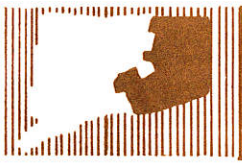
environmental review team report

SEPTAGE LAGOON

Essex, Connecticut



RC&D

EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ASSISTED BY: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND COOPERATING AGENCIES

ENVIRONMENTAL REVIEW TEAM REPORT
ON THE
SEPTAGE LAGOON
ESSEX, CONNECTICUT

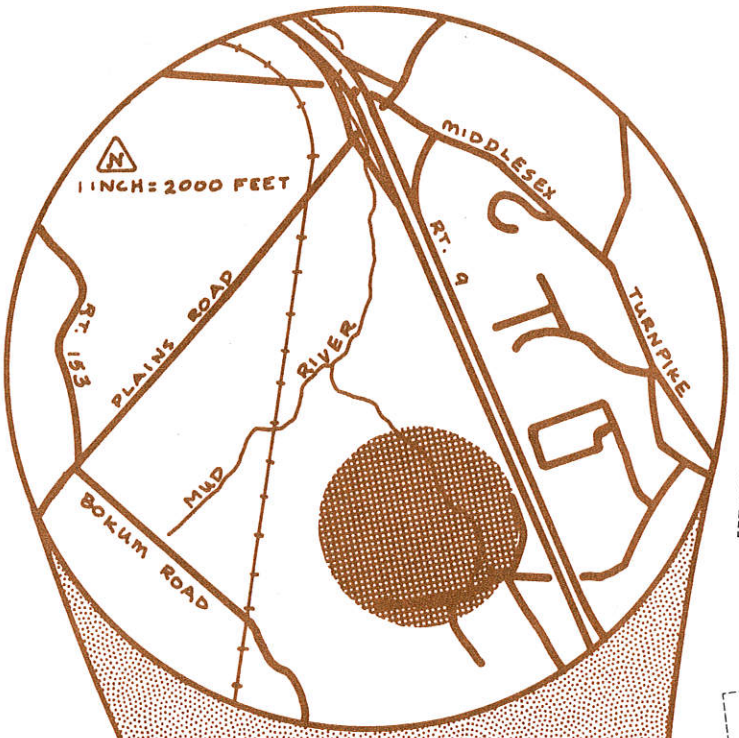
DECEMBER, 1973

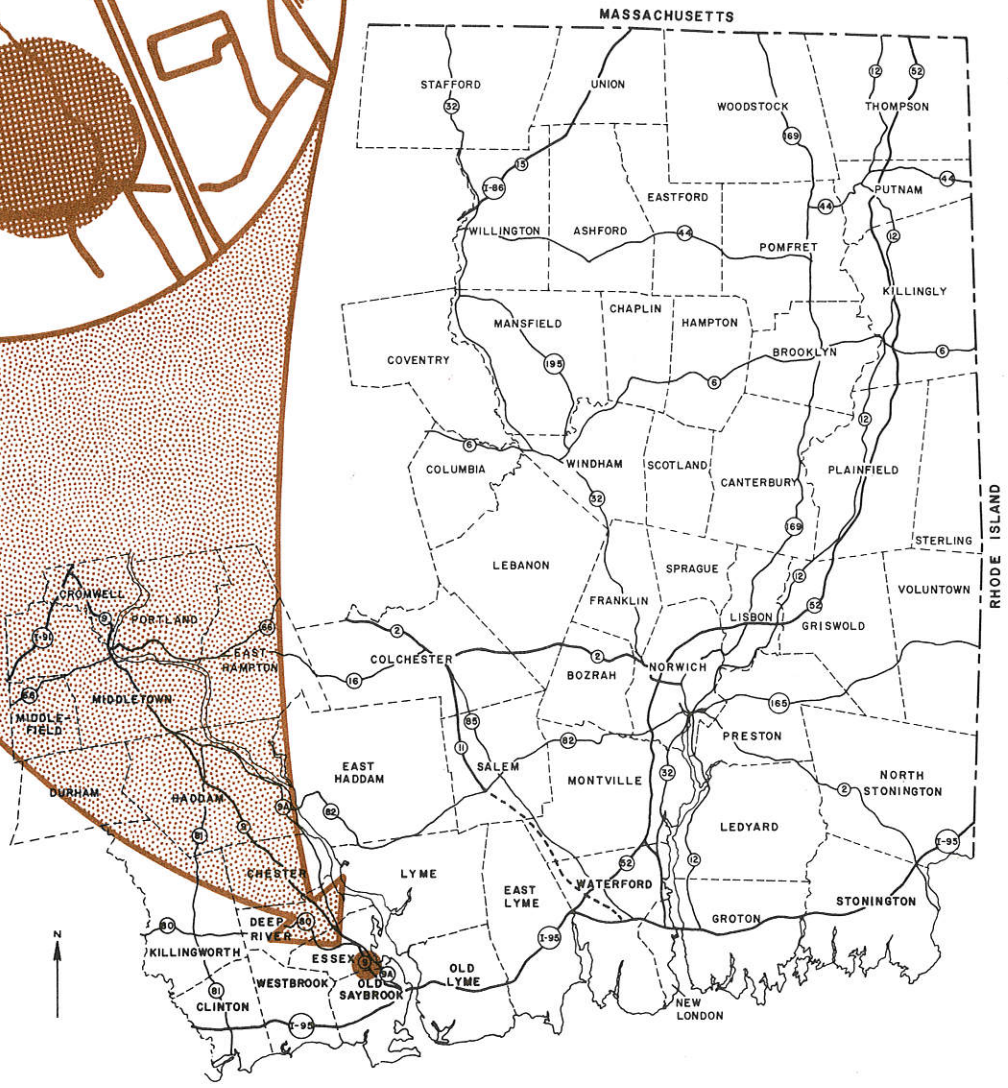
Preparation of this report has been, in part, assisted by a grant from the New England Regional Commission administered by the Southeastern Connecticut Regional Planning Agency

EASTERN CONNECTICUT RESOURCE CONSERVATION
AND DEVELOPMENT PROJECT
Environmental Review Team
139 Boswell Avenue
Norwich, Connecticut 06360

LOCATION OF STUDY SITE

SEPTAGE LAGOON
ESSEX, CONNECTICUT





EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT
ON THE
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ESSEX, CONNECTICUT

This report is an outgrowth of a request from the Town of Essex, with the approval of the owner, to the Middlesex County Soil and Water Conservation District (S&WCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Project Committee for their consideration and approval as a project measure. The request has been approved and the measure reviewed by the Environmental Review Team.

The soils of the site were mapped by a soil scientist, of the USDA Soil Conservation Service. Reproductions of the soil survey, natural soil group descriptions, and a soils limitations chart were forwarded to all members of the Team prior to their review of the site.

The Team that reviewed the site consisted of the following personnel: C. Donald Summers, District Conservationist, Soil Conservation Service (SCS); Barry D. Cavanna, District Conservationist (Acting), SCS; Dennis Hutchison, Soil Scientist, SCS; Dwight Southwick, Engineering Specialist, SCS; Richard Hyde, Geologist, Natural Resource Center, State of Connecticut Department of Environmental Protection (DEP); T.W. Workman, Water Compliance, DEP; Donald Capellaro, Sanitarian, State of Connecticut Department of Health; David R. Miller, Climatologist, Connecticut Cooperative Extension Service (EXT); John J. Kolega, Agricultural Engineer, EXT; Stanley Greimann, Planner, Connecticut River Estuary Regional Planning Agency; William L. Lucas, Project Coordinator, Eastern Connecticut RC&D Project, SCS; Barbara Hermann, Team Coordinator, Eastern Connecticut RC&D Project.

The Team met and reviewed the site on November 1, 1973. Reports from each Team Member were sent to the Team Coordinator for review and summarization.

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. The report identifies the existing resource base and evaluates its significance to the septage lagoon operation and also suggests considerations that should be of concern to both the Town of Essex and the operator of the lagoon. The results of this Team action are oriented toward the development of a better environmental quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Committee hopes you will find this report of value and assistance in making your decisions on this particular site.

If you require any additional information, please contact: Miss Barbara A. Hermann (889-2324), Environmental Review Team Coordinator, Eastern Connecticut RC&D Project, 139 Boswell Avenue, Norwich, Connecticut 06360.

INTRODUCTION

The Environmental Review Team was requested to evaluate an existing septage lagoon on the Wollock property in Essex, Connecticut. The operation was begun in June, 1973, when local septic pumpers declared a moratorium on pumping due to the absence of local septage pits. In the process of establishing a site the Board of Selectmen overlooked both local zoning regulations and the State Department of Environmental Protection permit procedure. This has been a focal point for public controversy along with the concerns of the adjoining neighborhood over traffic, odor, and potential water pollution.

The Wollock property is located in a rural residential zone, which is basically a one acre/single family district. There is a gravel extraction operation currently underway on the property. This activity has been going on for at least five years and probably longer. The owner's ultimate intent is to subdivide the land for residential use when the gravel is exhausted, using the newly-created pond(s) as a focus. This development is expected to begin in about two years at which time the Town of Essex will have to find a new location for a septage lagoon.

The regulatory problems in establishing the present septage operation are being taken care of. The purpose of this report is to consider the existing and potential environmental aspects of the septage lagoon as it relates to the immediate site and the surrounding area. Recommendations for alleviating and/or preventing problems will be made, keeping in mind that this is a temporary facility for which major financial investments should be minimized, if possible. Most of the suggestions made would be applicable to future septage lagoons as well.

EVALUATION

GEOLOGY AND HYDROLOGY

The type of bedrock found at the Wollock site (Bedrock Geology Map, QR-15) is the Putnam Gneiss, which in this area is listed as a sparsely garnetiferous magnetite-bearing biotite-muscovite schist. This rock's general trend or strike is nearly east-west and it dips slightly to the west of north at an angle of 75° to 80°. This means the rock plunges into the earth in a northerly direction at a very steep angle.

The bedrock surface is quite irregular, containing pockets and hollows which, in glacial time, were filled with sand. Presently, the active lagoon site appears to be situated in a sand filled depression which is shaped like a small horseshoe with its opening facing north towards an excavated overflow lagoon. The eastern bedrock margin of this depression is exposed at the land's surface and shows signs of having been dynamited. This process has disrupted the rock and increased the number and size of its cracks and openings. The western rock border is less well defined, but based on the topography and exposures of outcrops along the powerline, it appears to swing around, blocking the southern and western sides of the lagoon.

The surface materials of this portion of the sand and gravel pit have been preliminarily mapped as sand by Dick Naylor, geologist, Wesleyan University, in his "Unconsolidated Materials Map of the Essex Quadrangle" (unpublished). In this mapping system, a sand classification means particle sizes can range from 25 percent coarse and 75 percent sand-sized,* to 100 percent sand-sized, to 50 percent sand-sized and 50 percent fines. Locally this classification may also contain minor amounts of finer particles.

During the time when the glaciers were melting and shedding their burden of clays, silts, sands, and gravels, this site became covered with a veneer of sands. Because of the irregular bedrock surface these deposits were thicker in some places than in others. The sand and gravel operator has stripped away the more accessible materials leaving those deposits trapped within the bedrock hollows and depressions. The present septage lagoon site is in such a deposit. These sands may reach a maximum thickness of 15 to 20 feet, but they thin quickly as the rock side of the horseshoe is encountered.

Rain and snow rapidly infiltrate these deposits** and travel

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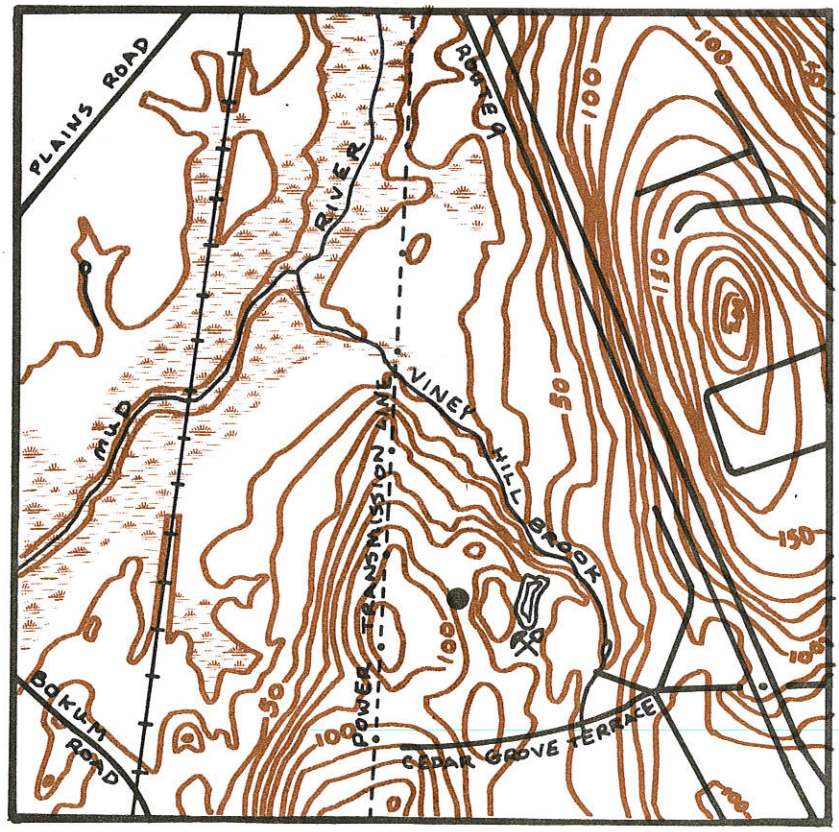
* The Wentworth Scale, which is the size system used in the materials map, considers sand as those particles having a diameter ranging from 2 millimeters down to 0.063 millimeters.

** A soil survey of the area (see Appendix) indicates that the soils in the area adjoining the gravel pit are also moderately to rapidly permeable.

downward to the water table unless some less permeable barrier is reached first, such as the bedrock surface. In this situation the water moves down slope along the rock's surface and is taken slowly into its cracks and openings. Generally, the water table assumes the same shape as the land surface. Groundwater moves by the force of gravity downhill to discharge into valley brooks, just as surface runoff does.

At the Wollock site, Viney Hill Brook is the principal discharge area for local groundwater and surface water runoff. There is a possibility that some subsurface water may travel down dip along the bedrock's joints, fractures, and bedding planes to be discharged in the swamp area west of the power lines. Once discharged into either of these water bodies, it travels into and down the Mud River, into the Falls River, and eventually into the Connecticut River at Foxboro Point. The topography map below shows the relationship of the site to Viney Hill Brook, the swamp west of the power lines, and the Mud River. In the immediate area of the gravel pit operation, the topographic lines may not be accurate due to changes resulting from excavation.

TOPOGRAPHY



● APPROXIMATE LOCATION OF SEPTAGE LAGOON

N 1 INCH = 1000 FEET

EXISTING OPERATION

The existing septage lagoon is about 50 to 60 feet in diameter and about 4 or more feet deep. An overflow pond of similar size has been dug immediately to the north, though it has received no use as yet. When the Environmental Review Team visited the site, the depth of septic waste fluid was from 3 to 12 inches in the lagoon, indicating that the host sands were still accepting and carrying away liquids as they were dumped. This situation will probably continue for some indefinite period of time until the septic sludge and suspended particles can permeate the sand and form a barrier or crust which inhibits infiltration of fluids.

Once a crust has formed and the depth in the lagoon increases, the excess liquid, fairly free of suspended particles, should pass out of the lagoon into the overflow pond. Until the crust is formed, however, unaltered septic fluids will continue to be released from the truck and allowed to infiltrate into the host sands where they travel down to the water table. At this point the fluids mix with the groundwater, and the factors of dispersion, dilution, and a minor amount of attenuation take place until the groundwater is finally discharged into one of the nearby surface water courses travelling to the Connecticut River.

POTENTIAL HAZARDS

Water Pollution. One of the major concerns with the septage lagoon is the possible contamination of surface and/or ground water. The Connecticut Water Company has two production wells approximately 1 and 1 1/2 miles downstream of the site on the Mud and Falls Rivers. While this is a considerable distance to afford protection of the water quality of the aquifer, it is not to infer that precautionary measures should not be taken. Contamination of surface waters near the lagoon site could also pose a public health hazard.

Below is a calculation utilized by the U.S.G.S., Water Resources Division to give a rough estimate of the 7 day minimum flow (low flow) for streams over a 10 year period. The results of this calculation can then be compared to the amount of septic fluids potentially entering the ground water at the lagoon to determine a rough dilution ratio during periods of low flow.

$$M_{7\text{-}10\ Yr.} = .015\ (\text{Drainage area in sq. mi.})^{1.37} = \text{low flow in cfs} \pm 83.2\%$$

The Mud River drainage area is 3.2 square miles from its mouth at Essex, including the Tiffany and Viney Hill Brook systems.*

* "Gazetteer of Natural Drainage Areas of Streams and Water Bodies Within the State of Connecticut," U.S.G.S., Water Resources Division, 1972.

Therefore, using the above equation, the low flow is estimated to be .07380 cfs or 47,700 gallons per day.

On the conservative side, this means if 1,000 gallons of septic effluent are dumped into the lagoon each day, and all of this fluid reaches the surface watercourses and is carried to the mouth of the Mud River, then during the seven day, 10 year low flow, the dilution ratio will be 1 to 47.7 or, roughly, 1 to 50.

By sealing the bottom of the lagoon, infiltration of the septic fluids into the surrounding ground and surface water can be prevented. The volume of the existing lagoon is about 18,500 cubic feet. With an anticipated yearly volume of septic waste fluid of 36,800 cubic feet, the lagoon can accommodate about 6 months storage, assuming that surface run-off is diverted away from the lagoon and that the rainfall does not greatly exceed evaporation.

Odor. A properly designed and operated septage lagoon should not create a significant odor problem. Odor could be a problem here if the site actually gets more usage than is planned. Weather records could be used to determine wind direction and velocity probabilities for each season of the year. These in return could be used to give an idea of when, where, and how far away an odor problem is likely to occur. If an odor problem is found to exist, it could be minimized by planting the site with rows of vegetation (windbreaks) to keep the odor from blowing so far and to absorb as much as possible on the leaf surfaces. Some odor control is also possible through the addition of various chemicals.

Safety. The facility also needs improved safety features to avoid being an attractive nuisance and hazard to small children. Fencing could accomplish this.

Traffic. Access to the site presently necessitates invading a residential neighborhood. However, it is a neighborhood which presumably has lived with a fair amount of truck movement for a number of years due to the sand and gravel operation. The addition of a few more trucks, provided they are properly sealed and washed, ought not to be too serious. Both the gravel operation and the septage lagoon are to be phased out within a couple of years, if the owner proceeds with his plans for residential development.

An alternate approach road could be developed, at additional cost to the town, from Bokum Road. This would transfer the traffic to another neighborhood with fewer numbers. However, the road would be narrower and more hazardous and would increase the cost of a temporary public facility.

COMPATIBILITY OF SURROUNDING LAND USES

The septage lagoon site is well isolated by a distance of at

least 1,000 feet from the nearest residential area. The only major intrusion as a result of the septage lagoon would be the truck traffic, which was reported by the town to average one truck per day. As a temporary facility, it seems a reasonable use of a presently disturbed site.

Nearby undeveloped land which might be subject to an odor problem should not be developed while the lagoon is in operation.

ALTERNATIVE LAND USES FOR THE AREA

The Essex Town Plan and Zoning Regulations identify the area as one intended for low density residential development. There is also some local interest expressed in developing the site for town recreation purposes.

ALTERNATIVE COURSES OF ACTION

There are several options possible with respect to the septage lagoon itself, as well as a number of improvements that may be implemented irregardless of the final septage lagoon design. These suggestions are presented here for consideration by the town and should not be construed as mandatory actions.

A. No change in the present system.

B. Seal the bottom of the present lagoon. This can be done by using Bentonite (rate, 150 lbs./100 sq. ft.) or another suitable material. This would allow settling and some renovation of the septic material. As the lagoon fills to capacity, the supernatant would spill over into the overflow lagoon and be permitted to enter the ground.

C. Design and construction of an oxidation and stabilization lagoon. This would operate in a fashion similar to alternative B, but the surface area and depth would be designed in conjunction with the expected volume to allow adequate aeration and penetration of sunlight to insure renovation of the septic materials.

D. The land around the lagoons should be regraded to prevent surface water from entering the lagoons. All disturbed areas should be limed and fertilized to soil test recommendations and seeded. A mixture of 20 lbs. Kentucky 31 tall fescue, 20 lbs. creeping red fescue, and 10 lbs. crownvetch per acre is suggested. Seeding should be mulched with 1 1/2-2 tons per acre of high quality straw.

E. The odor could be reduced by installing a means for trucks to discharge their wastes below the lagoon surface.

F. A truck-washing facility could be constructed on the site to insure proper and frequent cleaning. If this is determined to be too great an investment for a temporary facility, trucks should be required to meet certain standards before being permitted to use the septage lagoon.

G. In order to monitor ground water quality in the vicinity of the lagoon, a test well should probably be installed between the disposal site and the Viney Hill Brook. Water samples could be collected periodically for appropriate laboratory examinations.

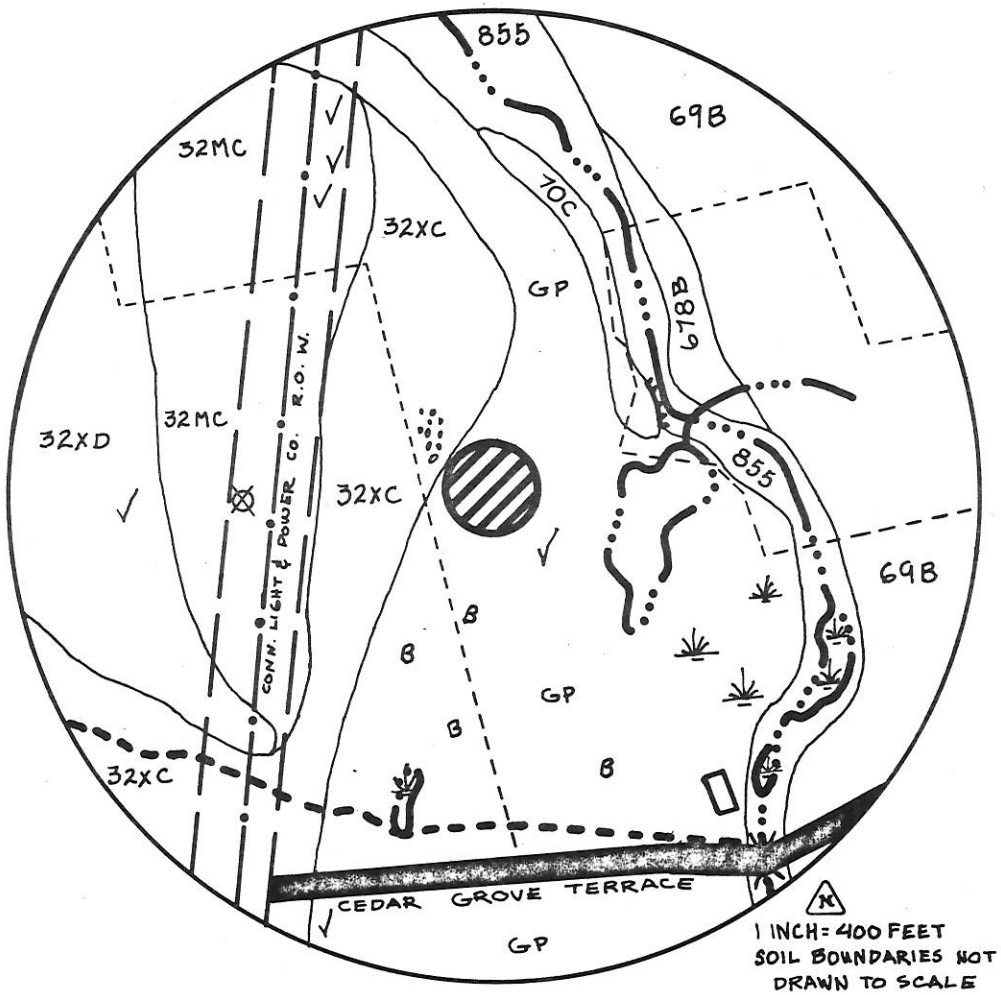
H. Fencing around the site would improve the safety of the facility, particularly with regard to small children living in the area.

I. An option exists regarding disposal of the fluids from a sealed lagoon. Rather than discharging them to an overflow lagoon, they could be pumped and sprayed onto the woodland just north of the area. Spraying at a rate not to exceed the infiltration rate of the soil, the volume could be sprayed on about one acre of woodland in one application in one day. The spraying should be done during the growing season so vegetation would utilize most of the nutrients.

In general, the team considered alternative B in conjunction with D as the minimum in desired improvements, with only minor financial investment required. Alternative C would provide greater purification of the septage material, but would incur additional engineering and construction costs.

Any steps taken to improve the present septage lagoon must be decided upon by local and state officials. It is hoped that this report will assist not only in making those decisions, but also in locating and establishing a permanent site elsewhere in Essex.

APPENDIX



APPROXIMATE LOCATION OF LAGOONS

----- PROPERTY LINES

STEEP SLOPE

✓ LEDGE OUTCROP

B BOULDERS

GRAVEL DEPOSITS

INCONSISTENT AREAS OF FRAGIPAN

SOIL MAP

WOLLOCK PROPERTY
ESSEX, CONNECTICUT

Prepared by:

UNITED STATES DEPARTMENT
OF AGRICULTURE

Soil Conservation Service

ADVANCE COPY, SUBJECT TO CHANGE

OCTOBER, 1973

SOILS LIMITATIONS CHART

Natural Soil Group*	Mapping Symbols	Acres	Percent of Total Acres
A-1a	678B	1.1	1.5
A-1d	69B	12.9	17.9
A-1e	70C	0.9	1.2
B-1b	32XC	10.4	14.5
B-1c	32MC	10.4	14.5
B-1d	32XD	6.7	9.3
E-3a	855	5.2	7.2
Unclassified	GP	24.4	33.9
		72.0	100.0

Limitations for Septage Lagoons

All these soils have severe limitations for a septage lagoon. For natural soil groups A and B, the principal limiting factor is the moderate to rapid permeability. For the soil group E-3a, a high water table is the principal limiting factor. The gravel pit has areas of rapid permeability, ledge, and standing water, all of which impose severe limitations.

* Refer to Know Your Land, Natural Soil Groups for Connecticut, Soil Conservation Service, USDA Connecticut Cooperative Extension Service, for further explanation of the natural soil groups.