in Connecticut. With continued growth foreseen in the future, a concerted effort must be expended by the Town to weigh the benefits of each development against the cost of negative impacts to aquatic resources. As development continues, recommendations for reducing impacts will be less effective and more costly. Permanent environmental damage may occur once a watershed has become saturated with urbanized development. Waterford citizens must utilize their best judgement to preserve natural resources today, so that they can be enjoyed by everyone in the future.

11. PLANNING COMMENTS

The proposed subdivision is an extension of an existing industrial park. The area is depicted as Mixed Suburban Uses on the Regional Development Plan which includes industrial uses. The area is recommended for industrial uses in the Waterford Plan of Development. Surrounding land uses are industrial, undeveloped land, and I-395. On a land use basis, industrial uses will be compatible with existing uses.

The properties located east of the proposed park along Vauxhall Street Extension are used for residential purposes. No permanent access from the proposed industrial park to Vauxhall Street Extension should be allowed to avoid the use of this street by industrial traffic. However, provisions should be made for access by emergency vehicles of the police, fire and ambulance services.

If public sewers are extended north of I-395 to serve the southern portion of the existing industrial park, a serious effort should be made to extend them to the entire industrial area. This is because the downstream portion of Jordan Brook has potential as a groundwater supply area and the aquifer recharge areas can be better protected with the use of public sewers rather than with the use of on-site sewerage systems.

About The Team

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

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

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

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

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