SPECIAL LAND USE STUDY

North Stonington, Connecticut

a community services program technical report

SPECIAL LAND USE STUDY

NORTH STONINGTON, CONNECTICUT

PROJECT NO. CPA-CT-01-26-1020

The preparation of this report was financially aided by a Federal grant from the Department of Housing and Urban Development, under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended, under the administration of the Connecticut Department of Community Affairs.

Prepared for the North Stonington Planning and Zoning Commission and the Development and Industrial Commission
by the Community Services Program Staff of the
Southeastern Connecticut Regional Planning Agency
139 Boswell Avenue, Norwich, Connecticut
in cooperation with the Environmental Review Team of the
Eastern Connecticut Resource Conservation and Development Project.

April, 1973

ABSTRACT OF REPORT

1.	Title:	*Special Land Use Study, North Stonington, Connecticut.*
2.	Author:	Community Services Program Staff of the Southeastern Connecticut Regional Planning Agency, 139 Boswell Avenue, Norwich, Connecticut 06360.
3.	Subject:	Evaluation of and recommendations for a tract of land having an especially high potential for development.
4.	Date:	March, 1973.
5.	Name of Agency:	Southeastern Connecticut Regional Planning Agency.
6.	Source of Copies:	Southeastern Connecticut Regional Planning Agency, 139 Boswell Avenue, Norwich, Connecticut 06360.
7.	HUD Project No.:	CPA-CT-01-26-1020.
8.	No. of Pages:	Forty-two.
9.	Abstract:	The report presents the findings of a study of a tract of land in North Stonington, Connecticut, adjacent to an interchange on Interstate Route 95. Included is an evaluation of the tract by a team of environmental specialists and recommendations for the use of the site consistent with environmental quality considerations. The report was prepared for the North Stonington Planning and Zoning Commission and the Development and Industrial Commission for their use in determining future land use controls for the area.

NORTH STONINGTON PLANNING AND ZONING COMMISSION

Richard Parant, Chairman
J. Franklin Brown
Royce E. Gray
Charles E. Robinson
John C. Sylvia

Richard E. Blodgett, Jr., Alternate
Roland F. Chireau, Alternate
Alfred J. Joachim, Jr., Alternate

NORTH STONINGTON DEVELOPMENT AND INDUSTRIAL COMMISSION

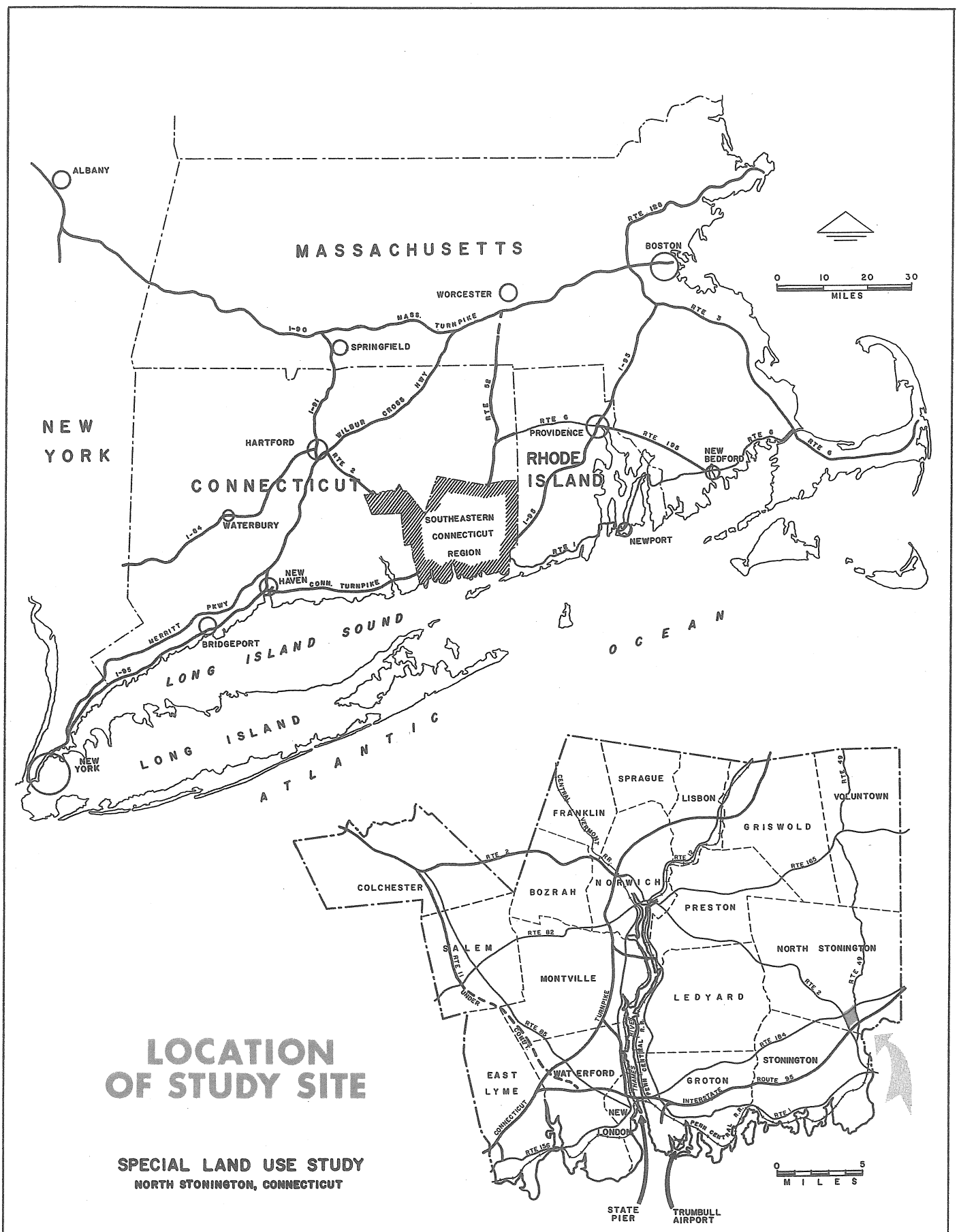
Maurice A. Browning, Chairman
Milton P. Banker
John N. Basile
Richard E. Blodgett, Jr.
Harlan J. Coit
C. Ernest Gray
Amos G. Hewitt
John P. Macina
Stephen G. Misovich
Arthur V. Pintauro

SCRPA STAFF CONTRIBUTING TO THIS REPORT

Gerhard J. Amt, Assistant Director
Thomas A.J. McGowan, Community Planner
Janet Smith, Illustrator
Claire Keroack, Secretary

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS



LOCATION OF STUDY SITE

SPECIAL LAND USE STUDY

NORTH STONINGTON, CONNECTICUT

SCRPA 1973

THE PREPARATION OF THIS DOCUMENT WAS FINANCIALLY AIDED THROUGH FEDERAL GRANTS FROM THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, UNDER THE URBAN PLANNING ASSISTANCE PROGRAM AUTHORIZED BY SECTION 701 OF THE HOUSING ACT OF 1954, AS AMENDED, UNDER THE ADMINISTRATION OF THE CONNECTICUT DEPARTMENT OF COMMUNITY AFFAIRS.

FIGURE 1

INTRODUCTION AND ACKNOWLEDGEMENTS

This study focuses special planning considerations on a relatively small area of North Stonington bounded by Interstate Route 95, and State Routes 2, 49 and 184. The special attention is based on the fact that this area of the Town combines outstanding economic development potential with fragile environmental conditions. The maximum potential of this area can be realized and the natural resources safely utilized only by gaining complete knowledge of the physical conditions of the site and by following a site development plan that reflects these conditions.

The North Stonington Planning and Zoning Commission and the Development and Industrial Commission have long realized that this site has exceptional development potentials for a variety of economic, residential and recreation activities. In order to assure that the area develops in a manner which takes into account its physical limitations, these Commissions requested that a special planning study of the area be conducted by the Community Services Program staff of the Southeastern Connecticut Regional Planning Agency. A special study committee, consisting of representatives from the two local commissions, was formed to work with the SCRPA staff on the project. This committee included the following: Milton Banker, Richard Blodgett, Franklin Brown, Maurice Browning, Amos Hewitt, Steven Misovich, Richard Parant and Charles Robinson. William Morgan, North Stonington Assessor, provided considerable information on properties and ownerships within the study area.

Because of the special environmental aspects of the study area, SCRPA sought assistance beyond its own staff in evaluating the physical characteristics of the area. This assistance request was made to the New London County Soil and Water Conservation District and was provided by the Environmental Review Team of the Eastern Connecticut Resource Conservation and Development Project. The team consisted of the following specialists:

Donald Capellaro, Principal Sanitarian, Connecticut Health Department
Sherman Chase, Conservationist, Soil Conservation Service, U.S. Department of Agriculture
Rudy Faveretti, Landscape Architect, University of Connecticut
Richard Hyde, Geologist, Connecticut Department of Environmental Protection
Daniel Meade, Geologist, Connecticut Department of Environmental Protection
Dr. David Miller, Ecologist, University of Connecticut
Edwin Minnick, Engineering Specialist, Soil Conservation Service, U.S. Department of Agriculture
Joseph Piza, Fish Biologist, Connecticut Department of Environmental Protection
Sidney Quarrier, Geologist, Connecticut Geological and Natural History Survey
Clifford Tiffney, Forester, Connecticut Department of Environmental Protection
Richard Watt, Hydraulic Engineer, Soil Conservation Service, U.S. Department of Agriculture

Information on water supply systems was provided by Douglas Crandall, Manager, and John Lenard, consulting engineer, of the Southeastern Connecticut Water Authority. James Spellman, Stonington First Selectman, and Genovese Associates, Stonington's sanitary engineering consultants, provided information regarding sewerage plans in the vicinity of the study site. Additional information and supporting services were provided by Dr. Hugo Thomas, Director of the Natural Resources Data Center of the State Department of Environmental Protection and by William Lucas, Coordinator of the Eastern Connecticut Resource Conservation and Development Project.

The project coordinator for this study and primary author of this report was Thomas A.J. McGowan, Community Planner on the SCRPA staff.

SURVEY AND EVALUATION

EXISTING LAND USE

INTRODUCTION

The land use factor of the site evaluation is discussed in two sections, one dealing with the area around the site and the other within the site itself.

A land use evaluation is commonly the first step in any land planning study, and its purpose is twofold. First, it should document the existing development - residential, commercial, industrial or open space. Second, it should evaluate the trends, problems and opportunities that the existing use of land presents for site planning.

AREA

The area immediately surrounding the site is dominated by open space, both farmland and woodland. Developed land is primarily residential, with a scattering of commercial activities strung along the major highways, especially along Route 2, south of I-95. There is one large subdivision, Kingswood Estates, within the immediate area. It is about 1 1/2 miles west of the site, off Route 184. Within a five-mile radius of the site there is one significant population center, the Pawcatuck-Westerly area, and two village centers, North Stonington village and Ashaway, Rhode Island.

Years ago the proximity of these centers would have been crucial as a source of labor supply for an industry. Today a site with access to an interstate highway has the population within commuting distance as its labor supply. In this instance the labor supply would be drawn from throughout southeastern Connecticut and southern Rhode Island. Thus, the impact of additional employment opportunities in the study area would be spread over a broad interstate area and would not significantly affect residential growth trends in North Stonington.

SITE

Unlike the land use pattern surrounding the site, existing land uses within the site will have an important impact upon the site plan.

Within the site there are two major land use factors: (1) the sand and gravel excavation in the central area of the site, and (2) the strip of development along Route 184, the northern border of the site.

The site's dominant land use is the sand and gravel excavation. It accounts for 65 acres, or approximately 19%, of the

total site area. A critical aspect of this study is analysis of the excavated area to determine if it can be used for industrial activities.

Because of its size and key location, the excavated area would logically be the heart of an industrial park planned for this site. If development cannot take place on the excavated area, the potential of the site for a substantial industrial park will be severely limited.

The site's second major land use feature is the development along Route 184. It consists of a string of 8 single-family homes bookended by a small tool manufacturing plant on the west end, and a restaurant on the east end, at the intersection of Route 49. This entire area is presently zoned for residential use.

There would be little advantage in planning this residential strip for another activity. The houses are substantial structures and this location is too far removed from I-95 to be an attractive site in an industrial park. The homes along Route 184 should remain in a residential zone to a depth of at least 600' from Route 184.

Developed land in the balance of the site consists of three occupied single-family homes, one on Route 2, and two on Route 49. There are also two light industrial activities, Posi-Seal, a valve manufacturing plant, and Analysis and Technology, a research firm. The remainder of the site is open space, including pasture land, wetlands and woodland.

Of these land uses, the two light industries are most likely to influence the future land use pattern. Posi-Seal is attractively located at the intersection of the frontage road and Route 49. It is visible from I-95 and presents an excellent advertisement for the attraction of new industry.

Analysis and Technology, located on Route 2 less than one-half mile from I-95, is excellently located for a research-type of industrial activity. This firm has an approved 6-lot subdivision called Technology Park. The objective of this firm is to draw other similar research, professional and office activities into its subdivision. This subdivision is recognized as an important factor in a future site design.

Assumption: The land use pattern outside the site will have little impact upon the potential for development. Conversely, development of the site will not adversely affect the surrounding area. Within the site the critical question concerns the sand and gravel excavation. Can it be developed? Finally, it is apparent that the residential development along Route 184 is firmly established and should not be planned for industrial or commercial activities.

ACCESS

GENERAL ACCESS CONSIDERATIONS

Modern executives of the largest industries consider as many as 900 factors in seeking a plant location. Regardless of the size of the industry or the number of locational factors evaluated, transportation is normally one of the three or four key considerations. Transportation includes air and rail transportation, but to the majority of industries it means highway transportation. Direct access to a major state highway, urban beltway or interstate highway provides accessibility to both the surrounding labor supply and the marketplace.

Broadly speaking, the primary industrial location factors are labor supply, natural resources, the market and transportation. Accordingly, in terms of location needs, an industry, such as textiles, that must have a large, realtively cheap or an especially skilled labor supply, is labor-oriented. An industry that must be near a natural resource, such as a mining operation, which is a resource extraction industry, or cement manufacturing, which incurs a weight loss in the production process, is a resource or material-oriented industry. A market-oriented industry seeks a location near its potential consumers, to sell products directly to the consumer (eg. beverages, bread, foodstuffs) or to other industries (eg. electronic firms producing electrical components). Finally, a transportation-oriented industry seeks a location which will minimize transportation costs. Most warehousing and bulk storage activities tend to locate near the appropriate type of transportation. For instance, high value instrument plants tend to locate near air freight terminals.*

For most industries the chief locational factor is proximity to market. Generally, the closer an industry is to its market, the lower its transportation costs and the larger its profits.

The North Stonington site is located on the main coastal highway serving the Atlantic seaboard, Interstate Route 95. The site is approximately mid-way between two major metropolitan markets, New York City and Boston. In addition, there are many smaller markets easily accessible to the site via I-95 along the Connecticut coastline, in Rhode Island, and in Massachusetts.

There are, however, non-oriented or "footloose" industries that may find the study site a good location. "Certain types of activities are not strongly oriented toward any of the foregoing factors.... These are often among the fastest growing industries. One example is the precision instrument industry. Relatively few employees are found in any one plant, but high level skills are

* Kinnard, William N., Industrial Real Estate. (Society of Industrial Realtors, Washington, D.C.), 1967, pp. 49-50.

are generally required."* Posi-Seal is an industry that generally fits into this category, and other similar industries may find the study site an attractive location.

A research type of industry could also generally fall into this "footloose" category, although this type of industry will often be located near a large university or governmental center. A large defense-related industry, such as Electric Boat, could also spawn small research-oriented activities.

Assumption: The site, which is located on an interstate highway approximately midway between two key national markets, is in an excellent position to attract industrial tenants. The type of activities most likely to locate at the site include warehousing, research and professional offices and other "footloose" types of industrial activities.

REGIONAL CONSIDERATIONS

The State highways (Routes 2, 184 and 49) bordering the site are the main highway arteries serving the site within the Southeastern Connecticut Region.

The site is outside of the Region's developed corridor, which is primarily along the Thames River and includes Norwich, New London and Groton. A prime industrial site within the Region should have easy access to the concentrated market and labor supply within this corridor.

Route 2

Route 2 provides a direct link from Norwich to the site. This road has been widened and improved in sections and according to the State it can safely handle traffic flows projected for the next five to ten years.

Sections of Route 2 are, however, quite narrow and unsatisfactory for heavy traffic flow and truck traffic. The stretch of Route 2 that borders the site on the west is in this category. If the site along Route 2 is built up with industrial or commercial activities, the highway may need to be widened and improved. Route 2, if it were improved to State highway standards, would have two 12-foot lanes and 8-foot shoulders. Route 2, improved to these standards, could adequately serve the increased traffic generated by new industries and businesses.

Unfortunately, even if development occurs along this stretch of Route 2, the State will not widen the road unless it becomes a safety problem area. According to State highway procedures, a safety problem area is determined by the number and severity of accidents on the road. Conceivably the State would improve the

---

* Ibid.

road if the Town can demonstrate that the road is unsafe. If the site is to develop for industry, the Town's Development and Industrial Commission and Planning and Zoning Commission should initiate action for the improvement of Route 2 near its intersection with I-95.

Meanwhile, in anticipation of the eventual need to widen this stretch of Route 2, new structures should be set back at least 100 feet from the highway pavement. Another measure that should be considered is a limitation to the number of access points along this stretch of Route 2. A requirement that there be a minimum of 500-700 feet between access points will help maintain travel safety and still allow a sufficient number of access points to permit development of this area.

Route 184

Because Route 184 is within five miles of and parallels I-95, it can be considered an auxiliary road to the interstate highway. I-95 serves as the primary access, and Route 184 as a secondary access, for the southern half of the Region to the site. Route 184 also serves as a connecting road between Routes 2 and 49.

Route 49

Route 49 has been realigned and improved from the intersection with Route 184 to I-95. This improvement is an asset to the site but the overall impact of Route 49 on the site is considered minimal. North of the site, Route 49 serves the least densely populated areas of the Region and will not be a significant access road to the site.

Planned State Highways

New highway construction will improve access to the site. Two small, but significant highway connectors, Connecticut Route 78 and Route 2A, will facilitate highway transportation to the site from the southern part of Rhode Island and the area northwest of Norwich, respectively.

Connecticut Route 78 will connect a bypass highway around Westerly, Rhode Island, and Route 2 just south of the site. The first phase of Route 78, which is due to be under construction in 1973, will be a two-lane highway connecting the Westerly bypass to Liberty Street in Stonington. Liberty Street will be connected to I-95 after 1975.

The other connecting highway, Route 2A will provide a direct highway access from the Connecticut Turnpike (Route 52) in Montville to Route 2 in Preston. This highway should be open before 1975. For traffic travelling to and from the area northwest of Norwich, Route 2A will be a bypass around the city.

Assumption: An excellent state highway system provides quick and easy access from the populated sections of the Region to the site. Area access should be considered as an important asset to the potential for developing the study site.

UTILITIES

INTRODUCTION

An industrial site with public water and sewer systems has an unquestioned advantage in terms of development potential over the same site without public utilities. The potential for expanding is greater for a site with public utilities than one with on-site utilities. Normally, a public utility can provide for the additional amount of water required or added sewage generated, while a site with an individual well for water and septic system for sewage treatment may present serious limitations for expansion. In addition, an established public system is usually less expensive and is independently maintained, while each industry must develop and maintain its own private well and septic system.

Another factor most industries are painfully aware of is the potential pollution problem that may arise from on-site sewage systems. Industries concerned with their public image are reluctant to locate where there may be a question of pollution.

On the other hand, existing public sewer systems are mainly confined to urban areas. Suburban and rural towns must deal at a disadvantage in attempting to attract a good industry to industrial sites that do not have public utilities.

This section will examine the advisibility and feasibility of providing public utilities, compared to on-site utilities, to the study site.

PUBLIC WATER SUPPLY

The public water supply is considered from two viewpoints: (1) the potential of a major water supply serving the Westerly-Pawcatuck-North Stonington area from the Shunock River-Pawcatuck River system, and (2) the potential of developing a public water supply within the immediate vicinity of the site to serve potential industrial activities.

Public Water Supply - Regional

The groundwater from the Shunock River-Pawcatuck River system is presently serving as a water supply for the nearby densely developed areas. This fact alone makes this groundwater system an

important one. The City of Westerly, Rhode Island, draws its public water supply from a groundwater source along the Pawcatuck River. In turn, Pawcatuck's water supply is drawn from the Westerly system through transmission mains across the Pawcatuck River.

Both the existing and the future potential of this groundwater supply are considered highly valuable. The overall water supply potential of the Shunock River-Pawcatuck River system was evaluated on a general basis in the 1968 report, "Water Resources Inventory of Connecticut, Part 3, Lower Thames and Southeastern Coastal River Basins."* Of the potential groundwater sources identified in this survey the Shunock River-Pawcatuck River system was estimated to have the greatest long-term yield for a water supply.

In 1970 the Southeastern Connecticut Region Water Supply Plan recommended that this groundwater supply be evaluated in detail to determine more precisely its potential long-term yield. The plan pointed out that future growth in Rhode Island could place a burden on the Westerly system to the point where it would not have sufficient quantities of water to sell to Pawcatuck.

Following up on this recommendation, the U.S. Geological Survey, in cooperation with the Southeastern Connecticut Water Authority and the Connecticut Office of State Planning, has recently completed a detailed analysis of the groundwater supply potential of the Shunock River-Pawcatuck River system. The final report is scheduled to be available in May, 1973. Preliminary findings of this analysis generally bear out the original indication that the land area along these rivers could produce a high quantity of groundwater of generally good quality.

Assumption: The aquifer, or groundwater sources, along the Shunock River-Pawcatuck River basin should be protected as a potential major source of water for future development in the southeastern part of this Region and for the area around Westerly, Rhode Island.

Public Water Supply - On-Site

The Shunock River runs through the center of the study site. The study area was included in the U.S.G.S. groundwater analysis and preliminary data indicate there is an estimated 3 to 4 million gallons per day (mgd) long-term yield available within and in the immediate vicinity of the study site.

Along the Shunock River and Pawcatuck River the U.S.G.S. analysis identified a number of favorable groundwater areas which could yield significant amounts of groundwater. One such area was identified within the study site, and it is generally located on the Physical Characteristics Map (Figure 2). The preliminary data

* By the Connecticut Water Resources Commission and the U.S. Geological Survey.

show that the water production potential (long-term estimated yield) of this area is below that of the other adjacent favorable groundwater areas along the river system. Despite this fact, it was determined that the normal demands of light industrial activities, which require only an average of 20 gallons of water per day per employee,* could be easily provided from the amount of water potentially available from this favorable groundwater site. If a specific industry, such as a bottling company, or a group of industries required more water than could be provided by this particular site, there are two other favorable groundwater areas located immediately north and south of the study site. Tapping these two groundwater areas would not present a serious obstacle, if there was a need.

Within the site the key factor in determining the feasibility of a public water supply is economic feasibility. There is no question of the physical potential of developing a water supply, the real question is: "Will there be a sufficient demand for a public water system within the study area?"

The Southeastern Connecticut Water Authority has estimated that at least 300 industrial employees would be needed to make a public water supply system a financial feasibility. (This estimate was based upon the assumption that the industry would be of the light industrial type and require water for only human activities and not for an industrial process.**) It was also noted that the 300 employees would have to be within one general area of the site, not scattered in widely separated locations.

Presently there is a total of 133 light industrial employees within the study site (103 at Posi-Seal and 30 at Analysis and Technology). These two firms are in widely separated locations and do not approach the 300-employee minimum necessary to support a public water system.

In the future if a public water system is to be feasible within the study area, it is important to plan for a relatively compact industrial site, large enough to hold at least 300 employees in a particular segment of the site.

Of course, if an industry requiring large quantities of water in its production process chooses this location, it would create an instant demand for a public water supply. But, other things being equal, a company that requires vast amounts of water will in all probability seek a location that has an existing public water system.

Assumption: It is evident that one of the primary industrial assets of this site is its potential water supply. The most effective use of this resource will be through a public water system. In planning for this site the need to provide for a public water system will be given a high priority.

---

* Ameen, Joseph S., Community Water System Source Book. (Technical Proceedings, High Point, N.C.), 1971, pg. 11.

** Ibid.

INDIVIDUAL WELLS

In rural areas individual on-site wells are normally the means of providing a water supply for residential and light commercial activities. But there is a wide variation in the water-producing capacity of individual on-site wells. The identified favorable groundwater area is the only general location within the study site of which it can be stated with some authority that a significant amount of water can be produced. There are locations within the site that could produce barely enough water for a single-family home, if that.

The two existing industries within the site offer an illustration of this water-producing capacity of on-site wells. Analysis and Technology, located on Route 2, is having no difficulty providing ample water for its 30 employees. But Posi-Seal, located at the intersection of the frontage road and Route 49, is drawing barely enough water to provide for its approximately 103 employees.

The fact is that no industry dependent upon an on-site well for water supply should finalize a location until the water producing potential of the proposed site has been determined to be capable of meeting the industry's needs.

Another factor that should be considered is that, in comparison to a central well system, individual wells scattered throughout an industrial area create a greater likelihood of septic system effluent polluting a water supply. To reduce the opportunity of such pollution, it would be advisable to encourage industrial land subdividers to install a central well system. For example, under this requirement, Analysis and Technology's industrial subdivision, Technology Park, would be served by a single central well, rather than by individual wells for each of the six lots in the subdivision.

Another possible advantage of this central well requirement would be to preserve the feasibility of a future public water system. If constructed under the same standards, several central well systems could easily be joined into a single central system. It would be very difficult and much more costly to provide a community water supply to an industrial area that developed with an individual well on each lot.

Assumption: Initially, industries locating in the study area will be being served by on-site wells instead of a public water system. As the study area grows, the need for a public system will increase. In anticipation of this need, provisions should be made to encourage industrial site design that will permit the future possibility of service from a public water system.

PUBLIC SEWERAGE

A key question influencing the industrial development potential of this site is: "Will this site be served by a public sewer system, and, if so, when?"

With a public sewer system this site would have a competitive advantage over most of the other existing industrial areas along I-95 in southeastern Connecticut. Also, public sewers would remove the concern of pollution from septic system effluent and permit a greater variety of industrial activities at a higher density.

Under existing state programs, and for at least the next ten years, there appears to be little possibility of this site being served by public sewers. On the other hand, the potential growth within the vicinity of the site will probably require public sewers within fifteen years.

It would be neither financially feasible nor permissible under present state policy to construct a sewage treatment plant to serve the site. And, according to the state funding priorities for the extension of sewer systems, it does not seem probable that the Pawcatuck system could be extended to the site within the next ten years.

The State of Connecticut has adopted a policy to reduce to the absolute minimum the number of sewage treatment plant outfalls. Under this policy a new treatment plant would not be permitted in North Stonington. If the site is to be served by a public sewer system, it must be from an extension of the planned Pawcatuck system.

The sewerage plan for Pawcatuck was prepared with the idea in mind that eventually it would serve the more densely developed areas of North Stonington. The plans for the Pawcatuck system, prepared by Genovese Associates, indicate a sewage treatment plant located in the Green Haven area of Pawcatuck, along the Pawcatuck River. This treatment plant was designed to accommodate 200,000 gallons per day from North Stonington.

The main sewer line in this system, called the interceptor sewer, has a 24-inch diameter extending from the treatment plant north along Mechanic Street to Route 1. In the original plan the size of the interceptor changed at this point from 24 to 18 inches. The planned 18-inch interceptor line has since been increased in size to 21 inches, primarily to accommodate the future connection of North Stonington to the Pawcatuck system. The funding for the construction of the treatment plant and the interceptor sewer from the treatment plant to Route 1 has just been approved.

As a second phase to the Pawcatuck plan, the 21-inch interceptor sewer could be extended north up Stillman Avenue which parallels the Pawcatuck River to River Street. From this point it

could be further extended along the river to White Rock Street, then west to Route 2 (Liberty Street) and into North Stonington.

A preliminary evaluation of alternative routes for this extension determined that, on the basis of the topography, Route 2, rather than Route 49, was the most likely avenue of extension. The hills along Route 2 are not as steep as those along Route 49, which would probably require planning for pumping stations. But, if future growth gravitates heavily toward Route 49 in Stonington, rather than Route 2, the installation of the pumping stations along Route 49 may be economically justifiable in order to locate the sewer lines close to the more densely developed area.

But, under Connecticut's long-range sewer plan, it does not appear that there is any opportunity for securing state money to assist in the extension of the interceptor sewer from Pawcatuck to serve a planned industrial activity at the study site.

As outlined by officials of the State Department of Environmental Protection, the State's sewer program will be committed to the correction of existing sewage problems for at least the next ten years. Until 1976 the objective of this program will be to extend existing sewers to areas that have documented sewage problems. The next phase will be aimed at constructing separate storm drainage and sanitary sewer systems where those systems are presently combined. The final phase, the most ambitious, intends to upgrade all sewage treatment plants to a level of treatment which would virtually eliminate all pollutants.

According to this overall plan, there is no provision for funding the extension of an existing sewage system to a planned high-density land use, such as an industrial area.

The State has identified two small sewage problems in the Town of North Stonington, and there is the possibility that to abate these problems the Pawcatuck sewer system may have to be extended to North Stonington village and the Kingswood Estates subdivision. However, the Town's Sewer Commission has submitted a report to the State contending that these problems can be corrected without the expense of a public sewer system and that the Town will not need a sewer system in the future. At this point in time the State has not officially reacted to this report.

Policies and reports aside, the fact is that it is only approximately 1 1/2 miles along Route 2 from the perimeter of the planned Pawcatuck sewer system to the study site. The tendency will be for this void along Route 2 to experience growth, the result of the nearby sewer system, and that eventually the system will be extended.

Assumption: Planning for the study area should be done on the premise that a public sewer system will not be available for at least ten years. It is anticipated that public sewers will eventually be extended to the study area. Between the next ten

to fifteen years it is felt that there will be sufficient development between the Pawcatuck sewer system and the site to justify the extension of a sewer main to the North Stonington town line and the study site.

ON-SITE SEWERAGE

A septic tank-leaching system is the most common and accepted method of on-site sewage disposal. The method of treatment in this system is simple, but, for the system to function properly, it must be designed to accommodate the activity it is serving, and the leaching area must be located in the type of soil that will effectively purify the system's effluent.

The size of the septic tank and the area of the leaching field must be determined according to the anticipated amount of sewage generated by the proposed activity. Another factor that will influence the system's design is the schedule for the extension of public sewers. The State Health Code requires that where sewers will not be provided within five years, a reserve area, which is equal to the area of the proposed leaching system, be set aside for the purpose of enlargement or replacement of the system.

But more than any other factor, the type of soil in which the system is located will determine whether or not the system will operate properly. A well-drained soil will absorb and naturally breakdown the septic effluent. This type of disposal system will generally not operate properly when located over hardpan soils, in wet soils or in soils that are shallow to bedrock. The State Health Code will not permit a septic system to be installed in fill placed over impervious soil, such as hardpan. Neither is a system permitted in areas where high groundwater, surface flooding or ledge rock will interfere with the effective operation of the system.

In the next section of this report the suitability of the soils in the study area to support on-site sewage disposal systems will be analyzed in detail.

Assumption: Areas planned for on-site sewage disposal systems must reflect consideration of a variety of factors, including the type and density of the activity, the time when public sewers will be available, and, most importantly, the type of soil present on the site, in terms of its suitability for on-site disposal.

PHYSICAL CHARACTERISTICS

INTRODUCTION

The primary purpose of this section is to evaluate the major physical characteristics of the study site and to relate these

factors to the existing and potential future land use activities. The focus of this evaluation is upon the impact of land use on the Shunock River aquifer, or groundwater supply. The major question to be answered is: "What is the relationship of the site to the aquifer, and what type and density of development can occur without jeopardizing the quality and quantity of the groundwater supply?"

This evaluation is divided into four parts, based on four geographic divisions of the site:

1) General - The Shunock River. The relationship of the site to the surrounding area and the Shunock River watershed, in terms of the general geology and hydrology.

2) Central Segment. The central area of the site, which includes the Shunock River and its floodplain.

3) East Segment. The part of the site lying to the east of the Shunock River floodplain, along Route 49.

4) West Segment. The part of the site lying to the west of the Shunock River floodplain, along Route 2.

The basic information for this evaluation was developed by the Environmental Review Team. Each team member, after a thorough briefing, examined the site in the field and submitted a report of his findings. This analysis is essentially a compilation of the reports of the team members.

GENERAL - THE SHUNOCK RIVER

The dominant feature of the site is the Shunock River. Before examining the physical characteristics of the site in detail, it is necessary to understand the general geology and hydrology of the site, especially as these aspects relate to the river.

Both of these aspects were generally evaluated in the geologist's report. The description of general geology was divided into two areas, bedrock and surficial geology.

> "The bedrock geology that underlies this area is granite gneiss and does not appear to have any specific characteristics that will be critical to this survey.
>
> "The nature and distribution of the surficial (unconsolidated) materials are of particular importance to this survey. Two basic kinds of material are present: glacial till and stratified deposits of silt, sand and gravel. Glacial till borders the valley walls on the east and west sides of the Shunock River valley. This till is compact, clayey and capped by a thin layer of sand and gravel along Route 2. Along Route 49 the till

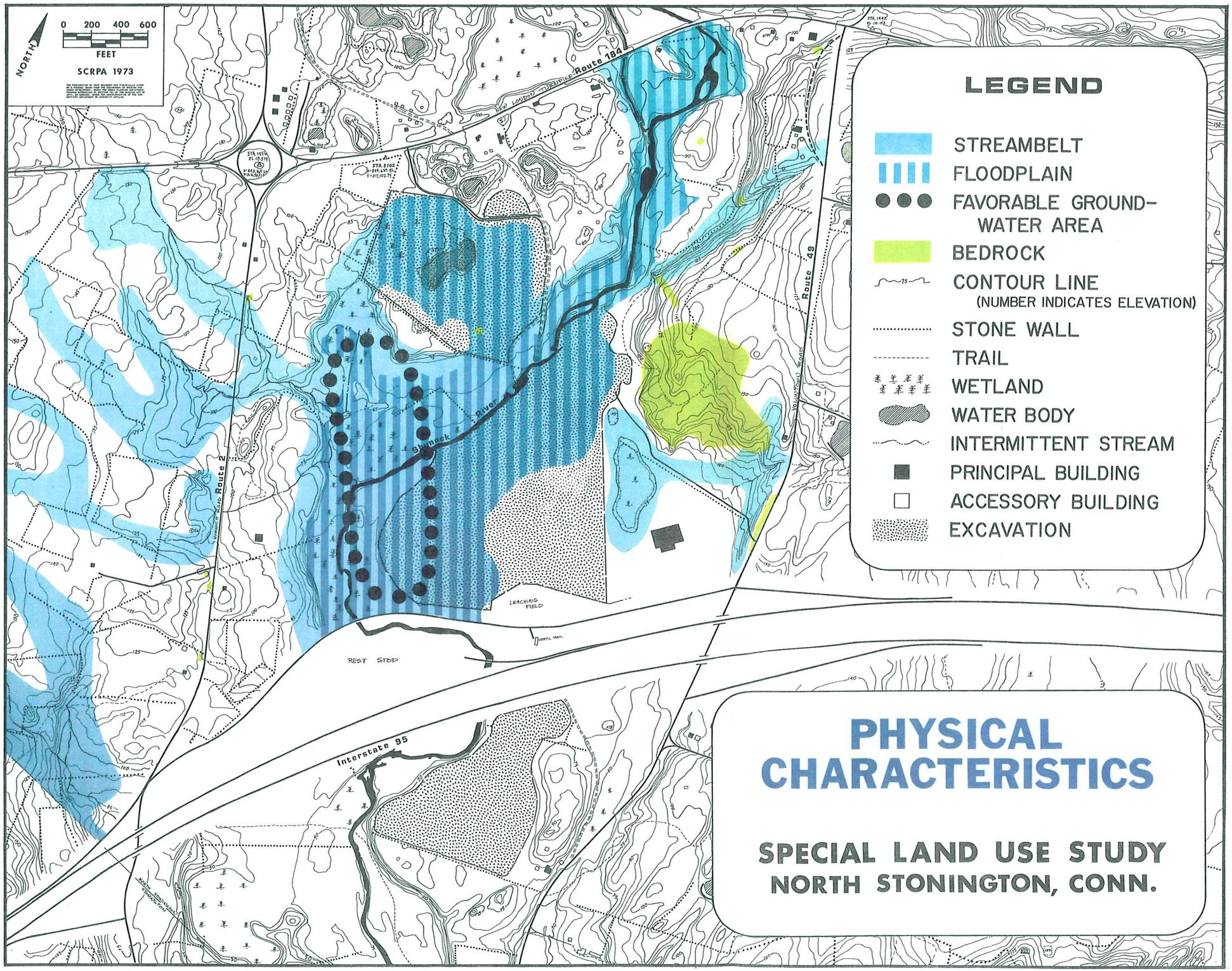

NORTH
0 200 400 600
FEET
SCRPA 1973
Old London Turnpike
Route 184
Route 49
Route 2
Shunock River
LEACHING FIELD
SEPTIC TRAIL
REST STOP
Interstate 95
LEGEND
STREAMBELT
FLOODPLAIN
FAVORABLE GROUND-WATER AREA
BEDROCK
CONTOUR LINE
(NUMBER INDICATES ELEVATION)
STONE WALL
TRAIL
WETLAND
WATER BODY
INTERMITTENT STREAM
PRINCIPAL BUILDING
ACCESSORY BUILDING
EXCAVATION
PHYSICAL CHARACTERISTICS
SPECIAL LAND USE STUDY
NORTH STONINGTON, CONN.

FIGURE 2

appears to be somewhat more friable and sandy. In many areas of the site where till is exposed, bedrock is fairly close to the surface. Stratified drift deposits, composed of silt, sand, and gravel or a combination of these, make up the surficial materials in the valley floor. They are as much as 100 feet thick in places and generally tend to become finer grained at depth....The considerable thickness of saturated stratified drift material in the valley bottom makes this a potentially productive aquifer....On the whole, the valley area could be considered as an aquifer area."

The geologist's description of the general hydrology explains the relationship of the groundwater system to the Shunock River, or surface water system.

"The ground and surface water system should be considered as one hydrologic system. Surface water moves through the valley to the south, in the Shunock River; in addition, the general flow direction of the groundwater is southerly and toward the river. Surface water flows from the valley walls toward the river in small and intermittent streams. As these streams run on the more level areas which are underlain by stratified materials, significant amounts of surface water may sink into the ground and become part of the general movement of groundwater. Since surface and groundwater comprise one hydrologic system, withdrawals and discharges of fluids from the surface and groundwater must be carefully planned."

Having described these general systems, the geologist offered a general observation regarding the relationship of surrounding land uses and the overall water system.

"The quality of the surface and groundwater can be determined by testing, but it is not possible at this time to accurately predict the changes in water quality due to the discharge of wastes, changes in surface materials or land use, and the multitude of other variables. It can only be said that what goes into the system stays in the system until it is in some way subtracted or otherwise altered. Maintaining a high quality of surface and groundwater in this system can only be achieved through strict controls on land use and waste discharges for much of the area in the drainage basin. This is particularly true in areas that are underlain by stratified material and in areas of steep slopes and thin veneers of surficial materials. Effective long term protection of the stream and the groundwater aquifer must be implemented on a basinwide approach."

A basin-wide planning approach for the Shunock River is suggested in both the Town Comprehensive Plan of Development and a study by the North Stonington Conservation Commission titled, "Conservation and Open Space Potentials."

The town plan shows the land along the Shunock River in the proposed land use category of Recreation, Reservation and Preserves. The floodplain area of the river that is within the study site is shown on the plan as a potential water impoundment.

The Conservation Commission's study determined that the Shunock River watershed was the most critical in the Town from the viewpoint of both future growth potential and conservation opportunities. The Commission's report states:

> "The Shunock River watershed is unique in that it is likely to contain the largest share of North Stonington's future development and at the same time has many potential conservation and recreation areas. This situation contains both a danger and a promising challenge. The danger is that the watershed's conservation and recreation potential could be smothered by development if a conservation and open space program is not developed. On the other hand, with a program, the watershed offers unusual opportunities to bring an 'open space corridor' into the center of the community.
>
> "A series of conservation areas and active recreation sites along the Shunock River and its tributaries would bring open space into the areas of development and would do much to prevent the sterile appearance characteristic of much of today's suburban development."

Since the town plan was prepared, another concept for preserving land along the Shunock River has been proposed. Within the past several years the "streambelt" concept has become recognized as a rational comprehensive method of designing an open space corridor along a river or stream. In this Region the streambelt concept has been promoted by the Soil Conservation Service of the U.S. Department of Agriculture through the Eastern Connecticut Resource Conservation and Development Project. These agencies have completed a Streambelt Study for North Stonington and the outline of the proposed streambelt that is within the study site is shown on Figure 2.

The main components of a streambelt, as defined by the Soil Conservation Service, include the following:

1. The watercourse of a defined stream, including banks, bed and water.
2. Lands subject to stream overflow.
3. Associated wetlands.
4. Contiguous lands with special environmental values, i.e., wildlife habitat, esthetic, public recreation, scenic, historic, etc.

5. Shorelines of lakes and ponds associated with the stream.
6. Potential water development sites of public significance.
7. Areas in proximity to streams where certain developments or land uses would have probable adverse environmental effects, i.e., pollution and health hazards, erosion and sedimentation, destruction of ecological systems.
8. Other areas necessary as links to form a continuous streambelt system.

Assumption: The first step in developing a program to protect the Shunock River aquifer is to recommend a river basin-wide planning approach, such as under a streambelt concept.

CENTRAL SEGMENT

The central segment of the site is defined by the Shunock River, its floodplain and associated wetlands. As described above, this area of the site is the one most directly related to the aquifer. This is also the largest of the three segments and the one that has been most disturbed by man.

The most readily identifiable feature of the site is the vast sand and gravel excavation area, which accounts for 65 acres, or approximately 19 percent of the total site area. Before the excavation an approximately 80-foot hill rose along the Shunock River between the river bank and the I-95 frontage road. This hill has been leveled for sand and gravel and an almost equal area has been mined for a deposit on the other side of the river.

The level of this excavation is near the groundwater level, and the overall result has been the creation of a vast floodplain along the Shunock River through the study site.

Figure 2 indicates the area that could potentially be flooded by a 100-year flood. According to the hydraulic engineer's report, a 100-year flood would raise the water levels to between 5 and 8 feet above sea level. The highest areas in the excavated site are approximately 8 1/2 to 9 feet above bankfill water surface elevation, but the major portion of the excavation area would be under the maximum flood depth.

This floodplain should not be developed for a variety of reasons. First of all, the potential of flooding would eliminate the use of the land for any type of commercial, industrial or residential land use. Secondly, the excavation, which is either below or very near to the groundwater table, has created a severe limitation to the potential for on-site sewage disposal. The State Sanitarian reports that: "The State Public Health Code for subsurface sewage disposal requires the bottom of the leaching system to be at least 18 inches above maximum groundwater level. This normally means the seasonal groundwater level needs to be at least 4 1/2 to 5 feet below ground surface. This being the case,

most of the central part of the site would not be suitable for on-site sewage disposal." Finally, even with a public sewer system, an urban type of development on the floodplain would greatly increase drainage run-off, which would seep directly through the highly permeable soils into the groundwater.

Various team members offered general recommendations for the use of this floodplain area. All of them suggested some type of recreation or open space land use. The following are excerpts from the reports regarding a recommended land use within the central or floodplain area.

> Engineer's report: "The potential for an impoundment type of reservoir is slight, due to high permeability of the soils. In addition, the cost to develop and install a structure designed to handle the flow from the approximately 11-square-mile watershed of the Shunock River would be prohibitive.
>
> "The possibility of a bypass or dugout-type pond is much better, but not without reservations. Further investigation as to the fluctuating groundwater table would be necessary to confirm the feasibility of such a project."
>
> Hydraulic engineer's report: "The best use of the floodplain would be some type of low potential drainage use. A pond would be in this category."
>
> Forester's report: "In the area where the graveling operation has encroached upon the stream, the forest cover should be reestablished to give shade and protection along the bank. Hemlock could be planted along the immediate bank while pine and larch should be planted further back. The effect of the tree cover would be to slow down erosion and to help maintain the cool water temperatures."
>
> Conservationist's report: "There are two possibilities for the present gravel bank area: 1) A bypass-type pond could be constructed. If this is to be for cold-water fish, the depth should be 10 or more feet. Also, the banks should be graded, spread with topsoil and seeded. Trees and wildlife shrubs could be planted back 50 feet from the water. 2) An alternative would be to grade the area smooth, spread back the topsoil and plant coniferous trees, as advised by the forester."

The wetland that extends along the western bank of the Shunock River is also a key feature of this central segment of the site. It too is an integral part of the groundwater system and generally is within the favorable groundwater area identified by the U.S.G.S. The ecologist determined that this is a "groundwater-table wetland

(rather than a poorly-drained wetland) and a floodplain; therefore any buildup would not prevent water in the basements, etc., because tiling would not help in this situation." This report also made note of the fact that some of the topsoil in this wetland was scalped for use in landscaping the State rest stop area on I-95. The ecologist concluded that this wetland should not be further disturbed and recommended that it be designated as a "greenbelt-type area."

Another human activity that should be controlled within the excavated area is the dumping of solid wastes. Both the geologist and ecologist on the team called attention to potential problems resulting from the dumping of demolition debris in the excavated area north of the Shunock River. The geologist noted the following:

> "Since it is very difficult to control the quality and quantity of this type of operation, and since stockpiling and/or burning of foreign materials could significantly affect the quality of the ground and surface water, it is suggested that this dumping operation be halted. No further solid waste disposal should take place if water quality is to be maintained." The ecologist reported that, "If the dumping is continued in the upper end of the excavated area, the chances of a flood spreading the waste material through the wetland are high."

Assumption: The central, floodplain segment of the site should be protected from any type of land use activity that would generate sanitary wastes, solid wastes or urban drainage runoff. Open space or recreational activities would be suitable for this area. A recreational pond, which would also serve as a flood control element, would be an ideal land use for this area from all viewpoints.

EAST SEGMENT

The east segment of the site consists of all the non-floodplain area east of the Shunock River. From Route 49 westward, the land slopes to the river. The land along the road is cleared, gradually sloping meadow land. Beyond the meadows the slope increases sharply and the land is marked by exposed bedrock.

There is an intermittent stream in the northeastern corner of the site. In the southeastern corner the runoff from the hill east of Route 49 drains across Route 49 and along the road. Part of this runoff drains into a kettle hole, or wetland pond, behind the Posi-Seal Company.

Soils in this segment are predominantly rocky and shallow to bedrock. There are several pockets of well-drained soils and soils

with a moderately high seasonal water table along the river between the floodplain and the rocky soils.

There are two types of rocky soils in this segment: the 17L-BC soil and the 17L-D soil. The 17L-BC is rocky, but there are occasional pockets of deep soils that are suitable for septic systems and make good home sites. The 17L-D soils are most often found on steep (15%-35%) side slopes and are underlain by hard bedrock with barren rock outcrops and rock cliffs.

It was noted in the field by the landscape architect that there is a particularly scenic area of exposed bedrock, trees and plant life in the large area designated as a rock outcrop on Figure 2. This area would be almost impossible to develop for any type of urban activity but would be attractive if maintained in its natural state with walking trails.

Around Posi-Seal Company the soils have a moderately high seasonal water table. These soils normally occur above floodplains in river and stream valleys. The permeability above the water table is moderate or rapid, but at high water time of year the water table is generally between 15 to 20 inches below the soil surface.

Often septic systems can be installed in this type of soil if special measures are used, such as drainage and landfill. For homes with basements this soil type may be a problem, but for an industry with a slab-concrete foundation, this type of soil presents little difficulty.

Immediately adjacent to Posi-Seal the land has been slightly disturbed, but most of the original soils remain. These are well-drained soils, excellent for building and septic systems.

Overall, the engineer's evaluation of the east segment concluded that it was not suited for industry although "the situation could be improved with the installation of a public sewer system." Specifically, the engineer commented upon the suitability of the land in this segment for on-site sewer systems, drainage and substratum support, as follows:

> "On-site sewer systems: Difficulty can be expected in the installation and operation of on-site sewage disposal systems in this segment.
>
> "Drainage: Drainage will be a major problem in this segment. Sediment and erosion control practices should be employed at all critical locations during construction.
>
> "Substratum Support: Support could be adequate, but differential settlement may be a problem unless caution is exercised when making individual site investigations. Foundation drains will be required in most instances."

The State Sanitarian had the following comments with regard to on-site sewerage in this area:

> "Drainage improvements, such as by groundwater control drains, would perhaps control the groundwater which lies on top of the impervious soil which is most evident in the area of Route 49. However, the underlying soil may still have a poor seepage rate and be questionable for leaching purposes. Soils with seepage rates slower than 1 inch in 30 minutes should be avoided for subsurface sewage disposal systems."

Assumption: On the basis of its physical characteristics, the industrial development potential of this segment is limited. There is an opportunity for a carefully planned single-family residential area. In the site design special attention should be given to the bedrock outcrop area.

WEST SEGMENT

To understand the land use implications of the physical characteristics of the land within this segment, it is helpful to restate excerpts of the geologist's summary of the site's general geology and hydrology:

> "Glacial till borders the valley walls on the east and west sides of the Shunock River valley. This till is compact, clayey and capped by a thin layer of sand and gravel along Route 2....Surface water flows from the valley walls toward the river in small and intermittent streams....The ground and surface water systems should be considered on <u>one</u> hydrological system."

An examination of the soils map (Figure 3) bears out this general geological analysis. The Route 2 area is dominated by the well-drained soils which are indicated by the color yellow. These well-drained soils are the most suitable of all the soil types within the site for development. Generally, these soils have only slight limitations for on-site sewerage, foundation or street construction and landscaping.

This soils pattern east of Route 2 carries over on the west side of Route 2. An overall evaluation of the soil patterns within the general vicinity of the site shows that this Route 2 area is one of the very few sizable tracts of land with well-drained soils. The land east of Route 49 is generally rocky on the slopes with hardpan on the hill tops. South of I-95 most of the well-drained soils have been excavated. South of Route 184 there is a general pattern of well-drained soils, but this area is removed from the I-95 interchange and therefore less desirable for an industrial type of activity.

SOIL SURVEY

SPECIAL LAND USE STUDY

NORTH STONINGTON, CONNECTICUT

— LEGEND —

- WELL TO EXCESSIVELY DRAINED SOILS OF THE TERRACES OVER SAND AND GRAVEL
- MODERATELY WELL DRAINED SOILS HAVING MODERATELY HIGH SEASONAL WATER TABLE
- WELL AND MODERATELY WELL DRAINED UPLAND SOILS WITH VERY FRIABLE TO FIRM SUBSTRATA
- SHALLOW TO BEDROCK SOILS
- POORLY DRAINED SOILS
- UNCLASSIFIED LAND
- 123/AB DETAILED SOIL TYPE
- W WATER BODY
- INTERMITTENT STREAM

0 660 1320
FEET

NORTH

BASED ON SOIL SURVEY MAP PREPARED BY U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE IN COOPERATION WITH NEW LONDON SOIL & WATER CONSERVATION DISTRICT

SCRPA 1973

THE PREPARATION OF THIS DOCUMENT WAS FINANCIALLY AIDED BY A FEDERAL GRANT FROM THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, UNDER THE URBAN PLANNING ASSISTANCE PROGRAM AUTHORIZED BY SECTION 701 OF THE HOUSING ACT OF 1954, AS AMENDED, UNDER THE ADMINISTRATION OF THE CONNECTICUT DEPARTMENT OF COMMUNITY AFFAIRS.

FIGURE 3

TABLE 1

DETAILED SOILS ANALYSIS* - TOTAL ACRES - 336.5

Natural Soils Group Color	Soil Symbol	Slope Percent	Urban Use Limitations**				
			On-Site Sewerage	Buildings With Basements	Streets and Parking	Landscaping	Principal Limiting Factor
Yellow	63-A	0-3	1	1	1	1	None
Yellow	63-B	3-8	1	1	2	1	Slope
Yellow	213-BC	3-15	1	1	2	2	Slope, Droughtiness
Yellow	60-BC	3-15	2	1	2	3	Slope, Droughtiness
Yellow	158-D	0-15	3	3	3	3	Slope, Droughtiness
Yellow	65-A	0-3	1	1	1	1	None
Dark Yellow	45-A	0-3	2	2	2	2	Moderately high seasonal water table
Dark Yellow	214-AB	0-5	2	2	2	2	Moderately high seasonal water table
Light Blue	825	-	3	3	3	3	High water table
Green	650-C	8-15	2	2	3	2	Slope
Light Blue	27M	-	3	3	3	3	High water table
Dark Blue	17L-BC	3-15	3	3	3	3	Depth to fragipan
Dark Blue	17L-D	15-35	3	3	3	3	Stoniness, slope
Light Blue	58	-	3	3	3	3	High seasonal water table
White	GP	-	n.a.	n.a.	n.a.	n.a.	n.a.

* Based upon analysis of U.S.D.A. Soil Conservation Service Soils Survey, as prepared by the Eastern Connecticut Resource Conservation and Development Project Office.

** Limitations: 1 - Slight, 2 - Moderate, 3 - Severe.

n.a. - not applicable.

According to Figure 3 there is little question that the soils along Route 2 are favorable for development. But the map shows the soils structure to a depth of only three feet. The geologist's finding that there is a thin layer of sand and gravel along Route 2 which covers an impervious substrata adds a new dimension to the development potential of the Route 2 area.

Based upon this general soils profile, it becomes clear that along Route 2 the top layer of soil will serve excellently for septic system leaching fields and to absorb drainage runoff. It is also obvious that effluent from a septic system that is not purified in this layer of well-drained soils, may move down slope into the favorable valley aquifer area.

Due to this soil condition and the proximity of the aquifer, the type of effluent from septic systems would have to be carefully controlled. The State Sanitarian pointed out the following:

> "In respect to the subsurface disposal of human wastes, concern with bacterial contamination would probably not be the major factor. Chemical constituents, such as nitrogen in the form of nitrates, could present a more difficult problem. Whereas bacterial organisms can be removed by soil filtration, nitrates can move through the soil and be leached into the underlying groundwater where they may accumulate. The buildup of nitrate nitrogen in a drinking water supply in excess of 10 milligrams per liter would exceed the U.S. Public Health Service standards for such supplies. Other chemicals that could affect (some most seriously) water quality are salt from roadway de-icing operations, detergents, oil and gasoline (hydrocarbons), various herbicides and insecticides, fertilizers and industrial wastes."

Adding to the complexity of this problem are the intermittent streams that lace this Route 2 segment of the site. The hydraulic engineer described the relationship of these streams to flooding, as follows: "Intermittent streams occur where the subsurface flow intersects natural low areas. Since many of these intermittent streams drain areas outside the site, they should be kept open if possible. If the drainage channels are obstructed, water flowing into the site can cause local flood problems." Except in these streams, the overland flow during and after a rain would be very minor. The soils are such that most rainwater will infiltrate almost immediately. This is especially true along Route 2, where the soils have a high infiltration rate.

The intermittent streams are an integral part of the aquifer and it can be concluded that any pollution of these streams will pollute the aquifer. For this reason the streams should be protected from any future development that would result in pollution, erosion or sedimentation. It is especially important that septic

systems be kept well away from the stream beds. Regarding on-site sewage disposal, it was the geologist's finding that along Route 2 the "moderate slopes with stratified sands and gravels overlying compact till or bedrock is not well suited for moderate density development with on-site septic systems. The local ground conditions would permit relatively rapid movement of waste fluids down the slope and into the river or into the surrounding groundwater." In conclusion, the geologist recommends that only light densities of development could be permitted without public sewers.

From the viewpoint of other physical characteristics, development potential of the west segment of the site is excellent.

The engineer's report stated the following:

> "Road Construction: No difficulty in construction provided good engineering principals (slope, drainage, etc.) are used in road location.
>
> "Slope Stability: No construction should be permitted on slopes greater than 15%. Vegetative cover on all cut and fill areas should be required.
>
> "Drainage: Little or no difficulty is expected during the installation of surface and subsurface drainage. Suggest each open drainage way be designed so as not to cause erosive velocities. Each pipe outlet should be protected from scour by the use of riprap or some other approved means. Erosion and sediment control practices should be employed at all critical locations."

Assumption: Development in this segment should be permitted only if the type of activity, the density and the site design is strictly controlled. The land use should not generate any type of toxic or industrial waste, the density must remain at a low level, and the land use controls must require high site design standards, especially for drainage features.

RECOMMENDED
LAND USE PLAN
AND IMPLEMENTATION

This section presents recommendations for the future land use of the study site and an outline of an implementation program. The recommendations are based upon the conclusions of the survey and evaluation section. Recommendations for each element of land use, as shown on the Recommended Land Use Plan map (Figure 4), are described below and followed by suggested means of implementation.

AREA

- Element: Streambelt.

Recommendation: The dominant feature of the land use plan is the streambelt. It is recommended that the area delineated as a streambelt in the Shunock River watershed be preserved as open space and for limited recreation activities. Maintaining a streambelt along the Shunock River will be a critical step toward protection of the water supply potential of the important aquifer located in this watershed.

Implementation: A local health ordinance is the simplest and most effective means of implementing this recommendation. A proposed "Ordinance Regulating Private Sewage Disposal Facilities" has been submitted to the Study Committee for its consideration. This ordinance would be of general benefit to the Town as a safeguard toward reducing the potential for a major sewage problem. The State Health Code provides only minimum standards for the installation and location of subsurface sewage disposal systems, especially in relation to water bodies. A local ordinance would establish much greater separation distances between on-lot disposal systems and the Shunock River and its tributaries then are presently required by the State Code.

SITE - CENTRAL SEGMENT

- Element: Natural Area.

Recommendation: In this segment the natural area consists primarily of floodplain, and it should remain as open space, either undisturbed or improved for recreation.

Implementation: According to the existing zoning regulation,

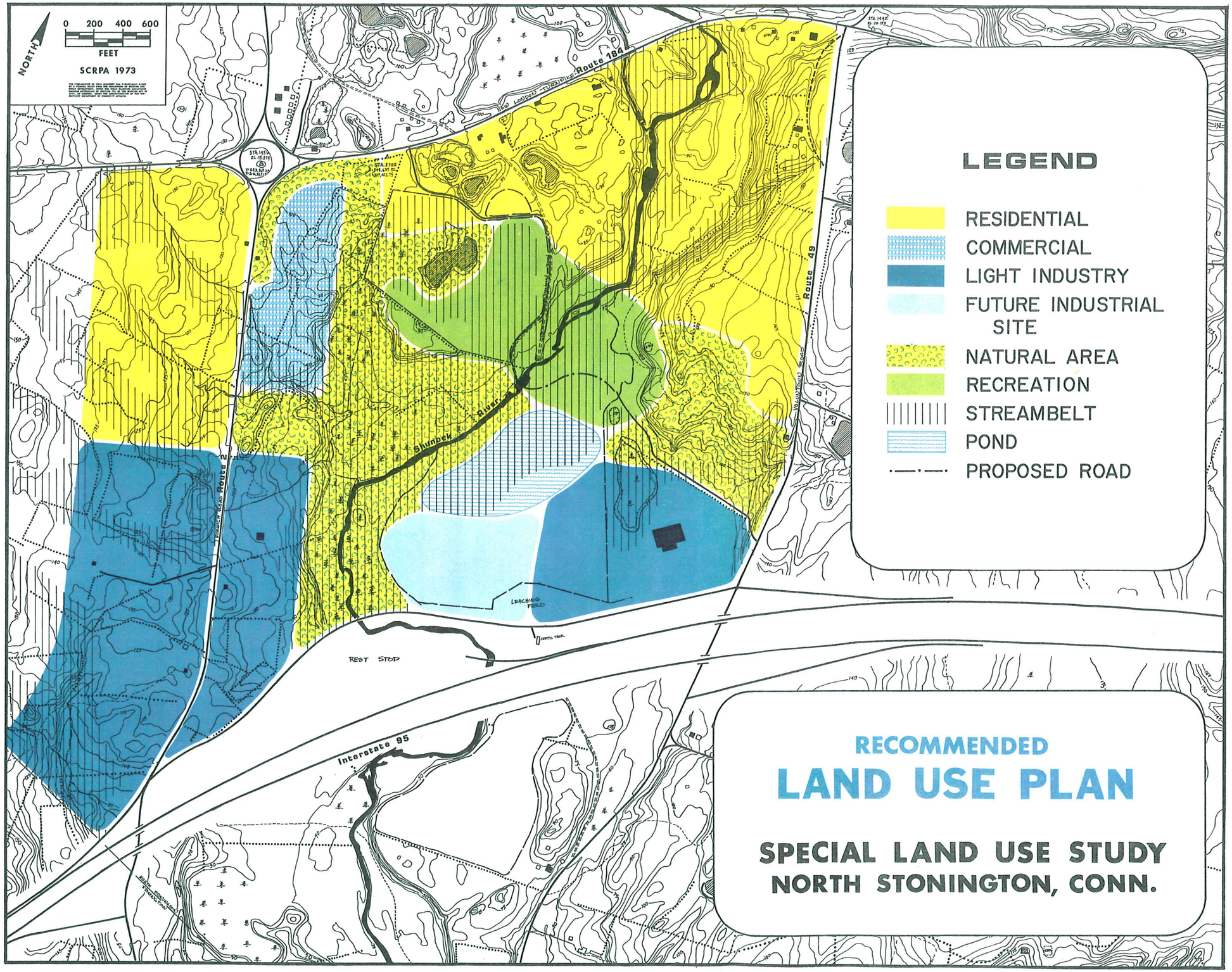

NORTH
0 200 400 600
FEET
SCRPA 1973
Route 184
Route 49
Shunpack River
Trumbull Road
Interstate 95
REST STOP
LEACHING FIELD
SEPTIC TANK
LEGEND
RESIDENTIAL
COMMERCIAL
LIGHT INDUSTRY
FUTURE INDUSTRIAL SITE
NATURAL AREA
RECREATION
STREAMBELT
POND
PROPOSED ROAD
RECOMMENDED
LAND USE PLAN
SPECIAL LAND USE STUDY
NORTH STONINGTON, CONN.

FIGURE 4

"No building except a boathouse shall be within 10 feet of any watercourse or wetland area, or, if subject to flooding, within 10 feet beyond its flood line." Enforcement of this provision of the zoning ordinance will not permit any development within the floodplain area as defined on the Physical Characteristics Map (Figure 2).

- Element: Pond.

Recommendation: A bypass pond, developed by the further excavation of sand and gravel, would serve a variety of functions. Properly designed, a pond could help reduce the potential flood level. Located along the Shunock River in the center of the site, a pond would be a focal point for recreational activities, and it could serve as an attractive landscape feature for future industrial activities located on the site.

The area, slope and depth of the pond would be dependent upon its function and the amount of useful sand and gravel available for excavation.

Implementation: The simplest method of implementation would be to permit the landowner to excavate below the water table in accordance with a pond design plan approved by the Soil Conservation Service, the Department of Environmental Protection and the Town's Planning and Zoning Commission. The landowner should be encouraged to deed the completed pond to the Town for subsequent operation and maintenance.

An alternative to this approach would be for the Town to apply to the Eastern Connecticut Resource Conservation and Development Project for funds to acquire and develop a multi-activity pond recreation area. Such an application would be made through the New London County Soil and Water Conservation District.

- Element: Recreation.

Recommendation: The balance of the excavated area is within the floodplain and should not be developed for an intensive type of land use. This area should be regraded as soon as possible and planted to prevent erosion, according to the standards of the Soil Conservation Service.

Especially if the pond is developed, this area would be ideal for recreation activities. It is accessible via existing roads from both Route 184 and Route 49. The Shunock River divides the excavated area into two sections. One area would include the pond and adjacent recreation site. The other could be planned for athletic fields and a picnic site.

Implementation: The regrading and planting of the excavated area should be completed by the excavation operators at the conclusion of the excavation. The land could then be purchased and

developed by the Town or by a private developer. Public acquisition and development can be assisted by state and federal open space programs. If the area is proposed for development for recreation use by private individuals, the plans for the proposed use should be reviewed by the Soil Conservation Service and approved by the Planning and Zoning Commission under special permit procedures.

- Element: Future Industrial Site.

Recommendation: Under certain conditions there is a potential for an industrial site located on the frontage road within the floodplain area. If the future industrial site designated on the Land Use Plan map was built up above the anticipated flood line level and a public sewer system was available to the site, it could be developed for a light industrial type of activity.

Implementation: If the above conditions were met the Town could rezone this general tract to a light industrial zone, which would permit research, professional, light assembly, warehousing and similar activities. The site design of an activity proposed in this location would need to be carefully reviewed by an engineer to determine that the drainage system would not produce runoff affecting the aquifer.

Sewers will not be available for between 10 and 15 years and by that time the Town will hopefully have an engineering capability to handle the design review of proposals for this area.

- Element: Wetland (see Figure 2).

Recommendation: The wetland area along the Shunock River should remain undisturbed as an element in the streambelt, or open space corridor, along the river.

Implementation: This wetland could be included in the wetlands protected under P.A. 155, the Inland Wetlands and Water Courses Act, if it is implemented by the Town.

- Element: Low Density Residential.

Recommendation: The land along Route 184 is a firmly established residential section and should remain residential.

Implementation: Maintain this section in the Residential-Village (R-V) zone.

- Element: Proposed Road.

Recommendation: The two existing roads entering the study site from Route 184 and 49 should be extended to provide access to all parts of the recreation area and pond.

Implementation: Since this road is intended only for access to the recreation facilities, it could be constructed according to very minimal standards. Responsibility for construction would depend on whether the recreation area and pond were in public or private ownership.

SITE - EAST SEGMENT

The survey and evaluation of this segment concluded that it has limited potential for industrial development. Low-density residential development was suggested as a potential land use, and the bedrock outcrop area was noted as an especially scenic feature of the site.

- Element: Low Density Residential.

Recommendation: The rocky and shallow to bedrock area along Route 49 could be attractively developed for single-family homes on large lots or possibly in clusters. There are occasional pockets of deep soil within this rocky area which would be suitable for locating septic systems. The landscape architect recommended the homes be located on a road constructed following the topographic contours.

Implementation: Rezone the area as delineated on the Land Use Plan map from Industrial to Residential-Village (R-V).

- Element: Natural Area.

Recommendation: Maintain the bedrock outcrop area as open space, serving as a buffer between the residential development and industrial activity.

Implementation: This area will be too costly to develop for housing or industry and would probably remain in a natural state in any case. If this area was included in a subdivision proposal designed on the cluster principle, it could be included as part of the required open space in the subdivision design.

- Element: Light Industry.

Recommendation: A limited type and density of industrial activity could be permitted near the intersection of Route 49 and the I-95 frontage road in the southeast corner of the study site.

Implementation: Introduce a new zone to the Zoning Regulations called Industrial-Designed (I-D) zone. This zone would permit no activity that produces any treated or untreated wastes other than human wastes. The overall density of a proposed use in this district should not exceed a density of 16.6 employees per

40,000 square feet of lot area. Uses permitted in this zone should be activities such as light industrial manufacture and assembly, research and analysis, electronics, professional offices and warehousing. The procedure employed to determine the permitted density for a light industrial activity in the I-D zone is shown in the Appendix to this report.

SITE - WEST SEGMENT

The survey and evaluation section concluded that development in this segment could be permitted only if the type of activity, the density and the site design is strictly controlled.

- Element: Light Industry.

Recommendation: An approximately 24-acre area east of Route 2 and 64 acres west of Route 2 could be planned for light industrial activities under the same conditions as outlined above.

Implementation: The same implementation procedures apply here as were discussed under the previous element. Because of the possibility of groundwater contamination resulting from overdevelopment along the edge of the aquifer in the low-lying part of the site, the types of industrial uses and the density of employment should be controlled. Establishment of the new I-D zone would afford the necessary protection to this area. Action by the Planning and Zoning Commission is necessary to carry out this recommendation.

- Element: Commercial.

Recommendation: The area along the eastern side of Route 2, just south of the rotary intersection should be reserved for commercial development.

Implementation: The Highway Commercial (H-C) zoning designation, presently provided for in the Town's zoning regulations, should be applied to this area. Furthermore, all uses permitted in the H-C zones should be classed as special exceptions.

The maximum financial benefit to both the Town and the property owner in this area can be realized only by careful adherence to site development controls. Therefore, special site development criteria should be included in the zoning regulations for uses permitted in H-C zones. These criteria should be aimed at achieving a coordinated development of all properties within the individual zones. The Planning and Zoning Commission must be assured that, as each segment of an H-C zone is developed, it is compatible with and complimentary to the ultimate development potential of the entire zone.

- Element: Natural Area.

Recommendation: Buffers should be established between the commercial area and the rotary intersection and between the commercial area and the light industry area along the east side of Route 2.

Implementation: The buffer by the rotary intersection is desirable for traffic safety. The one between the commercial and industrial areas would separate possible incompatible land uses and provide a visual break in development along the road frontage. These buffers could be included as part of the site design requirements as each property is proposed for development.

- Element: Residential.

Recommendation: The area fronting on the west side of Route 2 just south of the rotary intersection with Route 184 should be used for residential development that will not adversely affect the traffic conditions on the state highway.

Implementation: Residential subdivisions proposed for this area should be designed with a minimum of access points on the state highway. Subdividers should be urged to have lots abutting Route 2 front on interior streets.

* * *

In addition to the specific recommendations discussed above, it is suggested that the Recommended Land Use Plan shown on Figure 4 be adopted as soon as possible by the Planning and Zoning Commission as a part of the North Stonington Plan of Development. The plan for the study site would then provide an official guide for subsequent changes in the zoning map and regulations. Zoning changes should also receive early consideration in order to ensure that all future development in the study area is compatible with the Recommended Land Use Plan.

APPENDIX

PROCEDURE FOR DETERMINING PERMITTED DENSITY FOR LIGHT INDUSTRIAL ACTIVITY

Standards:

A. No activity will be permitted that produces any toxic waste discharge, whether treated or untreated.

B. The amount of waste water generated by the industrial employees should not exceed that which would be generated by single-family homes on one-acre lots with four persons per family.

C. Each person in the family generates a maximum of 125 gallons of waste water per day, for a total of 500 gallons per residential acre, while the average amount of waste water generated by an industrial employee is 30 gallons per day, exclusive of process water.

Formula:

$$\frac{\text{500 gallons/day/per single-family dwelling}}{\text{30 gallons/day/industrial employee}} = \text{16.6 industrial employees permitted per acre}$$

Source: Community Water Systems Source Book. J. Ameen, 1971.