SACHEM VILLAGE CONDOMINIUMS

MARLBOROUGH, CONNECTICUT

JULY 1991

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

Eastern Connecticut Environmental Review Team on
Sachem Villge Condominiums
Marlborough, Connecticut

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

The ERT met and field checked the site on Tuesday, May 14, 1991. Prior to the review day each Team member received a summary of the proposed project, a list of the town's concerns, a location map, topographic map and a soils map. During the field review the Team members were given plans and additional information. The Team met with and were accompanied by the Marlborough Planning Coordinator, the Town Engineer,and the applicant and his engineers and attorney. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed development, and also suggests considerations that should be of concern to the developer and the town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

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

If you require further additional information, please contact:

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Sachem Village Condominiums
Marlborough, Connecticut

Review Date: May 14, 1991

Report Date: July 31, 1991

Environmental Review Team
Report #493

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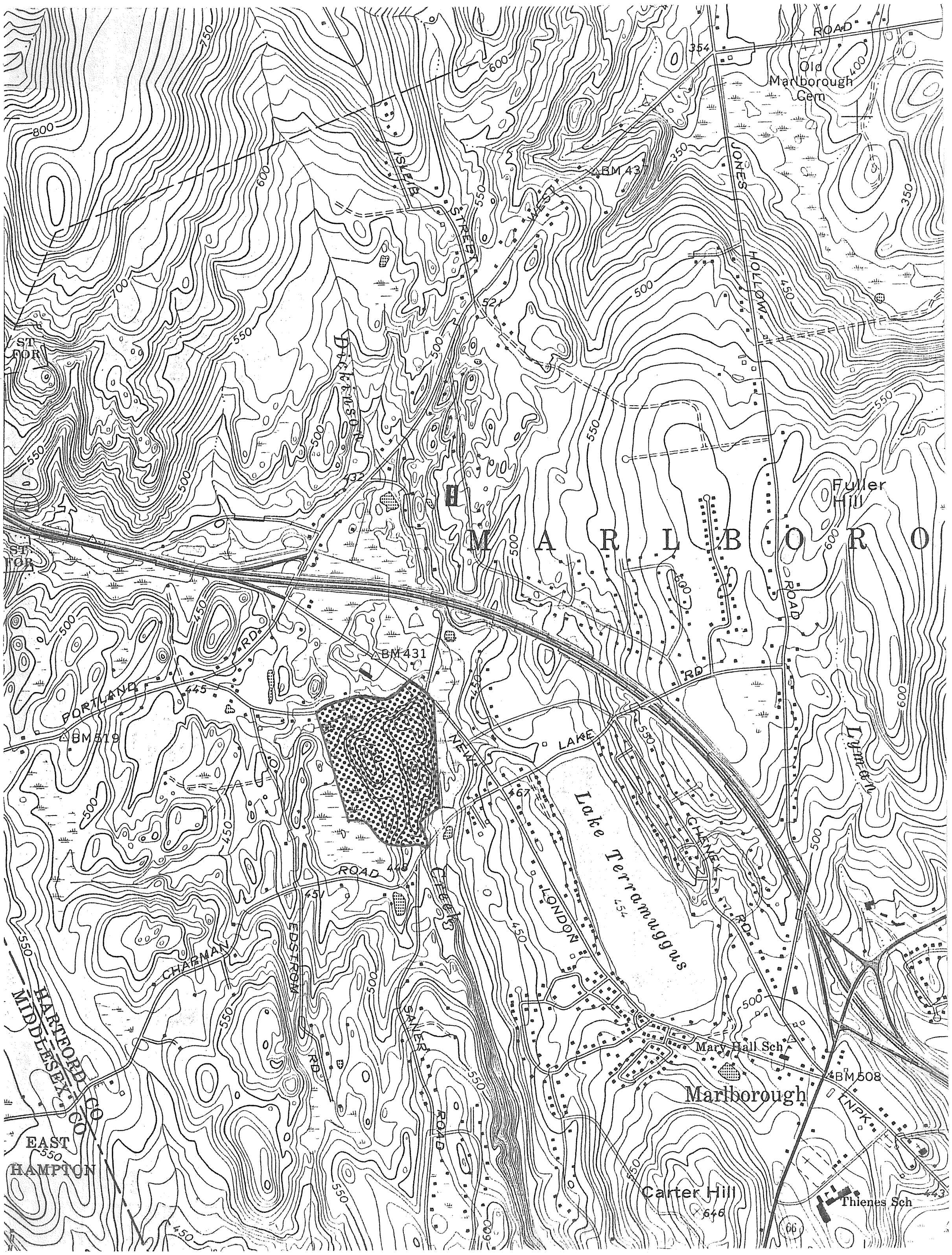
LOCATION MAP

Scale 1" = 2000'

Approximate Site



TOPOGRAPHIC MAP

Scale 1" = 1000'

Approximate Site Boundary

Geology

Robert M. Thorsen, Associate Professor Geology
University of Connecticut, Department of Geology and Geophysics
Telephone: 486-1396

Bedrock Geology

As mapped by George L. Snyder, in 1970 (Bedrock Map of the Marlborough Quadrangle), the entire site is underlain by the lower member of the Brimfield Schist, a formal lithologic unit of high grade metamorphic rocks with variable composition. The Brimfield Schist is strongly layered (foliated) in a north/northeast orientation, giving rise to a north-south grain to the topography. Rock layers, as defined by foliation, dip strongly (30-50 degrees) to the west. The lower member of the schist includes some gneiss.

Surficial Geology

As mapped by Dennis O'Leary in 1979 (Surficial Geological Map of the Marlborough Quadrangle), the surficial geology of the site is quite variable. O'Leary maps a swamp deposit to the west, indicating organic content to the material. A deposit mapped as "Qd" forms a *"collar"* around the site perimeter (exclusive of the border with the swamp) and extends through the site in the *"central depression"* (refer to map). This material, referred to as "kame terrace deposits" is a highly variable sandy gravel and gravelly sand that was deposited by glacial meltwater during ice retreat. O'leary maps rock outcrops on both the eastern and western elongate hills. He indicates that the till is less than 10 feet thick on the western hill, and even thinner on the more easterly one.

Field Observations of the Geologist

The Team Geologist saw nothing in the field that would conflict with the existing bedrock or surficial maps. In this sense, his reconnaissance of the property may be taken as supporting evidence that the mapping is correct. He did, however, make some site-specific observations that might be relevant. (Please refer to map)

1. The bedrock outcrops present near the ridgelines along the *"hogbacks"* appear to be resistant gneissic bodies within the schist, suggesting that the *"central depression"* is probably underlain by less resistant schist.

2. Dickinson Creek was examined at the road crossing. North and south of the road crossing it flowed as clear water in a set of braided pathways through a swampy floodplain. Near the bridge, the creek was artificially constricted into a channel about 20 feet wide. Here the bed of the stream was mantled with organic detritus and sand. At ll:00 am on the morning of May 14, flow was estimated to be 20 cubic feet per second, based on an estimated width of 20 feet, depth of 2 feet, and velocity of 0.5 feet per second.

3. Where exposed in excavation pits near buildings 2 and 3, the tills appeared to be very sandy, very heterogeneous and contain locally derived angular fragments of various sizes. Nothing resembling a compact clay-rich hardpan (basal) till was observed. The abundance of rounded pebbles in the meltwater deposits, and the generally pinkish color of the meltwater sands, stand in sharp contrast to the angular, schistose, locally derived character of the tills.

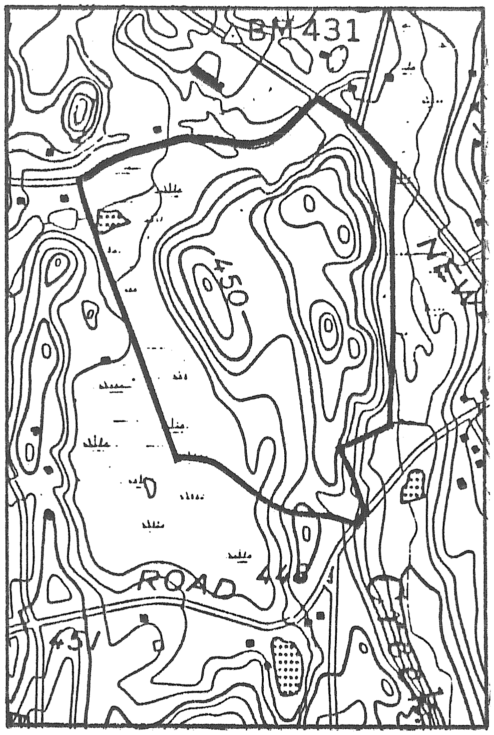
4. The edge of the swamp (large wetland mapped as swamp deposits) was examined with a bucket auger. At a depth of 1 foot, the irregular woody peats changed into a decomposed but firm felted grass/sedge peat. At a depth of 2 feet, this material became interbedded with silt layers near its base above compact cleanly washed sand. This stratigraphy suggests that the basin began as a postglacial pond which was later occupied by a marsh. Historic activities not related to the Sachem Condominium project then caused the wetland to change into its present shrub/scrub status.

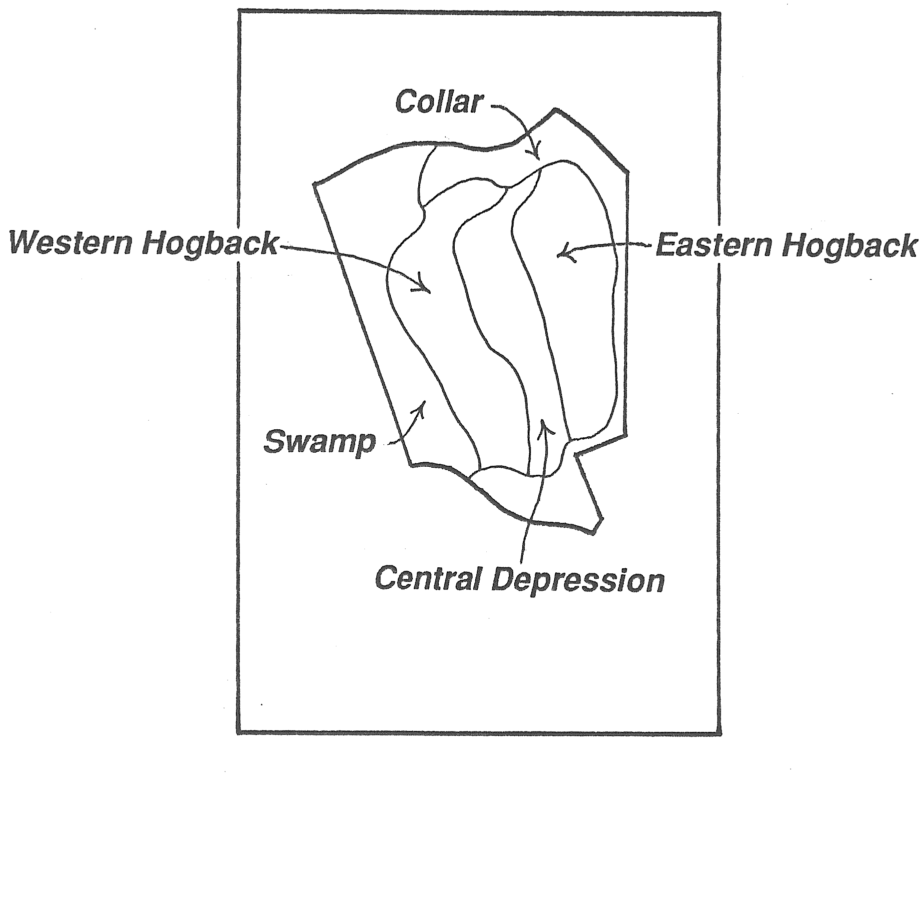
5. The *"central depression"* is much more uniform in its topography than in its content of unconsolidated material. Near the northern side, in the vicinity of building #1, the surface meltwater deposits range in thickness from 1 to over 20 feet depth, and in material from cobble/pebble gravel to loamy sand. In the center of the depression, coarse mixtures of rock and silt over silts and cleanly washed medium sands. The southern sector of the *"central depression"* is dominated by a broad gently sloping surface with a closed depression. Here, the surface materials are sandy, but the vegetation and topography suggests seasonally wet conditions. This suggests that impermeable lacustrine materials occur at depth.

6. The closed depression on the property adjacent to Hodge Road contains a thin fill of mineral-rich soil with historic artifacts, and bounding slopes that appear to have been recently excavated. This area, specifically described by John Ianni (applicant's soil scientist) as not containing a wetland, seems to be an artificially created depression associated with road construction and drainage improvements.

MAP REFERRED TO IN GEOLOGY SECTION

Scale 1" = 1000'





SURFICIAL GEOLOGY MAP

Scale 1" = 1000'

- Outcrops
- Stratified Drift
- Swamp Deposits
- Less than 10 Feet to Bedrock
- Saturated Thickness Greater than 10 Feet

Water Supply and Hydrology

Richard Hyde, Geologist
DEP - Natural Resources Center
Telephone: 566-3540

Water Supply

The entire State of Connecticut is underlain by hydrologically connected aquifers of three types. Aquifers are geologic formations capable of yielding usable amounts of water to a well. The three basic types found in Connecticut are till, stratified drift, and bedrock. Within each group, the capability to transmit water to a well varies depending on physical factors such as amount and interconnection of the void space within the aquifer medium.

In this project the potential for an on-site supply of potable water from one or more of the three aquifer systems might be possible since all three are present. The till deposits are found as a thin blanket covering the bedrock surface, generally less than ten feet in thickness and identified as a predominantly non-sorted, non-stratified sediment deposited directly by a glacier and composed of boulders, gravel, sand, silt, and clay mixed in various proportions. All areas of till on this property are mapped on the "Surficial Geologic Map of the Marlborough Quadrangle, Connecticut" by Dennis W. O'Leary as thin, which is evident by the numerous small, scattered rock outcroppings that are visible in the more elevated sections of the property. Its potential to supply water in this case is probably negligible and not worth exploring.

Stratified drift on site is known as the Dickinson Creek Valley Deposits, formed when glacier melt-waters spilled from the ice, carrying rock debris and dropping the load into lower energy water bodies adjacent to the wasting ice. The stratified drift in this part of the Dickinson Creek drainage system is predominantly stratified coarse to fine sand; well to poorly sorted, with local gravel to silt layers. This deposit could prove as a possible source of high quality water if there is a sufficient saturated thicknesses. The "Water Resources Inventory of Connecticut Part 10 Lower Connecticut River Basin" report (L. Weiss et.al.) maps the deposit in this area as being ten feet or less of saturated thickness in the northern part of the property. Generally at least 40 feet of saturated thickness is required for well development purposes, particularly if water demand is high. But, for moderate amounts saturated thicknesses may be much less. This report identifies a test hole drilled just north of Hodge Road which, based on grain size analysis, is calculated as having a potential transmissivity of 2,700 feet squared per day. In relative terms this number would indicate there is the possibility to develop high yield wells, although, one cannot be sure unless a detailed hydrologic study was conducted to determine saturated thickness and yield potential at any particular location. Water supply wells placed in well sorted stratified drift, medium to coarse grained sand

and gravel, with several tens of feet of saturated thickness can yield significant amounts of water, 50 to 2,000 gallons per minute (gpm).

The bedrock aquifer by the fact that two wells have already drilled, by default at this point, must serve the project and based on the yields of the wells, 18 gallons per minute each, it appears they are capable of supplying adequate amounts of water to the project. In this regard, the State Department of Health Services Public Water Supply Section should review yield test data to ensure that water demand for the proposed development is adequate. The rock unit the wells are tapping is mapped as the Brimfield Schist, a rock noted for its generally poor water quality that includes low pH, rotten egg odor due to iron sulphide content and elevated iron and manganese levels. While the latter are more of a nuisance from an aesthetic standpoint then physiological, the water will likely require some form of treatment, depending on the specific problem. The driller locates a site to drill the well(s) at a high point on the property and ensures that all State Health Code separating distances are met. Once this location has been approved by State and local health officials the driller simply drills through the unconsolidated overburden, the till and/or stratified drift, and advances into the solid rock until a sufficient quantity of water supply is achieved. The overburden zone is cased off with pipe to prevent the well from collapsing and to prevent the local surface water, that may be contaminated, from leaking into the well and mixing with the water supply.

The yield of a well tapping bedrock depends in part upon the number and size of water-bearing fractures or cracks that the well intersects. Because the fractures are unevenly spaced throughout the bedrock there is no practical way, other than drilling, to predict the yield of any specific well. The yield of each well is reported to be 18 gpm, which is equivalent to about 26,000 gallons per day per well, a moderate supply of water.
In the case of the Sachem Village Condominium Project two bedrock wells have been drilled and approved by the Department of Public Utility Control as a community water supply. The wells should meet all Health Department requirements for separating distances, 150 foot sanitary radius for wells yielding 10-50 gpm. Based on the indicated 18 gpm yields for each of these two wells a total of 51,840 gallons per day (gpd) is potentially possible to supply the needs of the development. Once completed and fully occupied the complex will require 17,400 gpd to meet the needs of the residents with additional amounts being required for maintenance, lawn care, and possibly for fire protection. This amount is based on the figure of 150 gallons per day per bedroom required for calculating residential demand.

To determine if the site is capable of providing, on a sustained basis, the amount of water that each resident will need, it is important to look at the recharge of precipitation to the groundwater system. A conservative figure for groundwater recharge is eight (8) inches per year. Connecticut receives about 45 inches of precipitation each year, with about half of that being returned to the atmosphere through evaporation from the land surface and transpiration from plants, a portion recharges to the ground and the remainder flows overland directly to the nearest water course. But, since the completed development will create four acres of impervious surfaces to groundwater recharge there is a reduction in the available groundwater recharge potential. See calculation below.

(44.64 acres) X (43,560 sq.ft./acre) X (8 inches of recharge/year) = (1,296,410 cubic feet of recharge/year) X (7.48 gallons/cubic foot) = (9,697,150 gallons/year) / (365 days/year) = 26,568 gallons/day of potential recharge for the site

(minus)

(4 acres) X (43,560 sq.ft./acre) X (8 inches of recharge/year) = (116,165 cubic feet of recharge/year) X (7.48 gallons/cubic foot) = (868,920 gallons/year) / (365 days/year) = 2,381 gallons/day lost to recharge 24,187 gallons/day of actual recharged.

This figure is 1.4 times more than the calculated need of the project, a figure slightly less than the 1.5 to 2 times the recommended amount. However, with careful surface water management that encourages on-site recharge and with the use of on-site septic systems, where 85-95% of the renovated domestic wastewater will percolate downward into the ground water system, there should not be a problem. There is a fall-back position if the water supply proves insufficient, and that is to drill additional bedrock wells some distance from the existing ones in order to spread the withdrawal from the groundwater system over a larger area. Another possibility is to explore the stratified drift aquifer as a possible source in the future.

Natural surface water quality is classified as "A" according to the Water Quality Classification Map of Connecticut (Murphy, 1987), groundwater is classified as "GA" which means the water is considered suitable for drinking water supplies without treatment. However, because the bedrock found in the area is the Brimfield Schist, a rock which imparts certain natural impurities to the water; in this case high turbidity, iron and manganese levels; pre-treatment of the supply will be required. Other potential water quality problems associated with the water supply are the presence of sodium which is either related to road salting or backwash from water softeners serving nearby homes and radon that appears to occur naturally in the underlying bedrock. Per the State Department of Health Services, the latter will be monitored quarterly for a year then evaluated to determine if water treatment is required for removal of radioactive elements that may be present at levels which exceed desirable limits for drinking water. Enclosed for the town's review are conclusions and recommendations made by the State Department of Health Services, Public Water Supply Section regarding yield tests and water quality for the proposed community water supply. In addition, the DOHS will review plans for pumping, storage, treatment and the distribution system for the project.

The Impact of the Proposed Activity on the Overall Hydrology of the Area: (The groundwater in general and impact on adjacent wells in the neighborhood).

Depending upon the interconnection of the fractures in the bedrock underlying the area, it is possible for the Sachem Village wells to draw from the same fractures as neighboring wells of local residents. However, the same situation could easily be occurring among the existing residences themselves. Whether such mutual interference will have a negative impact on the residents for practical purposes is unclear. If the proposed wells have any effect on neighboring wells, the affected wells will probably be relatively close to the site and would probably be only limited to those on west side of Dickinson Creek. Based on the location of the Sachem Village wells, the risk of interference is greatest, although very unlikely, to the several residential wells to the south along Chapman Road and specifically the community water supply for the Marlborough Village Mobile Home Park and more remotely possibly the apartment and businesses just to the north. The park is supplied by a bedrock well for the reported 15 residents. No well data was available for the water supply but perhaps the local health department has information regarding water quantity (yield data) and quality.

Groundwater does not respect property boundaries. Although recharge throughout the site itself is conservatively calculated to be only 1.4 times the ground water demand of the development, the actual source of supply to the wells may extend far beyond the boundaries of the site. Therefore, when the groundwater demand in the area surrounding a high-requirement site is equally high, there is a greater possibility of mutual interference among wells. However, it does not appear that existing neighboring properties require large supplies of water from the local groundwater aquifer. To minimize possible impacts every effort should be made to encourage direct recharge of the underlying aquifer by infiltrating precipitation. Consideration should be given to:

1) minimizing the amount of impervious surfaces created and maximizing pervious open areas in a natural state;

2) utilizing grass swales instead of asphalt or concrete drainage swales; and

3) utilizing features such as dry wells and detention basins for on-site infiltration of roof drainage and stormwater runoff, respectively.

Careful examination is warranted for direct stormwater discharged to dry wells on the site. Stormwater may be laden with automobile residue that poses a threat to groundwater quality. Roof drainage, as long as it is not contaminated, could be discharged to dry wells on-site, which will help to offset the loss of recharge.

Septic tank effluent plays an important role in the groundwater budget for the site. A high portion (85-95%) of the renovated domestic wastewater will percolate downward to recharge the underlying bedrock via on-site sewage disposal systems. This underscores the need for proper design, location, installation and maintenance of the proposed community septic systems. Also, persons living in the condominium project should be educated with respect to proper disposal of household hazardous wastes. Careless disposal of household hazardous waste may find their way to groundwater once they pass through the on-site sewage disposal system(s), thereby posing a threat to on- and off-site water supplies.

Although the calculations provide an interesting starting point for an evaluation, several additional factors should be weighed. First, the actual population of the proposed development may be less than the potential of four persons/unit estimate used. Second, the DEP's monitoring of water usage at other apartment/condominium projects shows that the actual per capita usage is less than the 75 gallons per person per day standard.

Changes in the Surface Hydrology

Any development will cause increases in surface water runoff. These increases will result from the creation of impervious surfaces such as rooftops, roads, parking areas and sidewalks. Additionally, removal of the natural vegetation on the site to lawn will increase runoff. It is estimated that four acres of impervious surfaces will be created following development, and probably more than 33 acres (75%) will be disturbed and/or landscaped. These changes to the natural condition will create a more direct route of surface drainage causing an increase in the rate of overland runoff.

The main concerns with any post-development runoff increases are the potential for flooding and stream bank erosion/surface water quality degradation. This site naturally drains predominantly to the wetland area to the west which is part of a northerly draining system of about one third of a square mile. This overland flow finally enters Dickinson Creek immediately south of Route 2 to the north of Hodge Road. A small sliver of the property has its natural drainage to the east into the wetland area adjacent to Dickinson Creek, so all drainage ultimately enters Dickinson Creek.

A conscientious effort should be made to minimize the effects of development. Ideally the quantity and quality of stormwater runoff that reaches surface waters during and after development should not be altered from pre-development conditions. The following are some guidelines that should be considered in the preparation and review of the stormwater management plan for the project to ensure that runoff during and after development is not substantially altered from pre-development conditions. Special attention should focus on protection of on- and off-site surface water, wetlands and groundwater.

In general appropriate stormwater management plans should achieve the following objectives:

1) reduce the rate of runoff from the project site to prevent increases in flooding

and flood damage by examining the 2 year, 10-year, 25-year, 50-year and 100-year storm events;

2) reduce the erosion potential from the project site;

3) ensure the adequacy and maintenance of existing and proposed culverts and bridges;

4) utilize storm drainage structures that increase water recharge into the ground, i.e. dry wells for clean water, curbless roads and drives, especially in areas of sandy soils, etc.;

5) decrease non-point source pollution and water quality degradation i.e., minimize road salt and fertilizer application, etc.;

6) maintain stream channels for their biological functions as well as for drainage through reduced streambank erosion;

7) increase opportunities for preserving open space through stream corridor and floodplain protection; and

8) increase recreational and fire protection opportunities through multiple use of stormwater management facilities.

While recharge of building, road and parking lot runoff is desirable to reduce or minimize losses to the site aquifer; and the "first flush" particularly road and parking lot runoff may be laden with automobile residue, including oil, grease, gasoline and other compounds which pose too great a risk to groundwater quality. Therefore, consideration should be given to a mitigative measure that treats the "first flush" from roads and parking lots above ground. A possible solution is a 2 stage detention/retention basin. The "first flush" could be retained in the primary basin and the secondary basin could be designed to detain subsequent flows. The primary basin is designed to retain, settle and filter the "first flush" of the storm and trap floating materials. Once a critical design elevation is reached in this basin, the water is routed to the secondary basin, where it is detained based on hydrologic computations. The primary basin could be vegetated with selective plants that have the capacity to remove certain nutrients, grease, oil and other organic compounds from stormwater.

As long as it is clean (i.e., no discharge from air conditioning units, etc.), roof top runoff for each building unit could be directed to on-site dry wells located in areas of deep (10 feet or greater), sand and gravel deposits.

Every effort should be made to maintain or improve the quality of stormwater generated at the site. Catch basins should be equipped with hooded outlets and sumps to trap sediments and floating items From time to time, catch basins will require maintenance, and provisions should be made for this work.

The potential for streambank erosion/surface water degradation should be addressed in a comprehensive soil erosion and sediment (E&S) control plan. The E&S control measures should be monitored by town officials, especially following periods of heavy rainfall. An inspection program should be implemented.

During the construction period, control measures, including silt fences, hay bales, temporary/permanent sediment basins which permit settling time for suspended solids, anti-tracking devices and minimizing land disturbance, should be used to reduce the potential for environmental damage to off-site wetlands and watercourses, particularly Dickinson Creek. The Connecticut Guidelines for Soil Erosion and Sediment Control (CGSESC,1988, as amended) should be followed closely with respect to the E&S control plan. Please note, the Sachem Village plans indicate the use of the 1985 edition of the CGSESC, this guideline manual was revised and is superseded by the 1988 edition.

Research has shown that the urbanization of a watershed can have negative effects on streams and wetland systems. Efforts have been focused largely on stormwater management to reduce the risk of flooding downstream. Stormwater may contain pollutants that can affect water quality and wetland resources. Stormwater management should be combined with pollutant removal. Best Management Practices (BMPs) incorporate these ideas. An effective BMP is the use of infiltration basins and trenches that can not only manage stormwater quantity and quality, but also provide groundwater recharge, important to the hydrology of down gradient wetlands and watercourses.

The developer and his technical consultants are applauded for their attempt to use infiltration techniques on the site. Although the site is well-suited to such techniques (i.e., a relatively thick unsaturated zone and highly permeable soils), the structures and system as currently designed may not perform as expected for the following reasons:

1) Particulate matter in the stormwater will clog the pores of dry wells. The attached catch basins with sumps will only catch coarse sediments. Consider the dry wells only for rooftop runoff. Keep them 10 feet from the buildings and use rooftop gutter screens to trap debris. The remaining stormwater should be put into infiltration trenches or infiltration basins.

2) The infiltration basin in the northwest corner of the site may not function as expected. Keep the inflow above ground, otherwise the infiltration trenches will become clogged. Consider trapping the entering sediments with a sediment basin with a riprap/filter fabric weir before the water spreads out in the basin. The infiltration trenches should be secondary and slightly higher to allow the maximum water surface area.

Additional comments include:

1) Areas where infiltration structures (i.e., basins and dry wells) are planned should be protected from construction traffic during all phased of construction to prevent compaction.

2) Grasses used in the basin should be water tolerant and low maintenance.

3) Debris and sediment must be removed on a regular basis. Maintenance is extremely important to infiltration systems.

4) The use of pesticides, herbicides and fertilizers should be strictly controlled. In a condominium situation there are good opportunities to minimize excesses in this area with only a single grounds keeping maintenance/management entity governing the property. Education is the watch word so various applications when appropriate are not exceeded or used when they are not necessary by the grounds crew.

Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs (Thomas Schuler, Metropolitan Washington Council of Governments, July 1987) should be referenced for more specific detailed information on design, construction specifications and maintenance. Contact Eric Scherer, District Conservationist, Hartford County SCS at 688-7725 for more information.

Soil Resources

Jon Bourdon, Soil Conservationist
USDA Soil Conservation Service
Hartford County
Telephone: 688-7725

The Sachem Village Condominium Project site is characterized by a diverse terrain with a steep bedrock area on the east side and a large wetland area to the west. According to the Soil Survey of Hartford County, Connecticut, soils on site are derived from a complex mix of glacial till and glacial outwash plain. Hinckley and Walpole soils are derived from glacial outwash plains or stratified drift. Hollis and Charlton soils are formed from glacial till. Peats and mucks (Carlisle) and Saco soils are formed in recent deposits of organic material and alluvium.

The soils mapping generated by Highland Soils should be used for the evaluation of the site due to the greater mapping intensity. The field review showed that the wetland boundaries on the Sachem Village site plan are essentially accurate. However, one area should be re-examined to resolve the discrepancy between the SCS Published Soil Survey wetland boundary and the surveyed wetland boundary (as completed by John P. Ianni, Highland Soils Inc.). This area in question is located on the east side of Sachem Village Drive and bordering Hodge Road.

A soils table has been prepared which outlines the various soil map units found on the site and their limitations for the proposed uses (see attachment A). The following define the Degree of the Soil Limitations: Slight - soil properties and site features are generally favorable for indicated use, and limitations are easily overcome; Moderate - soil properties are not favorable for indicated use, and special planning, design or maintenance is needed; Severe - soil properties or site features are so unfavorable to overcome that special design, increases in cost and possibly increased maintenance are required.

Erosion and Sediment Control

In 1983, Public Act No. 83-388, "An Act Concerning Soil Erosion and Sediment Control" was passed to "reduce the danger from storm water runoff, minimize non-point sediment pollution from land being developed and conserve and protect the land, water, air and other environmental resources of the state." Under this law, most applications for development must have a comprehensive E&S control plan, including a map and narrative. While the proposed subdivision has an E&S control plan, additional elements which minimize erosion and sedimentation during and after construction include:

1. A construction phasing plan needs to be established and the methods of

stabilization for each phase needs to be specified. Plus, a construction flow chart should be developed to aid in this phasing plan.

2. All the catch basins on the site should be protected by some type of filter fabric envelope. Please see enclosed example.

3. Locate directly on the plan items such as, but not limited to:

   a) Construction entrance locations and details for each phase and

   b) Location(s) of stockpiled topsoil and topsoil erosion control protection measures.

4. Temporary E&S control measures should be specified when time of year or weather prohibit establishment of permanent vegetative cover. The recommended dates for establishing temporary vegetation, specifically annual rye grass, include:

   March 1 through June 15
   August 1 through October 1

5. Somebody needs to be designated with the responsibility to maintain the erosion control devices shown on the E&S plan.

6. The E&S plan needs to address the control of dust and wind erosion.

7. The Hinckley and Hollis soil types have severe limitations for septic systems. Engineered septic systems will be needed for this site.

8. Topsoil may have to be brought in to ensure that areas that are shallow to bedrock or contain sandy soils can be vegetatively stabilized.

9. The fertilizing, liming and mulching rates for areas to be graded and seeded should appear in the plan.

10. The key to successful E&S control is proper installation and maintenance. This is extremely important when considering the existing or potential E&S hazards associated with steep slopes and wetlands protection.

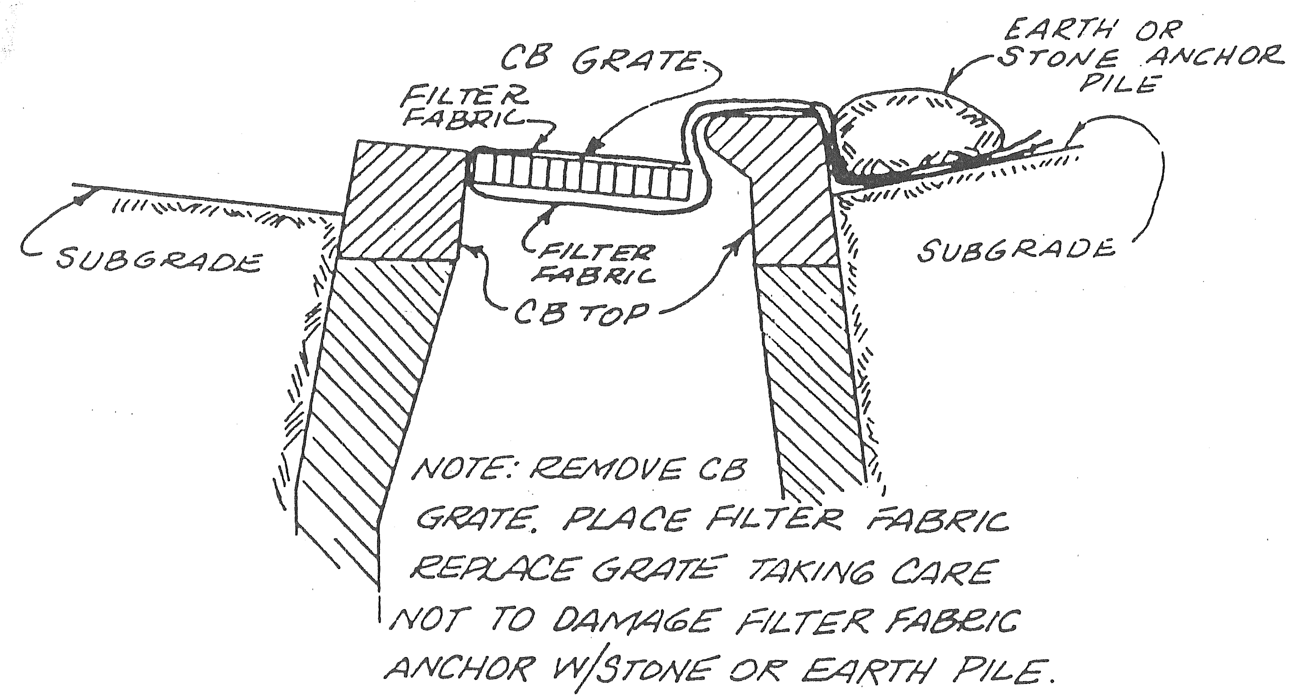
The soil E&S control plan for the Sachem Village Condominium Project is not adequate. However, if the 10 above points are addressed by the developers and included, the E&S control plan would be considered adequate to meet on and off site needs. Construction activities such as, but not limited to, those associated with steep slopes or wetlands must be carefully monitored to protect the soil resources from E&S damage.

SOILS MAP

Scale 1" = 1667'

SOIL INTERPRETATION REPORT

Map Symbol	Soil Name	Septic Tank Absorption Field	Shallow Excavations	Dwellings without Basements	Dwellings with Basements	Local Streets and Roads	Lawns, Landscaping and Golf Fairways
CaB	Charlton	Slight	Slight	Slight	Slight	Slight	Slight
HkC	Hinkley	Severe, poor filter	Severe, cutbanks cave	Severe, slope, depth to bedrock	Moderate, slope	Moderate, slope	Severe, droughty
HsE	Hollis	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope
	Charlton	Severe, slope	Severe, slope	Severe, slope	Severe, slope	Severe, slope	Severe, slope
	Rock Outcrop	Severe, depth to bedrock	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock, slope	Severe, depth to bedrock
PkA	Carlisle	Severe, subsides, ponds, percs slowly	Severe, excess humus, ponding	Severe, subsides, ponding, low strength	Severe, subsides, ponding, low strength	Severe, ponding, frost action	Severe, ponding, excess humus
SbA	Saco	Severe, floods, wetness	Severe, cutbanks cave, wetness	Severe, wetness	Severe, wetness	Severe, wetness, floods, frost action	Severe, wetness, floods
WcA	Raypol	Severe, wetness, poor filter	Severe, cutbanks cave, wetness	Severe, wetness	Severe, wetness	Severe, wetness, frost action	Severe, wetness



FILTER FABRIC SILT BARRIER AT C.B.

The Natural Diversity Data Base

Dawn McKay, Zoologist
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The Natural Diversity Data Base
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Julie Victoria, Wildlife Biologist
DEP, Wildlife Division
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The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to the information, there are no known extant populations of Connecticut "Species of Special Concern" or Federal Endangered and Threatened Species that occur at the site in question. However, this area is within the foraging boundaries for one of Connecticut's proposed endangered species, Crotalus horridus (Timber Rattlesnake).

The DEP Wildlife Division's Nonharvested Wildlife Program has not made a comprehensive field investigation of this area. The area does not interfere with any known populations of Federal Endangered or Threatened species. However, it is in close proximity to an existing foraging area for timber rattlesnakes. Populations of this reptile have declined dramatically in recent years and it has been proposed for inclusion on Connecticut's Endangered Species list. Timber rattlesnakes are currently protected by state regulation Sec. 2666-14(d) which prohibits the taking or killing of this reptile.

Timber rattlesnakes are actively foraging in Connecticut between April 1 and October 1 and rattlesnake sightings would not be unexpected in this area. The Wildlife Division recently contracted a professional herpetologist to conduct a 3 year study of the snakes in this region.

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

Wildlife Resources

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Upland Wooded Areas/Open Spaces

Fragmentation of habitat may lead to a decline in species diversity and richness. Sensitive, interior species that require large tracts of undisturbed forest, such as wild turkey, ruffed grouse, veeries, ovenbirds and scarlet tanangers, will no longer occupy the area.

It is suggested that open space areas be set aside contiguous with buffer zones, and that they encompass other areas of vegetation so as not to create small isolated islands.

Mitigation of Disturbances

There are several management guidelines which should be considered during the planning process in order to minimize adverse impacts on wildlife:

1. Make use of natural landscaping techniques (avoid and/or minimize lawns and chemical applications) to lessen acreage of lost habitat and possible wetland contamination.

2. Maintain at least a 100 foot wide buffer zone of natural vegetation around wetland/riparian areas to help filter and trap silt and sediments. These vegetated zones provide excellent wildlife cover and travel corridors.

3. Stone walls, shrubs and trees should be maintained along field borders.

4. During land clearing care should be taken to maintain certain forestland wildlife requirements:

> **a.** Encourage mast producing trees (oak, hickory, beech).
>
> **b.** Leave 3-5 snag/den trees per acre as they are used by many birds and mammals for nesting, roosting and feeding.
>
> **c.** Exceptionally tall trees are used by raptors as perching and nesting sites and should be encouraged.
>
> **d.** Trees with vines (fruit producers) should be encouraged.

e. Brush debris could be windrowed to provide cover for small mammals, birds and amphibians and reptiles.

f. Removal of dead and down woody material should be discouraged where possible The existence of many wildlife species (salamanders, snakes, mice, shrews and insects) depends on the presence of dead trees (Hassinger 1986).

5. Implementation of backyard wildlife habitat management practices should be encouraged. Such activities involve providing food, water, cover and nesting areas.

On small acreages with many buildings, landscaping can do a great deal to provide habitat and make an area attractive to wildlife. First, leave as many trees as possible around the buildings. This will not only benefit wildlife by providing food, cover and nesting sites (i.e. especially for songbirds), but will also be more aesthetically pleasing for the residents of the development. Plant trees and shrubs which are useful to wildlife and landscaping. Large expanses of lawn with no trees or shrubs present should be discouraged.

Planting shrubs that are less palatable to deer may lessen problems with nuisance deer. Shrubs less palatable to deer include evergreen hybrid rhododendrons, American Holly, Scotch pine, White and Norway Spruce, Japanese cedar, Flowering dogwood, mountain laurel, Common lilac and White pine. Taxus spp. (yews) experience a greater degree of damage as they are preferred winter foods of deer (Conover, 1988).

Management of open space tracts

In any proposed development the delineation of open space/wildlife corridors should be identified early in the planning process. The proper selection of habitats for incorporation into the open space system can make a major difference in the wildlife benefits to be incurred. A variety of habitat types should be retained to increase species diversity. Due to the impracticality of retaining one large area to include all the desired habitats, it is logical for an open space system to be based on a network of corridors. A corridor configuration essentially "hooks up" the different habitats into one contiguous system. This system enables wildlife species to utilize the different habitat components as required. The logical base for the wildlife corridor/open space system are the stream/wetland corridors. Woodlands are of importance to wildlife and the ecotones formed at wetland and woodland edges provide an additional habitat where a dense understory provides cover and screening from human disturbance. There should also be ancillary corridors that extend from this system into, and through, the developed area, thereby encouraging the movement of wildlife into and through the residential development.

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Fish Resources

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This report will address anticipated impacts to local aquatic resources and delineate appropriate measures to mitigate impacts.

Fish Population

Dickinson Creek, a vital tributary of the Salmon River, borders the proposed cluster-type Sachem Village condominium development. This section of the creek has not been recently sampled by the DEP Inland Fisheries Division; therefore qualitative and quantitative information regarding fish populations in this stretch of stream is unknown. Downstream sections of the creek are annually stocked by the Inland Fisheries Division with more than 2,200 adult brook, brown, and rainbow trout. The creek south of Route 66 contains important nursery habitat for juvenile Atlantic salmon. Based on a review of the creek's instream and riparian habitat on June 6, 1991, the Team's fisheries biologist expects the following fish species to inhabit the creek adjacent to the proposed development: native brook trout, blacknose dace, common shiner, fallfish, white sucker, redfin pickerel, and American eel. Warmwater pond species may also be present due to emigration from the downstream pond. These warmwater species would be bluegill sunfish, pumpkinseed sunfish, and brown bullhead.

Surface waters of Dickinson Creek are classified as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

The unnamed tributary of Dickinson Creek located on the western boundary of the property is expected to support a warmwater fish assemblage and may seasonally support resident freshwater finfish that penetrate the stream near its confluence with Dickinson Creek.

Impacts

The following impacts can be expected if proper mitigation measures are not implemented:

1. Site soil erosion and sedimentation of watercourses through increased runoff from unvegetated areas. During building and road construction topsoil will be exposed and susceptible to runoff events, especially if suitable erosion and sediment controls are not properly installed and maintained in areas adjacent to steep slopes.

Housing development will also involve the placement of fill which may contain erodible materials. Visual inspection during the field review revealed that minimal soil erosion and movement had occurred during the construction of the existing building #1. Similar precautions must be taken when additional construction is attempted; otherwise, unchecked erosion could potentially lead to sedimentation of downgradient watercourses.
If this scenario develops, the following impacts to fisheries could be expected:

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

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

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

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

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

(6) Sediment encourages the growth of filamentous algae and nuisance proportions of aquatic macrophytes. Eroded soils contain plant nutrients such as phosphorous and nitrogen. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth.

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

2. Aquatic habitat degradation due to the influx of stormwater drainage. Two detention basins will collect and outlet stormwaters finally draining into the unnamed tributary of Dickinson Creek. Stormwaters from roadway systems can contain a variety of pollutants that are detrimental to aquatic ecosystems. Pollutants commonly found in stormwaters are: hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment. Nutrients in stormwater runoff can fertilize stream waters causing water quality degradation.

3. Transport of lawn fertilizers to watercourses. Runoff and leaching of nutrients from fertilizers and lime applied to condominium lawns could possibly stimulate filamentous algae and nuisance aquatic weed growth in nearby watercourses, especially in slow moving low gradient stretches.

Recommendations

The following recommendations should be considered by Marlborough land use commissions to mitigate impacts to local aquatic resources.

1. Streamside buffer zones and open space. Through the existing cluster development design and deployment of streamside buffer zones, the applicant has made a concerted effort to minimize construction adjacent to sensitive on-site aquatic habitats. The 150 foot buffer zone measured from the edge of riparian wetlands associated with Dickinson Creek and the unnamed tributary is commendable. Research has shown that buffer zones, like the one proposed, help prevent damage to wetlands and stream ecosystems that support diverse fish and aquatic insect life.

2. Develop an aggressive and effective erosion and sediment control plan. Proper installation and maintenance of these devices is critical to environmental well being. This includes such mitigative measures as filter fabric barrier fences, staked hay bales, and sediment catch basins. Land disturbance and clearing should be kept to a minimum and all disturbed areas should be restabilized as soon as possible. Exposed, unvegetated areas should be protected from storm events. The applicant and the Marlborough wetland enforcement officer should be responsible for checking this development very frequently to ensure that all soil erosion and sediment controls are being maintained. In addition, the applicant should post a performance bond with the town to protect against future soil erosion violations. Past stream siltation disturbances in Connecticut associated with sand/gravel developments have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis.

3. Community septic system placement and design. The placement and design of on-site community septic systems are presently under review by DEP engineers within the Bureau of Water Management. The DEP will ensure that installed systems will meet design criteria and water quality standards as set forth by the State of Connecticut.

4. Stormwater management. The effective management of stormwaters and roadway runoff can only be accomplished through proper design, location, and maintenance of detention and catch basins. Present design will sufficiently convey and contain stormwater runoff; however, it is important that catch basins be maintained on a regular basis. Regular maintenance will minimize adverse impacts to riverine/wetland habitats. It is suggested that the use of road salt to deice roads be prohibited or at least minimized.

5. Limit liming, fertilization, and the introduction of lawn chemicals to condominium lawns. This will help abate the amount of additional nutrients to downgradient aquatic resources. Nonphosphorus lawn fertilizers are currently available from various lawn care distribution centers.

Archaeological Review

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A review of the State of Connecticut Archaeological Site Files and Maps shows no known sites in the project area. However, a 4,000 year old Indian encampment has been located on the north shore of Lake Terramuggus immediately east of the project area. The Lake Terramuggus Site (79-003) has recovered steatite stone bowl fragments, flint knife blades and quartz spear points. The site was excavated by the Albert Morgan Archaeological Society over ten years ago.

While no known prehistoric sites exist, the archaeological sensitivity of the project area, based upon land forms and local drainage patterns would suggest a high probability for sites. As a result, the Office of State Archaeology strongly recommends an archaeological reconnaissance survey of the project area. The enclosed map indicates areas of best potential for site survey.

Field review of the project area reveals several properties of historic and architectural significance that would qualify for listing on the National Register of Historic Places. These include (1) two houses located along New London Road at its intersection with Chapman Road and Lake Road and (2) the house located on the southeastern corner of the intersection of Edstrom Road with an unnamed town road. The condominium complex should be designed to minimize any visual intrusion upon these properties. It is highly recommended that mature tree species be retained within the respective view sheds for the historic properties.

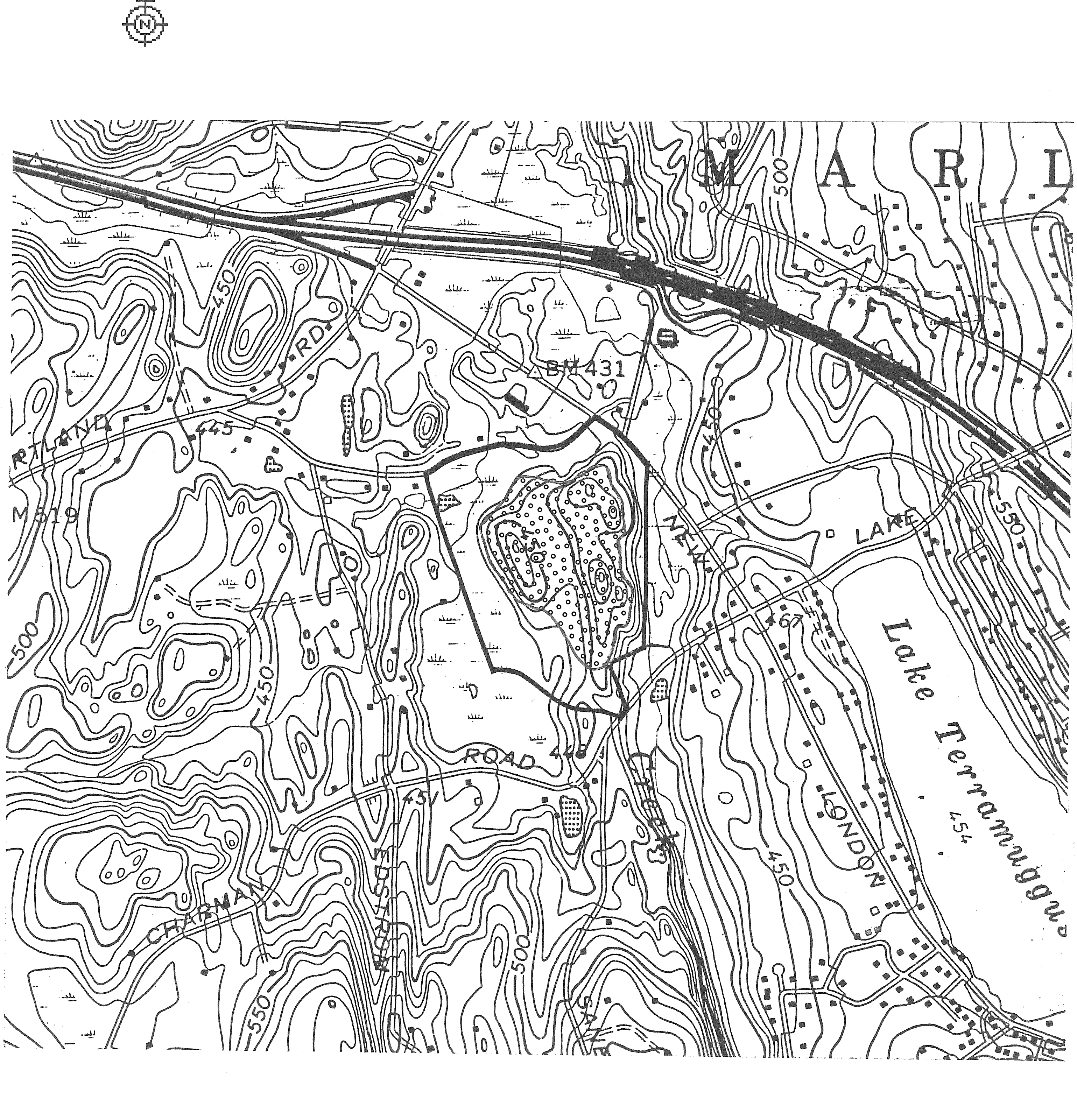
A 19th century stone dam is located immediately outside the project area on an unnamed stream which crosses Chapman Road. The historic archaeological potential of the project area should be examined in light of the various historical properties located in immediate proximity.

In summary, no known archaeological resources are listed for the project area. However, archaeological and historical sites have been recorded in close proximity. We strongly recommend an archaeological survey of the project area to locate and identify any cultural resources that should be preserved prior to any construction activity.

The Office of State Archaeology is prepared to offer A.S.L. Associates and the Town of Marlborough any technical assistance regarding this matter.

AREA OF ARCHAEOLOGICAL SENSITIVITY

Scale 1" = 1000'



Appendix

1. The following are essentially selected direct quotes from the publication "Carrying Capacity of Public Water Supply Watersheds: A Literature Review of Impacts on Water Quality from Residential Development", DEP Bulletin No. 11. The purpose is to provide a more complete picture of the problems, causes and possible solutions to the changes in the natural water quality and flow caused by development. Minor changes have been made to the original text to aid sentence structure and content flow.

2. State of CT Department of Health Services - Yield Test and Water Quality Information for Sachem Village

1.

Long-Term Storm Water Discharge: Impacts and Mitigation Measures

"A potential impact upon water quality from residential development is the discharge of runoff from roadways, parking areas and other impervious areas into existing waterbodies. Stormwater runoff has been identified by many researchers as a potential source of pollutants to receiving water bodies and groundwater. Potential contaminants in stormwater runoff may include suspended solids, organic and inorganic nitrogen, phosphorus, hydrocarbons, heavy metals, pathogenic bacteria, and road salts. Other water quality parameters such as biochemical oxygen demand and chemical oxygen demand are also of concern.

The "National Water Quality Inventory, 1986 Report to Congress", an assessment of water quality by individual states, concluded that pollution from diffuse sources such as agricultural and urban areas was the leading cause of water quality impairment. To provide a better understanding of the nature of urban runoff from commercial and residential areas, their impacts on water quality, and control techniques, the EPA provided funding and guidance to the Nationwide Urban Runoff Program (NURP) from 1978 through 1983. The NURP program involved 28 separate projects around the country. The data indicates that on an annual loading basis, suspended solids in storm water draining residential, commercial and light industrial areas are around an order of magnitude greater than secondarily treated sewage.

In a thorough study, examined land use and water quality in 10 watersheds tributary to lake Tahoe. They found that comparisons between land use and runoff water quality demonstrated significant relationships between increased watershed development and decreased water quality (as measured by nitrate, total phosphorus, and suspended sediment).

Time Scales of Water Quality Impacts: there are three major types of water quality impacts associated with urban runoff.

The first type is characterized by rapid, short-term changes in water quality during and shortly after storm events. Examples of this water quality impact include periodic dissolved oxygen depressions due to oxidation of contaminants, or short-term increases in the receiving water concentrations of one or more toxic contaminants.

Long-term water quality impacts, on the other hand, may be caused by contaminants associated with suspended solids that settle in receiving waters and by nutrients which enter receiving water systems with long retention times. In both instances, long-term water quality impacts are caused by increased residence times of pollutants in receiving waters. Other examples of the long-term water quality impacts include depressed dissolved oxygen caused by the oxidation of organics in bottom sediments, biological accumulation of toxics as a result of uptake by organisms in the food chain, and increased lake eutrophication as a result of the recycling of nutrients contributed by urban runoff discharges. The long-term water quality impacts of urban runoff are manifested during critical periods normally considered in point source pollution studies, such as summer, low stream flow conditions, and/or during sensitive life cycle stages of organisms. Since long-term water quality impacts occur during normal critical periods, it is necessary to distinguish between the relative contribution from other sources, such as treatment plant discharges and other nonpoint sources. A site-specific analysis is required to determine the impact of various types of pollutants during critical periods.

A third type of receiving water impact is related to the quantity or physical aspects of flow and includes short-term water quality effects caused by scour and resuspension of pollutants previously deposited in the sediments."

1). <u>Suspended Solids</u>

"The suspended solids of urban runoff consist of mineral and low solubility chemicals. The bulk of solids found in urban runoff consist of "inert" minerals of various types (i.e., quartz, feldspar, etc.) which reflect components of street paving compounds and local geology from land surface disruption and changes in land-use. Suspended solids often carry other contaminants with them, such as coliform bacteria, organics and heavy metals.

Sedimentation is one of the most important mechanisms for the removal of suspended solids from urban runoff. Particle size and flow rate are the main factors determining sedimentation rates. In general, sands (43-4800 microns) will settle out at low current velocities (<3 ft./sec.), clay (<4 microns) will remain suspended and silt (4-43 microns) will be intermediate.

The potential impact of suspended solids on biological systems includes the physical burial of plants and animals and changes in the nature of the substrate which may cause alteration of fauna and flora. High suspended solids concentrations reduce light penetration through water and may inhibit photosynthesis. Pollutants absorbed to suspended solids may be toxic to certain flora and fauna, and may also increased the nutrient load on receiving water bodies. Suspended sediments may also clog respiratory, feeding and/or digestive organs of certain organisms. Suspended solids often carry oxygen demanding substances and as such may reduce dissolved oxygen concentrations in water bodies."

2). Nitrogen and Phosphorus

"The majority of nitrogen and phosphorus in stormwater runoff is from commercial fertilizers, animal wastes and that which occurs naturally in precipitation. Up to 85% of phosphorus and 70% of nitrogen in surface runoff is attached to sediment. The loading intensities of nitrogen and phosphorus found on street surfaces have been reported as percent by weight of the dry solids collected from the street surface. Based on the analysis of samples from numerous cities, they report loading intensities for phosphates, Kjedahl nitrogen and nitrates for residential land-use to be 0.113, 0.218, and 0.0064 respectively as a percent by weight.

The potential impact from nitrogen and phosphorus in urban runoff is primarily the threat of accelerated eutrophication of receiving water bodies. The fate of the two major nutrients in urban runoff, nitrogen and phosphorus is determined by different mechanisms.

Nitrogen in runoff may exist as organic nitrogen, ammonium, nitrite, and/or nitrate. Organic nitrogen is rapidly mineralized to ammonium under aerobic conditions . Ammonium is further converted to nitrate under aerobic conditions. The conversion of ammonium to nitrate is achieved by the bacteria, *Nitrosomonas* and *Nitrobacte*, and is possible only where oxygen is present. Since the bacterial populations exist primarily on substrate surfaces such as litter, plant stems and soils, only the surface and upper submerged soil horizons are active nitrification sites.

Removal of phosphorus from stormwater runoff occurs primarily through precipitation, adsorption and plant uptake. Soluble phosphorus reacts with iron, aluminum and calcium in soil to form insoluble phosphates. Acidic conditions favor iron-phosphate and aluminum-phosphate complexes, while alkaline conditions favor calcium-phosphate complexes.

Other mechanisms of phosphorus removal involve microbial and plant uptake and incorporation of organic phosphorus into the soil. The available microbial pool may be quickly saturated under heavy phosphorus loads. Rooted emergent wetland vegetation takes up substantial quantities of phosphorus during the growing season, but during (plant decay), 35 to 75 percent of the plant phosphorus is released. Thus vegetation may serve as a temporary sink for phosphorus."

3). Hydrocarbons

"Hydrocarbons in urban runoff are associated with automotive exhaust, accidental oil and gasoline spills, crankcase drippings, and illegal dumping. Crankcase drippings are the most likely source of these pollutants. The low molecular weight hydrocarbons are quite volatile and evaporate quickly, often before any runoff-causing storm occurs. Low-volatility hydrocarbons are often adsorbed to particulate matter.

In an aqueous environment, the chemical structure of the hydrocarbon determines its fate. The two basic classes of hydrocarbons present in fuel oils are the aliphatics, which have their carbon atoms in open-chain structures, and the aromatics, whose carbon atoms are arranged in closed ring structures. Most hydrocarbons are insoluble and are either adsorbed to particles in the water or float on the water surfaces as a film. The low molecular weight aliphatic and aromatic hydrocarbons are volatile and evaporate quickly. The hydrocarbons adsorbed to particulate matter will settle out with the sediments; they are then subject to microbial degradation. Many hydrocarbons are capable of being decomposed through biochemical oxidation by certain species of bacteria, yeasts and molds, of which about 100 species have been identified.

Potential impacts of hydrocarbons are predominantly related to aquatic life. Oils may coat and destroy algae and other plankton. Settleable oily substances may coat bottom sediments, destroying benthic organisms and interfering with spawning areas. Hydrocarbons tend to accumulate in bottom sediments where they persist for long periods of time and exert adverse impacts on benthic organisms."

4). Heavy Metals

"Heavy metals identified in urban stormwater runoff include: zinc, copper, lead, nickel, mercury, chromium, iron, and cadmium. Most heavy metals originate in street dirt. Lead, zinc, nickel and copper appear most frequently. Concentrations of heavy metals in highway runoff exist predominantly in association with particulate matter.

The potential impact associated with heavy metals is their high potential toxicity to various biological forms. One of the most important factors in determining the toxic effect of a given metal is the form of the particular metal.

The NURP final report identifies copper as the key toxic pollutant in urban runoff.

- "Problem situations anticipated for lead and zinc do not occur under any conditions for which copper does not show up as a problem as well - and with more severe impacts. On the other hand, copper is indicated to be a problem in situations where lead or zinc are not.

- Based on the ratios between concentrations producing increasing severe effects, copper is suggested to be a more generic toxicant. It has an effect on a broad range of species.

Copper is accordingly suggested to be an effective indicator for all heavy metals in urban runoff relative to aquatic life. It might be used as the focus for control evaluations, site specific bioassays, monitoring activities, and the like."

Heavy metals in urban runoff are attenuated in the environment through physical, chemical and biological transformations and the fate and transformations of trace metals in natural environments follow complex processes. These processes include: adsorption on fine soil particles, plant and animal uptake, and sedimentation of particulate fractions. The results of an examination of heavy metals in highway runoff indicate that the fate of a large portion of both the suspended and dissolved fractions of heavy metals is their deposition into the bottom sediments of the receiving water body. It was also determined that the presence of organic substances in natural waters and the role of the sediments in the removal and retention of trace metals tend to detoxify the metals associated with highway runoff. It has been found that retention/detention ponds are effective in heavy metal removal from highway runoff, through the concentration of the heavy metals in the bottom sediments."

5). <u>Road De-icing Salts</u>

"Chloride and sodium are the primary chemical constituents of almost all deicing salts. Salt is most commonly mixed with sand prior to spreading on roadways. Sand and salt are pre-mixed at a ratio of 7:2 for spreading on State maintained roads in Connecticut.

Concentrations of sodium and chloride in storm water runoff vary seasonally; large increases, generally by two orders of magnitude, occur during the winter months. There is tremendous variation in the values reported for chloride and sodium in storm water runoff.

Impacts associated with the application of road de-icing salts, in particular sodium chloride, may effect receiving surface water bodies, groundwater, plants, animals, as well as roads and bridges. While the vehicular corrosion caused by road salts is well known to most New Englanders, road salts also damage home sidings, structural steel, and highway structures and pavements, particularly those constructed of Portland cement. Detrimental effects from de-icing salts have also been reported on various underground utilities, such as cables and water mains.

High concentrations are necessary for these salts to have toxic effects on aquatic organisms. Reported toxicity levels of sodium chloride on freshwater fish range from 2,500 to 50,000 mg/L NaCl.

Some research has been conducted on the effects of roadway de-icing salts on roadside plantings. Twelve studies indicate liberal application of road salts lead to widespread damage of roadside vegetation.

Additives present in many highway salts create additional pollution problems. Sodium ferrocyanide, used to minimize caking of salt stocks, is soluble in water and generates deadly cyanide in the presence of sunlight. In addition, chromate is added to de-icers for inhibition of corrosion. Chromium is also highly toxic; the Public Health Service limit for drinking water is 0.05 mg/L.

The greatest potential impact to water resources from the use of road de-icing salts is on groundwater. Salt enters groundwater as a solution containing chloride and sodium. Little or no removal of chloride ions takes place via adsorption. Thus, chloride is used as an indicator of the rate and extent of groundwater contamination. Groundwater is the source of most drinking water in rural areas of the state. In a study of groundwater quality in Connecticut, it is reported that sodium levels exceeded the State drinking water standard of 20 mg/L in about 12% of the water samples from all aquifers. In addition to increasing the corrosiveness of water high chloride levels in groundwater are unacceptable to some industrial uses such as dairy processing and photographic operations."

6). Biochemical Oxygen Demand and Chemical Oxygen Demand

"Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are two indices used to measure the effect of oxygen demanding pollutants on receiving waters. For the most part, such pollutants are organic substances.

The potential impact associated with BOD and COD is the depression of dissolved oxygen levels in aquatic habitats. Minor depressions can usually by tolerated by a free flowing, relatively unpolluted stream without any serious effect, although a slight shift in the aquatic ecological balance may occur. Under very heavy loads of oxygen demanding substances or where receiving waters are polluted, fish kills, foul odors, discoloration and slime growths are possible.

Due to the first flush effect of storm water runoff (i.e. the removal of most surface contaminants during the initial period of a storm event) the shock loading of oxygen demanding materials washed into water bodies from storm runoff can cause problems of greater severity than the average loadings would if discharged continuously.

Fish species such as salmonids and trout which rely on cold, well oxygenated water are especially sensitive to decreases in dissolved oxygen content of water bodies. It has been found that brook trout, native to Connecticut, have reduced growth when dissolved oxygen concentrations are reduced from 10.6 to 5.3 mg/L in a diurnal manner.

Wetland systems appear to be very efficient in reducing BOD and COD concentrations. Studies show that the greatest consistency in pollutant removal from stormwater runoff by wetlands appears to be for BOD as well as suspended solids and heavy metals. Wetlands receiving wastewater have been reported to reduce BOD and COD levels by 80 to nearly 100 percent. BOD and COD reduction in wetlands is aided by the large surface area of plant stems and litter which form a substrate for bacterial populations."

<u>Mitigating Measures</u>

"Several measures can be taken to reduce the potential for impact on water quality from storm water runoff. These measures include: periodic sweeping of paved surfaces, use of catch basins with sumps, incorporation of settling basins into the overall storm drainage design, stormwater detention within existing or created wetlands and, as already discussed, the substitution of various compounds for sodium chloride salts used in winter street and highway maintenance programs. Several other techniques are available including first flush diversion systems, infiltration trenches, porous pavement, oil/grit separators, grass swales, vegetative filter strips, lawn maintenance controls, debris removal, erosion control and the elimination of roadway curbing (on slopes less than 5%) to allow for sheet runoff and filtration of runoff through vegetative filter strips.

1). <u>Street cleaning</u> equipment preferentially removes the larger particles while rain events remove finer materials, and that street cleaning does not very effectively remove the available particles and street cleaning operations are expected to improve runoff quality by a maximum of 10 percent. While it is concluded that street sweeping is not effective in removing much of the pollutant load in stormwater runoff; it is effective in reducing sediment that would otherwise be deposited in storm drainage structures, settling basins, or the receiving water bodies."

2). Catch basins work as effective sediment traps and have been shown to effectively remove the coarse granular material in stormwater runoff. Test results have shown that virtually all of the solids larger than 246 microns are removed by catch basins. On the other hand, catch basins remove only a small portion of the fine solids. Since it is the fine particles that most pollutants are associated with, catch basins are not effective in reducing pollutants other than some suspended solids in stormwater.

Also, it is concluded that cleaning catch basin sumps about twice a year is expected to reduce lead and total solid concentrations in urban runoff by 10 percent to 25 percent and COD, phosphorus, nitrogen and zinc by 5 to 10 percent.

3). Settling basins constructed at storm drainage discharge points can effectively remove particulate matter from stormwater runoff. The efficiency of settling basins to remove suspended solids is determined by residency time within the basin and the nature of the flow pattern through the basin. Residency time depends on the volume of the basin and flow rates entering the basin.

Detention basins on individual subdivisions, for the control of post development increases in runoff, have been used with greater frequency since the early 1970's. While their use is effective in complying with local zoning regulations and sound engineering practice, the long-term maintenance of these structures has not been viewed with favor by municipalities due to the added costs associated with berm and weir maintenance and the removal of accumulated sediment. Ideally, a more logical approach to stormwater runoff control may be to address the entire watershed. This approach would provide for the construction of a single control measure placed at an appropriate position in the basin. This approach would require inter-town cooperation since watersheds do not respect corporate boundaries.

4). Wetlands Treatment Systems

It has been demonstrated that wetlands are very effective in removing a large amount of the pollutants that are present in stormwater.

One of the major functions of wetlands is the removal of suspended sediment from water moving through the wetlands. Decreased flow rate due to sheet-like flow and the presence of vegetation promote fallout of suspended particles. Since sediments often carry a substantial portion of the pollutant load of stormwaters, (i.e., adsorbed nutrients, heavy metals, COD and BOD) deposition of sediments can result in the removal of nutrients and toxins from the stormwater. Also, since little reworking of the sediments occurs in wetland systems, deposition of sediments can result in virtually permanent removal of most pollutants.

Wetlands provide an ideal environment for the denitrification of nitrates present in stormwaters to nitrogen gas because their substrates contain large amounts of organic carbon and because of the existence of anaerobic conditions. Denitrification has been demonstrated in many wetland studies and is generally cited as the major reason that wetlnads are nitrogen traps or sinks. Dissolved nitrogen in stormwater is removed not only by denitrification, but also through assimilation by emergent and submerged plants.

Phosphorus in stormwater runoff discharged to wetlands is removed from the stormwater via precipitation or adsorption of phosphorus on organic matter and through assimilation by plants and algae. The general pattern of phosphorus removal from stormwater is nearly complete removal of phosphorus during the growing season and limited uptake with possible release during non-growth seasons.

Since heavy metals are generally adsorbed to particulate matter in stormwater runoff, and since wetlands are considered very effective in the removal of suspended sediments, deposition of sediments effectively removes heavy metals from stormwater runoff.

The long retention times associated with wetlands allow adequate time for die-off of fecal and pathogenic microorganisms that may be present in stormwater runoff. Die-off occurs through competition with other soil microorganisms, inadequate nutrient source and other metabolic stresses (i.e., lower temperatures).

Wetland systems show great consistency in the reduction of biochemical oxygen demand and chemical demand. The large amount of surface area of plant stems and litter form a substrate for bacterial populations which are responsible for BOD and COD reductions.

5). Fertilizer Use Education

In residential areas, fertilizers are commonly applied to turf lawns, home gardens, as well as ornamental shrubs and trees. The major plant nutrients common to most fertilizers are nitrogen, phosphorus and potassium. In addition, over fertilization of suburban lawns may cause nitrogen to leach to groundwater, thereby increasing groundwater nitrate concentrations.

The education of residential home owners on proper fertilizer application rates can help mitigate their potential impact. The "more must be better" mentality often leads to over fertilization which increases the possibility of nutrient export.

Another form of mitigation is the preservation of freshwater wetlands, especially those contiguous to tributary surface waters, within residential watersheds. Wetlands "can be a very significant factor in reducing available phosphorus loadings in tributaries during the low flow period of the summer growing season". Removal of phosphorus from overlying water in wetlands is accomplished via physical entrapment of particulate phosphorus, chemical sorption by organic matter and soil particles, uptake by aquatic plants and attached algae, and utilization by bacteria an other microorganisms. Although little phosphorus is permanently withheld on an annual basis, the "spring and summer storage, fall and winter release" is a valuable service to lake and reservoir water quality provided by wetlands.

Predicting the effect of residential development on lake and reservoir water quality requires an understanding of its incrementally nature. Most residential subdivisions in Connecticut are not very large; they probably lack the potential by themselves, to contribute enough nutrients to noticeably alter a reservoir's trophic status. However, many new developments in a watershed previously forested probably pose an eventual threat to reservoir water quality. Consider a lake or reservoir whose entire watershed is forested. If over the years, 10 new subdivisions are built, each covering about 1% of the watershed, the total export of phosphorus from the watershed to the lake would increase 40-90%. This substantial increase in phosphorus loading might be expected to alter a lake or reservoir's trophic status resulting in possible algal blooms and hypolimnetic oxygen depletion. In reality, this situation is probably happening in parts of Connecticut and, therefore, long-term maintenance of lake water quality requires that new development, even seemingly innocuous low density subdivisions, be designed and maintained so as to minimize phosphorus export.

6). <u>Pesticide Use Education</u>

Types of pesticides include: insecticides, fungicides, herbicides, weedicides, rodenticides, and nematocides. As of 1974, some 900 chemicals in 60,000 formulations were being used to control pests in the United States.

Based on recent studies public concern is on the increase and awareness is due to: (1) new information and concern about subtle health effects and associated risks linked to low-level pesticide exposure; (2) numerous discoveries of pesticides in groundwater coupled with the growing awareness that pesticides may persist in groundwater orders of magnitude longer than in soils or surface waters; and (3) many newer pesticides are purposely designed to be more mobile (less strongly soil-absorbed) than their predecessors. The introduction of unwanted pesticides from spills, drift, surface runoff or groundwater discharge into a lake or reservoir can upset delicate aquatic plant balances, kill or contaminate fisheries, limit water contact recreation, and severely contaminate drinking water. Baker shows that conventional water treatment does not remove many commonly used pesticides.

There appear to be five possible fates of pesticides once they end up in the soil.

Vaporization. The volatility and susceptibility to atmospheric loss of pesticides in soils is quite variable. Generally the higher the vapor pressure of the individual chemical, the higher the loss to the atmosphere. It is possible for some chemicals, after their loss to the atmosphere, to return to the soil or surface water in precipitation.

Adsorption. This is determined by characteristics of the soils and pesticides, themselves. Generally, the larger the size of the pesticide molecules, the greater the adsoprtion. Certain functional groups on the pesticide molecules (-OH, -NH_2, -$COOH_2$, -COOR, R_3N+) encourage adsorption, especially to soil humus. Apparently, the complexity of the humus fraction along with its non-polar nature encourages adsorption. Overall, soil organic matter content is the soil characteristic most closely associated with adsorption.

Leaching. The ability of pesticides to move downward through the soil profile is closely related to their potential for adsorption. Strongly adsorbed molecules are unlikely to move downward. Generally, herbicides seem to be more mobile than fungicides or insecticides.

Chemical Reactions. Within soils, many pesticides undergo chemical modification independent of soil organisms. Solar radiation causes slow photo-decomposition of some pesticides, but reactions catalyzed directly by the soil are more important. This catalysis is thought to be due largely to the silicate clay fraction, especially if the soils are acid.

Microbial Metabolism. Biochemical degradation by soil microorganisms is perhaps the single most important method by which pesticides are removed from soils. Certain functional groups on pesticides seem to provide points of attack for soil organisms (-OH, -COO, -NH_2, -NO_2). Many pesticides, such as the chlorinated hydrocarbons, are new to the earth; soil organisms have not yet evolved metabolic pathways for the rapid degradation of these compounds. Organophosphate insecticides are generally degraded by microorganisms in soils."

Principles of Soil Erosion and Sedimentation

"Soil erosion is defined as the process by which the land's surface is worn away by the actions of wind, water, ice and gravity. Natural erosion occurs at a very slow and generally uniform rate. Water generated erosion is the most damaging of all the erosional forces, especially in developing areas. The disturbance of the land's surface through urban development eliminates the protection provided by natural vegetation and exposes soil to the forces of erosion.

The erosion process can be viewed as a transfer of energy. The natural energy of water, as a falling rain drop at 20-30 feet per second, first detaches the exposed soil particle. As much as 100 tons per acre can be splashed into the air during a heavy rain storm. On level areas, soil particles can be transported 2 feet vertically and 5 feet horizontally. On sloped sites the net transport is down gradient. Compaction of the soil surface can also result from rainfall impact.

Existing urban land generates 200-500 tons of sediment per square mile per year. It has been estimated that development of urban land generates from 1,000 to 100,000 tons of sediment per square mile per year. In contrast, forest land is estimated to generate 15-100 tons of sediment per square mile per year.

Suburban expansion has been identified as the principal source of silt to water bodies. Construction related erosion and sedimentation was identified in 1988 as a known source of water quality problems in fourteen Connecticut reservoirs."

Groundwater Contamination Associated with Residential Development

"The quality and quantity of groundwater and surface water are so interdependent, that they can not be managed separately. Connecticut's groundwater quality is generally good to excellent, but, groundwater contamination is widespread; public or private wells have been contaminated in 116 towns in the State.

The process by which water enters groundwater is known as "recharge". Precipitation is the major source of groundwater recharge in Connecticut. Annual precipitation in Connecticut averages 44 to 48 inches and is distributed almost evenly throughout the year. This is equivalent to about 70 million gallons of water falling on every square mile each month. Nearly half of this precipitation evaporates or is transpired by plants; the rest flows overland into surface waterbodies or infiltrates into the ground to become groundwater. The volume of infiltration will vary depending on site characteristics. Groundwater can be divided into two zones, the saturated zone and the unsaturated zone. Within the unsaturated zone the small spaces and voids within the soil are partially filed with water and partially filled with air. Within the saturated zone, all soil pores are filled with water under hydrostatic pressure.

Water can move up or down between these two zones via percolation (gravity flow), evaporation, and capillary action. The movement of groundwater depends on the properties of the soil and geologic material in which it is found. Horizontal flow is determined by the relative altitude of the water table while the rate of movement is determined by hydraulic gradients, hydraulic conductivity, and porosity. The downward movement of water is often obstructed in Connecticut by "hard pan", a dense layer of compacted glacial till resulting from the action of obstructed glacial ice flows.

An aquifer can be defined as any geological condition where groundwater can be withdrawn in usable quantities. Groundwater in Connecticut comes from aquifers composed of unconsolidated sediments (till and stratified drift) or bedrock.

In Connecticut, bedrock aquifers are the primary sources of water for both domestic and commercial users who are not served by public water supplies. In addition, over 1,000 bedrock wells serve as water supply sources for public water systems in the State. Within bedrock aquifers, water moves through a network of fractures and other large openings. Contaminants can enter along these fractures, especially where the overlying unconsolidated sediments are thin and it is generally accepted that a large reduction in the concentration of a pollutant takes a long time. A complete removal of a body of contaminated water in a bedrock aquifer may require decades or even centuries, depending upon the bedrock characteristics. As water moves through bedrock it is renovated little, if at all, so bacteria and viruses can travel significant distances if they reach the saturated zone in a fractured bedrock aquifer.

Unconsolidated sediments are materials that have been moved by glaciers and subsequently sorted and deposited either directly from the ice or from glacial melt-water. These sediments overlay bedrock. However, not all stratified drift aquifers have good water bearing properties. Stratified drift that isn't interbedded with coarse layers makes poor aquifers. However, these fine grained stratified drift aquifers are less susceptible to contamination than coarse grained drift because of the lower hydraulic conductivity. Many sources have indicated that Connecticut's stratified drift aquifers are susceptible to contamination. The reasons for the susceptibility of coarse grained aquifers are as follows: (1) a high hydraulic conductivity; (2) shallow depth to the saturated zone; (3) location primarily in or near urban and industrialized areas; (4) hydraulic connections to nearby surface water bodies; (5) and recharge from direct precipitation to adjacent upland areas that flows in groundwater down gradient."

STATE OF CONNECTICUT
DEPARTMENT OF HEALTH SERVICES

NAME: Mr. James Ericson
Lenard Engineering, Inc.
1066 Storrs Road
ADDRESS: Storrs, CT 06268

DATE: March 9, 1987

TOWN: MARLBOROUGH

UTILITY: SACHEM VILLAGE

( ) For your information.

( ) Please note special recommendations.

( ) Resampling requested.

(X) For necessary action.

( ) Remarks. Phase 1-B of PA 84-330 with contingencies.

Michael Hage
Senior Sanitary Engineer
Water Supplies Section

MH/ch

cc: John Lamonte, 584 Franklin Ave., Hartford
Mark Tuttle, M.D., Director of Health

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February 19, 1987

YIELD TEST AND WATER QUALITY

SUBJECT: MARLBOROUGH, CT: DEVELOPMENT OF A NEW WELL #1 TO SERVE THE SACHEM VILLAGE CONDOMINIUMS.

From: MH Michael Hage
Senior Engineer Intern
Water Supplies Section

UTILITY: Sachem Village
CONSULTING ENGINEER: Lenard Engineering, Inc.
SITE LOCATION: Hodge Road, Marlborough, CT, Well #1
PROJECT DESCRIPTION: Well development for new condos project

WELL INFORMATION

WELL DRILLER: Stavens Brother
TYPE OF WELL: Drilled
CASING DIAMETER: 6"
PUMP CAPACITY: 38 gpm (see item 4)
SCREEN TYPE: Not Available

DATE CONSTRUCTED: 10/20/86
DEPTH: 530'
CASING LENGTH: 22'
DEPTH TO PUMP (From Top of Casing): 441'
SCREEN LENGTH: Not Available

YIELD TEST

TEST DONE BY: Stavens Brothers
DURATION OF TEST: 36 hours
STABILIZED PUMPING RATE: 18 gpm
STATIC WATER LEVEL: 62'
STABILIZED DRAWDOWN: 218'

WATER QUALITY

DATE SAMPLES COLLECTED: 12/2/86
NO. OF HOURS WELL PUMPED
BEFORE SAMPLE COLLECTION: 1 hour
BACTERIAL: OK
ROUTINE SANITARY CHEMISTRY: High Na and Fe
INORGANIC CHEMICALS: OK
VOLATILE ORGANIC CHEMICALS: OK

LABORATORY PERFORMING ANALYSIS:
State Lab
(X=ANALYZED FOR)
PHYSICAL: High color and turbidity
PESTICIDES: Not tested
HYDROCARBONS: OK
RADIATION: OK

CONCLUSIONS AND RECOMMENDATIONS

1. The results of water samples collected from the wells (1 and 2) on 12/2/86 and analyzed for bacteriological, physical, sanitary chemical, metals, volatile organics chemical, hydrocarbons and radiation parameters, indicated that the water meets the standards set by the Public Health Code with the exception of high levels of sodium, iron and manganese. The high conentrations of iron and manganese contributed to the unacceptable levels of color and turbidity at Well #1 and the elevated levels at Well #2.

2. Treatment is needed to reduce the levels of iron, color and turbidity to an acceptable range. Approval to use the subject source of supply would not be issued unless all water parameters meet the Public Health Code standards Section 19-13-B102. All treatment plans and specifications should be submitted to this office for our review and approval prior to construction. This evaluation can be submitted under Phase II of the review process.

3. The sodium levels at Well #1 (44 mg/l) and Well #2 (39 mg/l) exceed the Public Health Code limit of 20 mg/l. Unless the utility decides to treat the water and reduce the sodium levels, public notification of elevated sodium will be required. Notice should be placed in the town records so that potential buyers will be aware of the sodium levels prior to purchasing a condominium unit.

4. The combined radium 226 and 228 results for Wells #1 and #2 were measured at 3.75 pico curies per liter and 3.94 pico curies per liter respectively. The maximum permissible level is 5.0 pico curies per liter. Although water treatment is not required at this time, both wells should be tested quarterly for a period of 1 year. At the end of the year each well will be revaluated to determine compliance to the regulations and the need for treatment.

5. The well pump capacity should not exceed the safe yield, and should only be capable of pumping 90% of the well yield as determined during the yield test. In this case the pump capacity should not exceed 16.2 gpm at each well.

In closing, items 2-4 should be considered and implemented by the owner. Necessary treatment should be included on the next submittal to this office regarding Phase II of Public Act 84-330.

MH/ch
10s

SUBJECT: MARLBOROUGH, CT: DEVELOPMENT OF A NEW WELL #2 TO SERVE THE SACHEM VILLAGE CONDOMINIUMS.

From: MH Michael Hage
Senior Engineer Intern
Water Supplies Section

UTILITY: Sachem Village
CONSULTING ENGINEER: Lenard Engineering, Inc.
SITE LOCATION: Hodge Road, Marlborough, CT
PROJECT DESCRIPTION: Well development for new condos unit

WELL INFORMATION

WELL DRILLER: Stavens Brother
TYPE OF WELL: Drilled
CASING DIAMETER: 6"
PUMP CAPACITY: 50 gpm (see item 4)
SCREEN TYPE: Not Available

DATE CONSTRUCTED: 10/20/86
DEPTH: 780'
CASING LENGTH: 22'
DEPTH TO PUMP (From Top of Casing): 441'
SCREEN LENGTH: Not Available

YIELD TEST

TEST DONE BY: Stavens Brothers, John Kupchunos
DURATION OF TEST: 36 hours
STABILIZED PUMPING RATE: 18 gpm
STATIC WATER LEVEL: 44'
STABILIZED DRAWDOWN: 214'

WATER QUALITY

DATE SAMPLES COLLECTED: 12/2/86
NO. OF HOURS WELL PUMPED
BEFORE SAMPLE COLLECTION: 1 hour
BACTERIAL: OK
ROUTINE SANITARY CHEMISTRY: High Na and Fe
INORGANIC CHEMICALS: OK
VOLATILE ORGANIC CHEMICALS: OK

LABORATORY PERFORMING ANALYSIS:
State Lab
(X=ANALYZED FOR)
PHYSICAL: OK
PESTICIDES: Not tested
HYDROCARBONS: OK
RADIATION: OK

CONCLUSIONS AND RECOMMENDATIONS

1. The results of water samples collected from the wells (1 and 2) on 12/2/86 and analyzed for bacteriological, physical, sanitary chemical, metals, volatile organics chemical, hydrocarbons and radiation parameters, indicated that the water meets the standards set by the Public Health Code with the exception of high levels of sodium, iron and manganese. The high conentrations of iron and manganese contributed to the unacceptable levels of color and turbidity at Well #1 and the elevated levels at Well #2.

2. Treatment is needed to reduce the levels of iron, color and turbidity to an acceptable range. Approval to use the subject source of supply would not be issued unless all water parameters meet the Public Health Code standards Section 19-13-B102. All treatment plans and specifications should be submitted to this office for our review and approval prior to construction. This evaluation can be submitted under Phase II of the review process.

3. The sodium levels at Well #1 (44 mg/l) and Well #2 (39 mg/l) exceed the Public Health Code limit of 20 mg/l. Unless the utility decides to treat the water and reduce the sodium levels, public notification of elevated sodium will be required. Notice should be placed in the town records so that potential buyers will be aware of the sodium levels prior to purchasing a condominium unit.

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5. The well pump capacity should not exceed the safe yield, and should only be capable of pumping 90% of the well yield as determined during the yield test. In this case the pump capacity should not exceed 16.2 gpm at each well.

In closing, items 2-4 should be considered and implemented by the owner. Necessary treatment should be included on the next submittal to this office regarding Phase II of Public Act 84-330.

MH/ch
10s

ABOUT THE TEAM

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

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

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

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

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