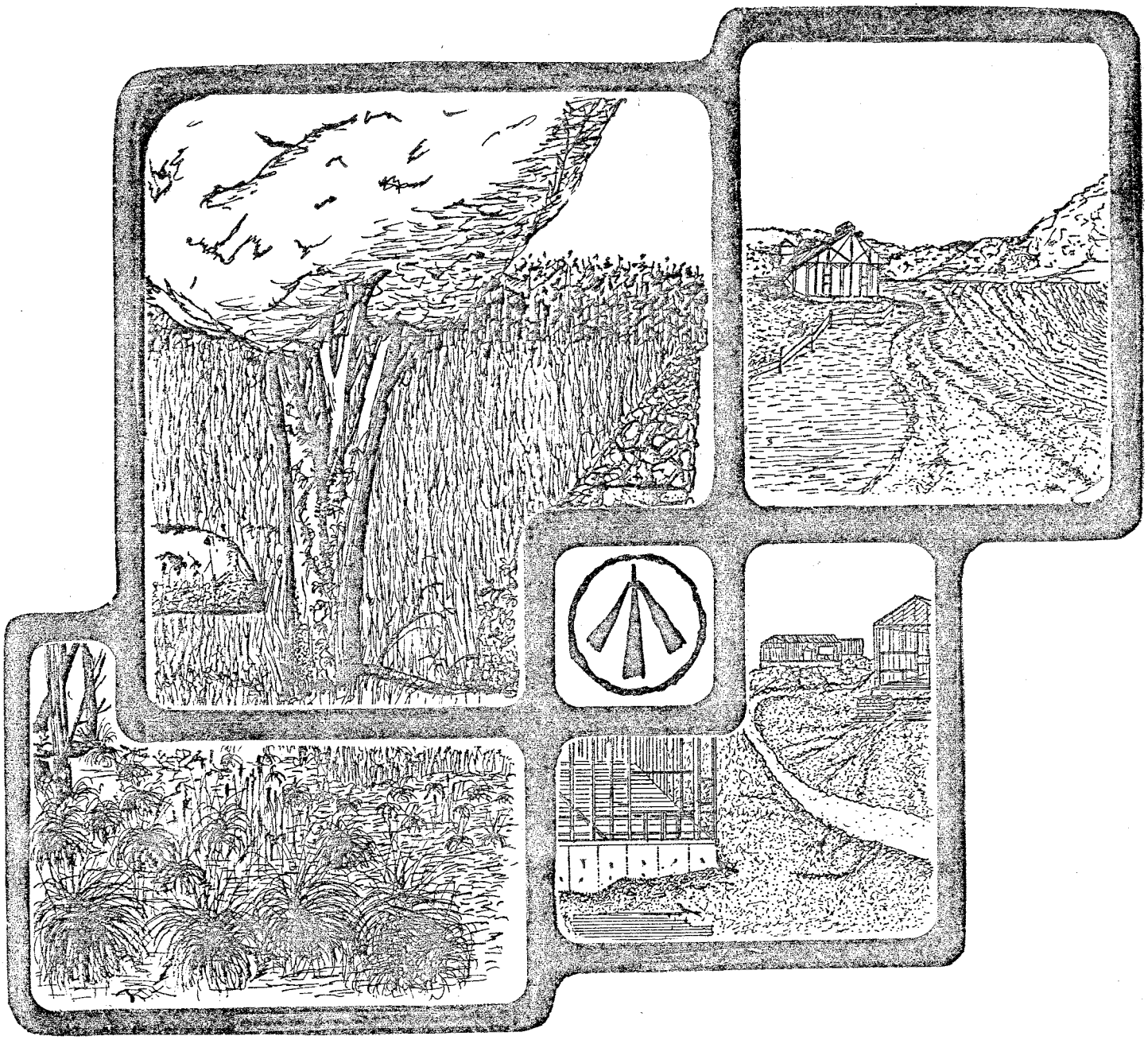
ENVIRONMENTAL REVIEW TEAM REPORT



LAKE COMO
BURLINGTON, CONNECTICUT

KING'S MARK
RESOURCE CONSERVATION & DEVELOPMENT AREA

KING'S MARK
ENVIRONMENTAL REVIEW TEAM REPORT

LAKE COMO
BURLINGTON, CONNECTICUT
DECEMBER, 1983

King's Mark Resource Conservation and Development Area
Environmental Review Team
Sackett Hill Road
Warren,Connecticut 06754

ACKNOWLEDGMENTS

The King's Mark Environmental Review Team operates through the cooperative effort of a number of agencies and organizations including:

Federal Agencies
U.S.D.A. Soil Conservation Service

State Agencies
Department of Environmental Protection
Department of Health
University of Connecticut Cooperative Extension Service
Department of Transportation

Local Groups and Agencies
Litchfield County Soil and Water Conservation District
New Haven County Soil and Water Conservation District
Hartford County Soil and Water Conservation District
Fairfield County Soil and Water Conservation District
Northwestern Connecticut Regional Planning Agency
Valley Regional Planning Agency
Central Naugatuck Valley Regional Planning Agency
Housatonic Valley Council of Elected Officials
Southwestern Regional Planning Agency
Greater Bridgeport Regional Planning Agency
Regional Planning Agency of South Central Connecticut
Central Connecticut Regional Planning Agency
American Indian Archaeological Institute
Housatonic Valley Association

x x x x x

FUNDING PROVIDED BY
State of Connecticut

POLICY DETERMINED BY
King's Mark Resource Conservation and Development, Inc.
Executive Committee Members

Victor Allan, Chairman, Bethlehem
Harold Feldman, Treasurer, Orange
Stephen Driver, Secretary, Redding
Leonard Assard, Bethlehem
Sam M. Chambliss, Ridgefield
David Hannon, Goshen
Irving Hart, New Hartford
Frederick Leavenworth, Woodbury
David Brooks, North Canaan
John Rabbe, East Hartford
Mrs. Julia Wasserman, Newtown
Donna Lindgren, Ansonia

STAFF ADMINISTRATION PROVIDED BY

Northwestern Connecticut Regional Planning Agency

Dorothy Westerhoff, Chairman
Charles A. Boster, Director
Richard Lynn, ERT Coordinator
Sandra Bausch, ERT Cartographer
Jamie Whitman, Secretary

LOCATION OF STUDY SITE

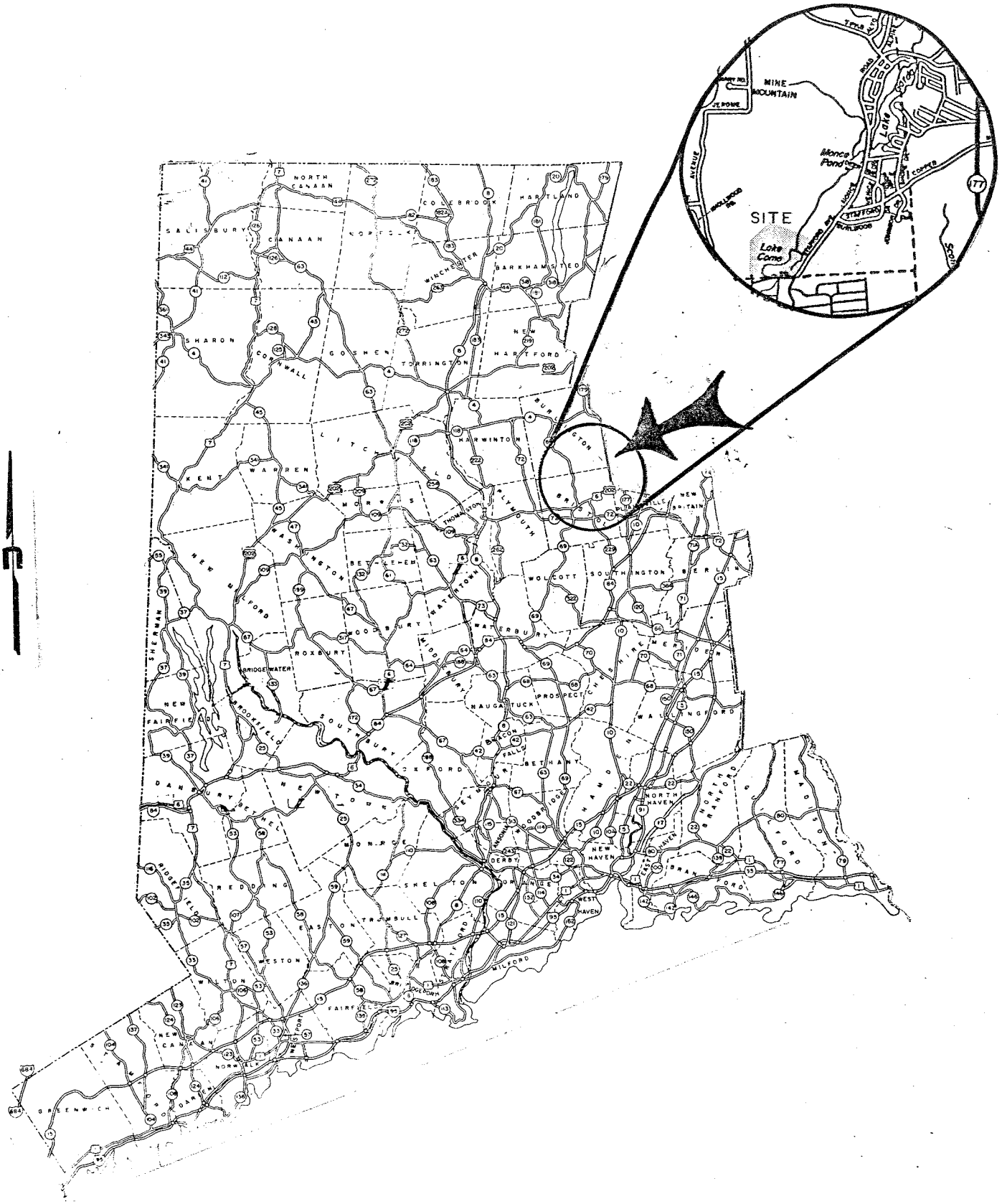


TABLE OF CONTENTS

LIST OF FIGURES

ENVIRONMENTAL REVIEW TEAM REPORT
ON
LAKE COMO SAND AND GRAVEL EXCAVATION
BURLINGTON, CT

I. INTRODUCTION

The preparation of this report on the Aiudi Property at Lake Como was requested by the Burlington Planning and Zoning Commission.

Lake Como is ± 15 acres in size and located in the southeastern quarter of town. As shown in Figure 1, the southern shore of the lake has been developed for single family residential use. The northern shore consists of a sand and gravel pit which is owned, together with the Lake itself, by "Aiudi and Sons".

Aiudi and Sons has a permit to excavate sand and gravel from the lake area and the northern shore. As shown in Figure 2, the excavation plan would create a deeper lake and regrade the northwest shore of the lake. The excavation permit will expire soon without the material being removed as planned. The Planning and Zoning Commission is concerned with 1) how the area can best be reclaimed in its present condition if the performance bond is called, and 2) how can the area best be reclaimed if the proposed excavation is completed as planned. Of major concern to the Planning and Zoning Commission is the protection of the water quality in Lake Como.

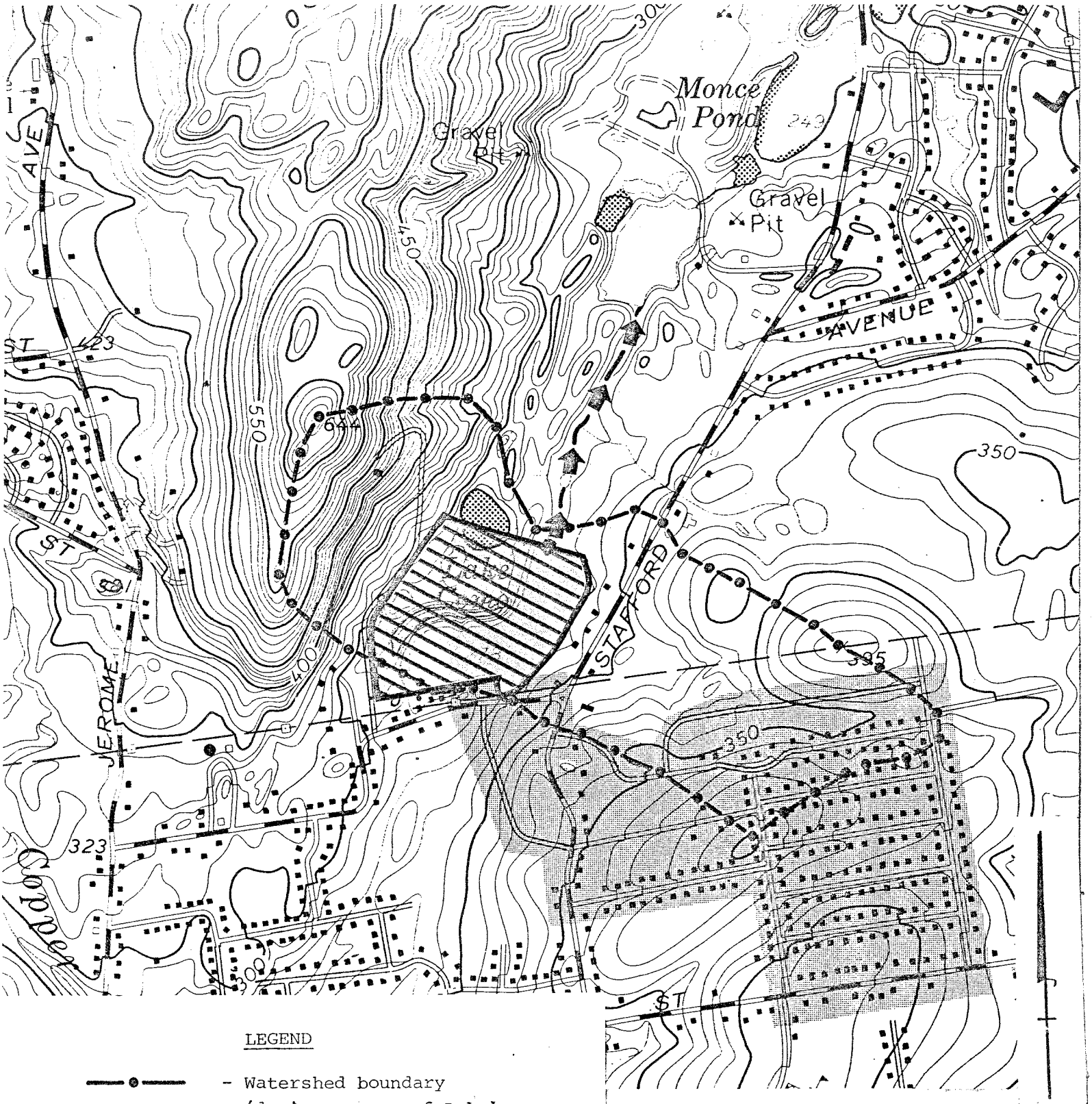
The ERT was asked to assist the Burlington Planning and Zoning Commission by 1) providing an inventory of the existing conditions at Lake Como and the Lake Como environs (e.g. erosion, aquatic life, lake flow, etc.) and 2) commenting on opportunities and limitations for reclaiming and/or improving the site with respect to existing and proposed conditions.

The King's Mark Executive Committee considered the town's request for assistance, and approved the project for review by the Team.

The ERT met and field reviewed the area on October 12, 1983. Team members participating on this review included:

Stephen Cashman	Soil Conservationist	U.S.D.A. Soil Conservation Service
William Hyatt	Fishery Biologist	CT Department of Environmental Protection
Nancy Marin	Lake Ecologist	CT Department of Environmental Protection
Dwight Southwick	Civil Engineer	U.S.D.A. Soil Conservation Service
William Warzecha	Geohydrologist	CT Department of Environmental Protection

Figure 1
TOPOGRAPHIC MAP

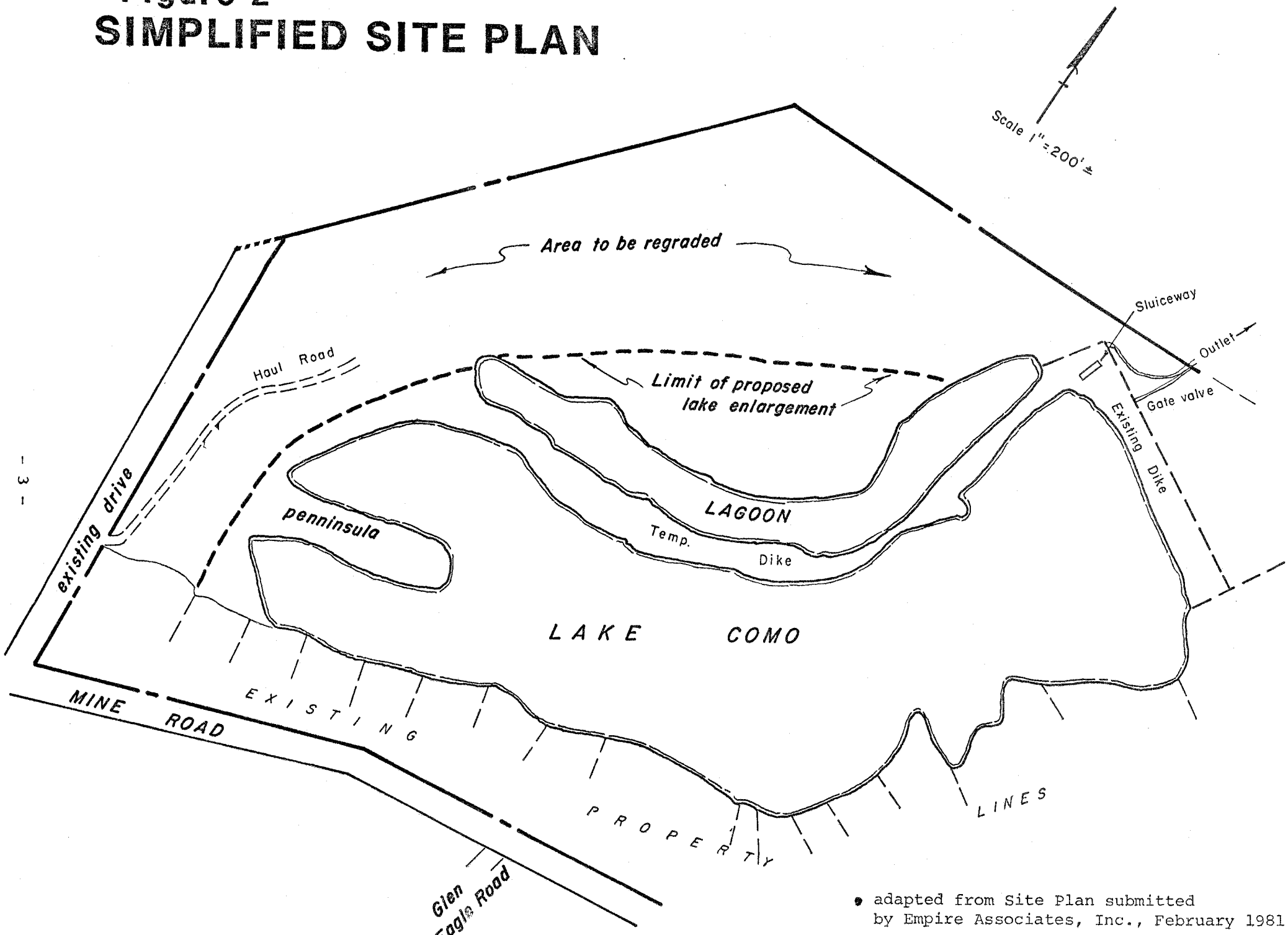


LEGEND

- Watershed boundary (drainage area of Lake)
- Watercourse showing direction of flow
- Aiudi Property (study site)

Scale 1"=1000'

Figure 2
SIMPLIFIED SITE PLAN



• adapted from Site Plan submitted by Empire Associates, Inc., February 1981

Prior to the review day, each team member was provided with a summary of the proposed project, a checklist of concerns to address, and a topographic map of the subject area. During the Team's field review, team members toured the Lake Como area and met with representatives from the town and the contractor, to discuss the situation at Lake Como. Following the field review, individual reports were prepared by each team member and forwarded to the ERT Coordinator for compilation and editing into this final report.

This report presents the Team's findings. It is important to understand that the ERT is not in competition with private consultants and hence does not perform design work or provide detailed solutions to land use problems. The ERT concept provides for the presentation of natural resources information and preliminary land use analyses. All conclusions and final decisions rest at the local level. It is hoped the information contained in this report will assist the town of Burlington and the landowner/contractor in making environmentally sound decisions.

If any additional information is required, please contact Richard Lynn, (868-7342), Environmental Review Team Coordinator, King's Mark RC&D Area, Sackett Hill Road, Warren, Connecticut 06754.

* * * * * *

II. HIGHLIGHTS

1. Lake Como presently has a surface area of approximately 15 acres, a drainage area of 177 acres, and an average depth of 3.5 feet. Given these conditions, it is estimated that it would take approximately 50 days or just under two months to refill if the Lake was drained and not enlarged or deepened. On the other hand, if the proposed plan is implemented, the surface area of the lake would be enlarged to approximately 20 acres with an average depth of approximately 10 feet. The retention time based on the proposed plan is estimated at approximately six months.

2. Prior to draining the lake, the Water Resource Unit of the Department of Environmental Protection should be contacted to discuss the proposed plan.

3. It is recommended that the brush and trees on the dam be cut and sod type vegetation established. This will enhance the stability of the dam. Also, the hydraulics of the spillways should be checked by a qualified engineer and an adequate spillway constructed if necessary. This will ensure the controlled release of water from the dam during major storm events.

4. In its present condition the fishery value of Lake Como is limited. In the opinion of the Team's fishery biologist, as long as the pond's depth remains unchanged, algae and/or aquatic weed proliferation will make Lake Como more of a nuisance than a benefit to residents of the area. Eventually, costly chemical treatments would become necessary to prevent large scale algae/weed problems and the associated odors of decaying vegetation and fish. The proposed excavation, with subsequent lake enlargement and deepening, would serve to significantly improve conditions within the lake from a fisheries standpoint. Following such an excavation the pond could be stocked with the following species: bluegill sunfish, large mouth bass, brown bullhead, golden shinner and crayfish.

5. An on-site investigation of the soils on the northwest side of the Lake revealed that most of the area consists of disturbed sand and gravel soils. At the present time, erosion from the project site is minimal and is not viewed as a problem by the Team's Soil Conservationist. It is recommended that a comprehensive erosion and sediment control plan be prepared and implemented for each phase of the proposed project.

6. In the opinion of the Team's Soil Conservationist, a project of this size and scope should be undertaken in phases to ensure that visual and environmental impacts are kept to a minimum. One area or "phase" should be completed before the next area is disturbed.

7. With attractive landscaping, the land will offer good potential for future residential development from an aesthetic standpoint. A major consideration with residential development of this area however is the nature of the underlying soils. Any proposal for residential development of this area should include detailed soil borings throughout the area to document soil conditions and suitability for developmemt.

8. The site would also offer potential for public recreational use, if so desired. Potential uses would include: 1) limited swimming, 2) nature trails, 3) picnic sites, 4) fishing, and 5) light boat use (row boat or canoe).

9. *If, for any reason, a quick reclamation of the site is needed or desired, the following should be done: 1) disturbed areas should be regraded to create gentle slopes on the property, 2) following regrading, topsoil should be applied together with lime and fertilizer and then the area should be seeded with grasses which are best suited to the existing conditions. Existing brush or other vegetation on-site should be left undisturbed where possible. If these above two steps are followed, the site would not present such a poor visual impact on the surrounding neighborhood, and erosion and sedimentation will be kept to a minimum.*

10. *Due to the present shallowness of the Lake, it is highly susceptible to accelerated eutrophication in the near future. Turbidity, weed growth, and algae blooms can all be expected to increase, thereby further degrading the value of the lake from a recreational and aesthetic standpoint. The proposed sand and gravel operation can greatly enhance the environmental health of Lake Como if judiciously implemented. Deepening the lake and contouring the lake bottom will also enhance the recreational use of the lake and provide a better fisheries habitat. Further, with conscientious regrading and landscaping, the northwestern shore of the Lake can be made very attractive from an aesthetic standpoint. The proposed project, therefore, if carefully implemented along the guidelines suggested in this report, offers the opportunity to dramatically improve the lake and its surrounding area. Clearly, the proposed project would be preferable to any attempted "quick fix" of the disturbed land on the northwestern shore.*

III. TOPOGRAPHY AND GEOLOGY

The Aiudi Property as shown in Figure 1 is located in the southeast corner of Burlington on the Bristol-Burlington town line. It occupies a valley between the southern tip of Mine Mountain and upland areas to the southeast of Lake Como. The topography of the site has been modified as a result of a sand and gravel extraction operation which has taken place during the past. With the exception of areas where earth has been piled up by grading equipment, the land surface throughout the site is generally flat.

Elevations range from a low of approximately 278 feet above mean sea level at the surface of Lake Como to a high of approximately 300 feet above mean sea level along the northern limits of the property. Residential homes have been developed along the southern shore of the lake as mentioned above.

The site is located in a section of Burlington which is encompassed by the Bristol topographic quadrangle. A surficial geologic map of the quadrangle has been prepared by Howard E. Simpson and published by the United States Geological Survey (Map GQ-145). The bedrock geologic map for the quadrangle has not been completed to date; however, pertinent bedrock information is available for review purposes only at the Natural Resources Center of the Department of Environmental Protection.

The surficial geologic map indicates that the Aiudi Property contains sediments that were deposited by meltwater streams in contact with glacier ice in the valley presently occupied by Lakes Como and Garda. These sediments, collectively called "ice contact stratified drift", consist of coarse gravel which is moderately well sorted and stratified (layered). Although sand and gravel are the predominant components of ice contact stratified drift, silt, clay and occassional large boulders are interspersed throughout it in small percentage.

Since much of the site has been modified during the past by the sand and gravel mining operation, the actual thickness of these deposits is unknown. Nevertheless, based on information available to the team geologist, thickness probably ranges from approximately 10 feet along the northern boundary to perhaps up to 40 feet throughout the remainder (Source: Hydrogeologic Data - Farmington River - Water Resources Bulletin #28).

The log of two residential wells drilled just south of Lake Como in the town of Bristol indicates the surficial deposits extend to a depth of 27 and 32 feet below ground surface.

Bedrock does not appear to outcrop on the site. Based on preliminary bedrock information compiled thus far for the Bristol topographic quadrangle, it appears the site is underlain mainly by a bedrock type known as New Haven Arkose (Source: Preliminary Bedrock Geologic Map for the Bristol Quadrangle, by Howard E. Simpson, and the Preliminary Geological Map of Connecticut by John Rodgers). New Haven Arkose is a coarse grained gray, pink and red arkosic rock (sandstone containing a high percentage of quartz and feldspar), with siltstone and silty shale layers.

IV. HYDROLOGY

Lake Como is an articial impoundment with a surface area of approximately 15 acres and an average depth of 3.5 feet. Information on the average depth of the Lake was supplied by the property owner. Based on the above information, Lake Como has a maximum storage capacity of about 17 million gallons of water.

Originally, Lake Como was located within the watershed of Cooper Mine Brook and was drained by an unnamed outlet stream at the southern tip of the Lake. This stream flowed approximately 3,000 feet in a southwesterly course until it merged with Cooper Mine Brook. According to the property owner, this outlet stream was blocked and a new outlet was created in the northern portion of Lake Como. This northerly outlet is controlled by two gate valves and an emergency sluiceway. The outlet stream for the lake now flows in a northerly direction towards Monce Pond and Lake Garda. An area of approximately 177 acres or .28 square miles now drains into Lake Como (see Figure 1).

Town officials questioned the team on how long it would take for Lake Como to refill once it had been drained and modified according to the proposed excavation plan. This value can be calculated from the formula for retention time which is equal to RXDXN, where V is the lake volume, R is the rate of runoff in the watershed, D is the approximate drainage area for the impoundment and N is a constant which equals the number of seconds in one year. "Retention time" is the time period required for a lake to flush once.

As discussed previously, Lake Como presently has a surface area of approximately 15 acres, a drainage area of 177 acres, and an average depth of 3.5 feet. Given these conditions, it is estimated that it would take approximately 50 days or just under two months to refill if the Lake was drained and not enlarged or deepened. On the other hand, if the proposed plan is implemented, the surface area of the lake would be enlarged to approximately 20 acres with an average depth of approximately 10 feet. The retention time based on the proposed plan is estimated at approximately six months.

Another method which may be used to estimate the time (in days) for Lake Como to refill is by applying regional duration curves which show the effects of basin geology on streamflow. These curves are illustrated in Figure 3 of the Connecticut Resources Bulletin #34 (available at the DEP Natural Resources Center in Hartford) and are used to estimate the flow duration characteristics of an outlet stream when no gaging station is present on the stream. By using the curves, an estimate of various flows at the basin outlet point can be determined. These curves are based on the percent of coarse grained stratified drift within the watershed.

TABLE I. ESTIMATED FLOW DURATION CHARACTERISTICS OF THE OUTLET POINT OF LAKE COMO

Percent of time flow equalled or exceeded	1	10	50	90	99
Flow equalled or exceeded in cubic feet per second (CFS)	1.96	1.89	.392	.168	.112

Flow equalled or exceeded in million gallons per day (mgd)	1.27	.54	.25	.10	.07
Time period (in days) to fill Lake Como if excavated as planned.	51	119	255	598	898

As shown in Table 1, the rate of re-fill for Lake Como will depend upon the amount of rainfall received during a given period of time. For example, an inflow rate of .168 cubic feet per second, which will be equalled or exceeded at least 90% of the time, would fill the enlarged lake in 598 days. On the other hand, a flow of .84 cubic feet per second (CFS), which will be equalled or exceeded only 10% of the time would fill the lake in 119 days. It should be noted that very low flows (i.e. 90% and 99%) are exceeded most of the time, where very high flows, (i.e., 1% and 10%) are exceeded only a small percent of the time.

Team members were also asked to comment on how the draining of Lake Como would affect septic systems serving lakefront residences along Stafford Avenue. According to town officials, approximately eight lakefront homes along the southeast shore of Lake Como are serviced by on-site sewage disposal systems. Of particular concern was whether or not effluent from leaching fields would "bleed out" along the side banks of the Lake once it is drained.

Providing the septic systems were installed in accordance with the State Public Health Code (i.e., septic system locations, proper capacity, separating distances, etc.) the draining of Lake Como should not adversely affect the functioning of the septic systems. In fact, lowering the water level of the lake will temporarily benefit the operation of the septic systems since the water table underlying the systems, which is hydraulically connected to the water level of the lake, will also be lowered. This should eliminate the chance of groundwater interference to the leaching system. Ideally, the most favorable conditions for on site sewage disposal systems include soils which have a deep water table, substantial depth to bedrock (7' or greater) and which are well drained. However, there is a possibility that if a septic system or systems were located too close (less than 25') to the high water mark of Lake Como, the effluent could "bleed out" once the lake is drained. For this reason, it is recommended by the Team's geohydrologist that the Town request a visual sanitary survey be conducted by the Bristol-Burlington Health District if and when the Lake is lowered. By conducting such a survey, health department officials should be able to determine whether or not septic systems are "bleeding out". Also, it will enable them to see if there are any pipes discharging domestic wastes into the lake, since normally such pipes would be under water. If any of these conditions exist, the necessary corrective measures could be taken by the health district which includes either renovating a failing septic system or to extending the public sewer line so it is accessible to the remainder of lake front homes.

PERMITS

Prior to draining the lake, the Water Resources Unit of the Department of Environmental Protection should be contacted to discuss the proposed plan. They can be reached at Room 207, State Office Building in Hartford or by telephone at 566-7220.

EROSION/SEDIMENT CONTROL

During the review, the water quality of Lake Como appeared to be cloudy. This may have been a result of precipitation which occurred on and before the day of the review, wind disturbance, or erosion and sedimentation within the watershed.

It is recommended that an erosion and sedimentation control plan, which is in strict compliance with local regulations, be formulated and implemented prior to any work being started on the site. The U.S.D.A. Soil Conservation Service office for Hartford County is available for assistance in the formulation and review of such plans. They can be reached at 688-4946.

OUTLET CONTROL STRUCTURES

The existing outlet structures are located on the north side of the lake through an existing embankment. The present owner said that a larger pipe was installed to give better draw down capabilities when the pond was drained. An environmental concern, when the pond is drained, is not to allow flow or discharge that would erode the stream bottom or banks downstream. Draining the pond before excavating it deeper and larger would reduce the potential damage from siltation to minor concerns. However, pumping the pond to keep water out during the excavating could produce silt which should be trapped. A small silt trap could be built just downstream from the outlet structure. Haybales with a 2-3 foot high berm of crushed stone would be quite effective. As long as the discharge is small, a silt fence could be effective. Consideration should be given to constructing a positive outlet that could drain the pond by opening and closing a valve.

The State DEP Water Resources Unit (Vic Galgowski), should be contacted for a permit because the enlargement of the lake by about one fourth increases to about 100 acre feet the volume of water that could flood downstream. Also, excavating through the dam to install a pipe drain would be more than normal maintenance and requires a permit.

It is recommended that the brush and trees on the dam be cut and sod type vegetation established. This will enhance the stability of the dam. Also, the hydraulics of the spillways should be checked by a qualified engineer and an adequate spillway constructed if necessary. This will ensure the controlled release of water from the dam during major storm events.

VI. FISHERIES

Lake Como is a shallow, 15 acre body of water with a maximum depth of only 5-6 feet and an average depth of about 3.5 feet. The pond is murky in appearance and complaints have been voiced in regards to this condition and questioning its water quality. It appears at present to be plagued by unicellular algae blooms. Additionally, the eventual encroachment of macrophytes (i.e. lake weeds) seems inevitable once sufficient muck has been deposited on the bottom. Bluegill sunfish, pumpkinseed sunfish and largemouth bass are present and provide a limited amount of recreational fishing.

Running parallel to Lake Como and separated from it by a dike, is a lagoon

approximately 35 feet in width and 25 feet in maximum depth (see Figure 2). This represents the most recent excavation site on the property. The water contained within this lagoon was observed to be much clearer than that in the lake. Bluegills of excellent size have been reported to inhabit the lagoon.

In its present condition the fishery value of Lake Como is limited. Panfish (bluegills and sunfish) do provide an enjoyable source of recreational fishing to children, however bass almost certainly exist in low numbers yielding only occasional catches. If unchecked, an abundance of weed growth in the lake could cause an overpopulation of sunfishes and subsequent stunting, thus further reducing the fisheries value of the pond. In the opinion of the Team's fishery biologist, as long as the pond's depth remains unchanged, algae and/or aquatic weed proliferation will make Lake Como more of a nuisance than a benefit to residents of the area. Eventually, costly chemical treatments would become necessary to prevent large scale algae/weed problems and the associated odors of decaying vegetation and fish. If no chemical action is taken to prevent excessive plant production, the following scenario can be expected to occur. In summer after several calm, cloudy days and warm nights, dissolved oxygen levels will drop to nearly critical levels for fish life. If large amounts of decaying plant matter (algae or weeds) are also present, conditions intolerable to the fish will result causing a "summerkill" of fish.

The proposed excavation, with subsequent lake enlargement and deepening, would serve to significantly improve conditions within the lake from a fisheries standpoint. However, if the excavation plans are not expanded to include deepening the eastern half of the existing lake basin, the problems previously mentioned are still likely to occur (i.e. algae, weeds, fish kills and odors). Thus it would be preferable from the viewpoint of both aesthetics and fisheries to 1) allow the developer access to the eastern half of the basin if it is financially solvent for him to do so, 2) encourage excavation to as deep a level as possible (20-25 feet) and 3) reconstruct the dam to the specifications dictated by the excavation. Caution should be taken to remove all waste material, such as muck, a sufficient distance away from the lake to prevent nutrient rich leechate re-access to the lake. Following such an excavation the pond could be stocked with the following species: bluegill sunfish, large mouth bass, brown bullhead, golden shinner and crayfish.

VI. SOILS AND SITE RECLAMATION

Soil Descriptions

An on-site investigation of the soils on the northwest side of the Lake revealed that most of the area consists of disturbed sand and gravel soils. There are a few undisturbed areas in the northern and western portion of the property which consist of Adrian Muck and Scarboro soils, both of which are wetland soils and have drainage ditches. Each of these soil types is briefly described below.

1) Adrian Muck - consists of organic soil, very poorly drained, with accumulations of organic matter from 1-1/2 feet to more than 20 feet in thickness.
   Seasonable high water table is generally between +1 and - 1' from the ground surface; however, due to drainage ditches it presently ranges from 0-3'.

2) Scarboro soils - consists of very poorly drained soils that have developed from sediment derived from igneous and metamorphic crystalline rocks and sedimentary Triassic rocks.
Seasonable high water table varies from, +1 to - 1'. In new ditch areas, fluctuation is approximately 0-2'.

3) Disturbed soils (known as udorthents, sands and gravel) - these areas are highly disturbed and may consist of fill over wetlands or cuts exposing the underlying sand and gravel. A few areas of undisturbed Hinckley soils may also be present.

It should be noted that in areas where Scarboro and Adrian soils are covered with sand and gravel fill materials, excavations below the fill materials may not be economically feasible.

While dredging of Lake Como is underway, sideslopes need to be kept gradual. The sand and gravels have very unstable slopes, and a minimum sideslope should be 2:1 with 3:1 being more desirable. Slopes steeper than 2:1 will tend to slough, possibly causing a safety hazard.

Depth to bedrock in this area according to USGS Survey of Bristol Quadrangle as mapped by Elinor Hardman and Daniel Meade, varies from 10-25+ feet.

Sediment and Erosion Control

There are several areas of concern pertaining to erosion and the proposed project. These include:

1) Maintaining or establishing vegetative cover over disturbed areas.

2) Erosion control at lake outlet during proposed draining in fall and winter months.

3) Silt runoff from disturbed soils.

4) Runoff control from hillside above gravel pit.

Some possible alternatives for solving these problems are as follows:

1) Minimize disturbance of vegetation to only the area being mined. In those areas being mined, strip and stockpile all usable organic material suitable to reestablish a cover crop. These practices will help to provide stability against wind and water erosion on the site.

2) Install an energy dissipator at the lake outlet to protect against washouts and downstream soil erosion.

3) Sediment basins should be built in each area proposed for excavation. All runoff from the disturbed areas should be directed through the basin. It should be noted that at the present time, erosion from the project site is minimal and is not viewed as a problem by the Team's Soil Conservationist.

4) Diversions may be needed across the northern portion of the property to assist in keeping the working area as dry as possible.

It is recommended that a comprehensive erosion and sediment control plan be prepared and implemented for each phase of the proposed project. Assistance in preparing and reviewing erosion and sediment control plans is available from the USDA Soil Conservation Service office in Windsor (688-4946).

Project Phasing

The Site Plan (dated February 1981) reviewed by the ERT provided no "time frame" for the proposed project. In the opinion of the Team's Soil Conservationist, a project of this size and scope should be undertaken in phases to ensure that visual and environmental impacts are kept to a minimum. One area or "phase" should be completed before the next area is disturbed. This concept of "phasing" the project is supported in the recently adopted "sand and gravel"zoning regulations for Burlington which state that "at no time shall more than one area, not to exceed five (5) acres, be opened within the lot" (Section 12.5K).

Future Site Use

The ERT was asked to comment on the future use potential of the site following completion of the proposed project. Specifically, the Team was asked to comment on its potential for residential use and, alternately, recreational use.

Upon completion of the proposed project, there will be about 12 acres of land within the site to the north and west of Lake Como. With judicious regrading of this area upon completion of the mining operation, the land should be gently sloping and offer a nice view of the Lake. With attractive landscaping, the land will offer good potential for future residential development from an aesthetic standpoint. A major consideration with residential development of this area however is the nature of the underlying soils. As previously discussed, portions of the area are wetlands and other portions appear to be "filled in" wetlands. Depending upon the extent of the underlying organic matter, these wetland soils could present a stability problem with development in this area. Any proposal for residential development of this area should include detailed soil borings throughout the area to document soil conditions and suitability for development. Another soil related concern is the excessively well drained nature of the on-site sand and gravel soils. Due to this rapid drainage, ground water pollution from septic systems may become a problem. This could affect the health of the lake, the water quality of any underlying wells, and/or become a public health hazard. If on-site septic systems are to be used in the future, carefully engineered designs will undoubtedly be needed. With residential development of the area, serious consideration should be given to extending the nearby public sewer lines to service the site.

The site would also offer potential for public recreational use, if so desired. Potential uses would include: 1) limited swimming, 2) nature trails, 3) picnic sites, 4) fishing, and 5) light boat use (row boat or canoe). It should be noted however that in its present condition, the land has a number of limitations for recreational use including: 1) the shallowness of Lake Como, 2) poor, scrubby vegetation on-site, and 3) poor cover over worked areas of the site. Nevertheless, with good planning, the site could be developed into a useful recreation area for the town as well as the surrounding neighborhood.

Site Reclamation

If, for any reason, a quick reclamation of the site is needed or desired, the following should be done:

1) disturbed areas should be regraded to create gentle slopes on the property. All steep slopes, including those along the shoreline of Lake Como, should be regraded to a slope no steeper than 3:1.

2) following regrading, topsoil should be applied together with lime and fertilizer (in appropriate amounts as determined from soil tests) and then the area should be seeded with grasses which are best suited to the existing conditions. Existing brush or other vegetation on-site should be left undisturbed where possible.

If these above two steps are followed, the site would not present such a poor visual impact on the surrounding neighborhood, and erosion and sedimentation will be kept to a minimum.

Should the proposed project be implemented as planned, site reclamation should properly take place in phases to minimize disturbance to the entire site. The USDA Soil Conservation Service (688-4946) is available to assist in developing a program for phasing of the project and the necessary erosion and sedimentation control measures.

VII. WATER QUALITY AND LAKE MANAGEMENT

Physical Characteristics

The present morphological characteristics of Lake Como are approximately as follows:

Surface Area - 15 Acres
Maximum Depth - 1.5 - 1.8 meters (5-6 feet)
Mean Depth - 1.1 meters (3.5 feet)
Volume - 2.29×10^6 cubic feet
Retention Time - 0.14 years (50 days)
Watershed Area - 177 acres

The lake is fed by groundwater inputs and surface runoff. The outflow is located on the lake's northeastern shore.

Existing Water Quality Conditions

In its present condition, Lake Como supports a population of aquatic macrophytes which is both low in abundance and diversity. The limited growth of aquatic vegetation is a result of turbidity which restricts light penetration to the lake bottom. Where the organic sediments have previously been removed, the remaining substrate may not be suitable for weed growth.

The high degree of turbidity which the lake is experiencing may be wind induced and in some part due to roadway runoff and erosion from organic materials excavated from the lake and stored on the site.

Department of Environmental Protection Model

An empirical analysis of 102 Connecticut lakes performed by the DEP Water Compliance Unit demonstrates that the trophic conditions of Connecticut lakes are strongly influenced by the morphological characteristics of watershed area, lake surface area and mean depth. The analysis reveals that as watershed area increases relative to lake size, lake waters tend to become more advanced in eutrophy.* Lakes which do not conform to this tendency possess unusual watershed or lake characteristics which alter normally expected nutrient loadings.

As mean depth increases so does the tendency for oligotrophic (i.e. nutrient poor) conditions. In its present condition Lake Como exhibits morphological characteristics which are similar to Connecticut lakes which possess eutrophic (i.e. nutrient rich) conditions. According to the model, mean depths of over 6.5 meters (21 feet) would tend to promote oligotrophic conditions. Mean depths between 3.2 meters (10.5 feet) and 6.5 meters (21 feet) would tend to promote mesotrophic conditions. Mean depths of less than 3.2 meters (10.5 feet) would promote eutrophic conditions.

Ideally Lake Como should be excavated to an average depth of 6.5 meters (21 feet) to promote the best water quality conditions. Increasing the mean depth will decrease wind induced turbidity, will also reduce light penetration to the lake's bottom, and will increase the opportunity for recreation if so desired in the future.

If the surface area of the lake was increased from 15 to 20 acres, the ideal mean depths would be 5.5 meters (18 feet) for oligotrophic conditions, between 2.8 - 5.5 meters (9-18 feet) for mesotrophic conditions and under 2.8 meters (9 feet) for eutrophic conditions.

The ideal physical charactertistics would be approximately:

Surface Area - 20 Acres
Mean Depth - 6.5 meters
Volume - 18.3 X 10^6 cubic feet
Retention Time - 1.1 years (401 days)
Watershed Area - 177 Acres

---

*Eutrophication is the natural process of lake aging by nutrient enrichment. As a lake eutrophies, many water quality changes occur. Fertility increases and macrophyte (weed) beds become denser and more extensive. Algae blooms occur more frequently and water clarity decreases. Organic matter accumulates on the lake bottom from decaying plants and animals. The lake gradually fills in. Decomposition of lake bottom material reduces oxygen levels in the bottom waters. In general, as these changes occur, recreation opportunities decline.

The eutrophication process can be accelerated by man's activities in the lake watershed which increase nutrient inputs to the lake. The major nutrients of concern are phosphorus, nitrogen and carbon. Phosphorus has been found to be the usual limiting nutrient in the eutrophication process. Therefore, most restoration strategies focus on phosphorus control to reduce the supply to a level where it becomes limiting.

The sides of the lake basin should be sloped in such a manner that aquatic weed growth will be minimized when the lake is refilled with water. All material excavated from the lake, especially the layer of organic muck overlying the sand and gravel, should be stored at a suitable site away from the lake so as not to become a source of erosion and sedimentation or nutrient enrichment to lake waters.

Erosion and Sedimentation

Erosion and sedimentation adversely affects water quality by decreasing water depth and adding nutrients.

Streambanks and shorelines are sites where erosion can cause serious sedimentation which immediately impacts the lake. Activities which disturb the land surface should be avoided in these areas, and maintenance of natural vegetation should be encouraged. Construction activities in these areas should employ erosion and sediment controls as described in the Erosion and Sediment Control Handbook for Connecticut.

If additional excavation is going to be conducted out of the lake basin while the lake water level is up, then the appropriate controls should be employed to minimize erosion and sedimentation as discussed earlier in this report. This should also be the case if, after the excavation is completed, residential development takes place on the northwest shore.

Erosion and sediment control measures undertaken along streambanks and shorelines may require the approval of the local Inland Wetlands Agency and/or the U.S. Army Corps of Engineers.

Septic Systems

Sewage disposal in residential areas not serviced by sanitary sewers is accomplished with on-lot subsurface disposal systems commonly referred to as septic systems. When functioning properly, septic systems provide for the sanitary breakdown of wastewaters into simple chemical substances including soluble phosphorus compounds. The basic components of the system include a house sewer, septic tank, distribution system, and leaching field. Sewage is delivered to the septic tank via the house sewer. In the septic tank, solids are physically separated from liquids (primary treatment) by the sedimentation of heavy solids to form a sludge blanket, and the flotation of light solids to form a scum layer. The distribution system delivers the liquids to the leaching field. The liquid effluent is decomposed biologically (secondary treatment) in the leaching system.

A septic system can fail if it is not properly designed, installed, or maintained. A failing system will either result in the backflow of wastewaters into the house, or the breakout of wastewaters on the surface of the ground. A failing septic system can contribute phosphorus and other pollutants to lake waters. A far more important consideration, however, is that a failing septic system is a public health hazard. The public health threat is an overriding concern which demands correction of the problem, irrespective of lake eutrophication.

The correction of individual or scattered failing septic systems is the responsibility of town health officials. The correction of widespread failures

within a residential community is initiated by facility planning as provided by state and federal water pollution control statutes. A community sewage disposal system is a likely outcome in these cases.

If the northwest shore of the lake should be developed at some point in the future, it is recommended that the local health officials oversee the design and construction of any new on-site subsurface sewage disposal systems. The proper administration of the State Public Health Code is essential to protecting the public health and the water quality of the lake.

Lawn and Garden Fertilizers

Lawns and gardens are generally very efficient at utilizing soil nutrients and preventing their loss through runoff and leaching. However, runoff and leaching of nutrients can occur if fertilizer applications exceed nutrient requirements, or if fertilizers are applied prior to storm events which cause runoff. These situations can be avoided if fertilizers are matched to soil requirements, and if applications are timed to avoid periods of runoff. Soil test kits can be purchased at a nominal charge from the University of Connecticut Cooperative Extension Service county office. The samples are analyzed at the Extension Service Laboratory, and the results identify soil nutrient deficiencies.

Yard and Garden Vegetation Disposal

Leaves, grass clippings, and other vegetative material from yard and garden maintenance should not be deposited in a location where the material may be washed into the lake. Vegetative material will add to the sediment in the lake and will provide plant nutrients upon decomposition. Each property owner should select a suitable site away from the lake and its watercourses for the composting of vegetative material.

Waterfowl

Ducks and geese are generally an attractive wildlife asset of lakes. However, large numbers of migratory waterfowl which spend considerable periods of time on a lake can contribute appreciable loadings of phosphorus and nitrogen to lake waters. In a study of one Connecticut lake, it was estimated that the phosphorus in the excrement of four geese in one month was equivalent to the total annual loading of phosphorus from 2.5 acres of watershed land. In order to quantify the impact of waterfowl on a lake, it is necessary to develop accurate information on waterfowl population numbers, feeding habits, resting areas, and periods of occupancy. In the absence of detailed information, it should be recognized that large flocks of migratory waterfowl which stop at a lake can be an important factor in the eutrophication process.

Waterfowl can be controlled by methods which discourage large flocks from frequenting the lake. The U.S. Fish and Wildlife Service regulates all migratory bird activities that involve handling the birds, such as trapping, banding, and hunting. This agency also provides information on methods of harassment. These activities include mechanical barriers, landscaping techniques, scarecrows and other foreign objects, automatic exploders, flashing lights, balloons, and chase dogs. Information on these methods can be obtained from U.S. Fish and Wildlife Service, 4 Whalley St., Hadley, Massachusetts, 01035.

The DEP Wildlife Bureau lends assistance and cooperation when possible concerning nuisance goose control. The DEP is studying the potential of special goose hunting by certified, competent hunters to control nuisance populations in areas where safety considerations are not prohibitive. Assistance regarding special goose hunting can be obtained from the DEP Wildlife Bureau in Hartford.

Roadway Runoff

Stormwater runoff is the overland flow of water associated with precipitation events or periods of snowmelt. Runoff from residential areas and roadways in a lake results in the transport of sediments, phosphorus, and other pollutants to lake waters. A watershed management program should include measures for minimizing the impacts of stormwater runoff. Under the Connecticut 208 Program, the Northwestern Connecticut Regional Planning Agency developed a report entitled "Best Road Maintenance Practices for Critical Watersheds" which should be used as a guide to minimizing erosion and sedimentation from roadways in lake watersheds. The report presents detailed information on the design of roadway drainage systems; the management of paved roadways, including sanding operations and early spring street cleaning; the stabilization of road banks with vegetation and proper grading; and the grading and surfacing of unpaved roads. A lake organization should establish cooperative working relationships with appropriate town and/or state maintenance officials in order to implement a sound management program for lake watershed roads.

Conclusion

As discussed above, a number of factors can accelerate the eutrophication of a body of water. Contributing factors at Lake Como may include erosion and sedimentation, septic systems, lawn and garden fertilizers, yard and garden vegetation disposal, waterfowl, and roadway run-off. Due to the present shallowness of the Lake, it is highly susceptible to accelerated eutrophication in the near future. Turbidity, weed growth, and algae blooms can all be expected to increase, thereby further degrading the value of the lake from a recreational and aesthetic standpoint.

The proposed sand and gravel operation can greatly enhance the environmental health of Lake Como if judiciously implemented. Deepening the lake and contouring the lake bottom will also enhance the recreational use of the lake and provide a better fisheries habitat. Further, with conscientious regrading and landscaping, the northwestern shore of the Lake can be made very attractive from an aesthetic standpoint.

The proposed project, therefore, if carefully implemented along the guidelines suggested in this report, offers the opportunity to dramatically improve the lake and its surrounding area. Clearly, the proposed project would be preferable to any attempted "quick fix" of the disturbed land on the northwestern shore.

* * * *

ABOUT THE TEAM

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state, and regional agencies. Specialists on the team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, recreation specialists, engineers, and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC&D) Area - a 47 town area in western Connecticut.

As a public service activity, the team is available to serve towns and developers within the King's Mark Area --- free of charge.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in the review of a wide range of significant activities including subdivisions, sanitary landfills, commercial and industrical developments, and recreation/open space projects.

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

REQUESTING A REVIEW

Environmental Reviews may be requested by the chief elected official of a municipality or the chairman of an administration agency such as planning and zoning, conservation, or inland wetlands. Requests for reviews should be directed to the Chairman of your local Soil and Water Conservation District. This request letter must include a summary of the proposed project, a location map of the project site, written permission from the landowner/developer allowing the team to enter the property for purposes of review, and a statement identifying the specific areas of concern the team should address. When this request is approved by the local Soil and Water Conservation District and the King's Mark RC&D Executive Committee, the team will undertake the review. At present, the ERT can undertake two reviews per month.

For additional information regarding the Environmental Review Team, please contact your local Soil Conservation District Office or Richard Lynn (868-7342), Environmental Review Team Coordinator, King's Mark RC&D Area, P.O. Box 30, Warren, Connecticut 06754.