Vynalek Golf Course

Haddam, Connecticut

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

Vynalek Golf Course

Haddam, Connecticut

Environmental Review Team Report

Prepared by the
Eastern Connecticut Environmental Review Team
of the Eastern Connecticut
Resource Conservation and Development Area, Inc.

for the
Inland Wetlands and Watercourses Commission
Haddam, Connecticut

September 1998

CT Environmental Review Teams
1066 Saybrook Road, P.O. Box 70
Haddam, CT 06442
(860) 345-3977

Acknowledgments

This report is an outgrowth of a request from the Haddam Inland Wetlands and Watercourses Commission to the Middlesex 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 Eastern Connecticut Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Tuesday, April 21, 1998.

Nicholas Bellantoni	State Archaeologist UCONN - Museum of Natural History (860) 486-5248
Norman Gray	Geologist UCONN - Dept. of Geology and Geophysics (860) 345-1386
Ann Hadley	Executive Director and Geologist Middlesex County Soil & Water Conservation District (860) 345-3219
Douglas Hoskins	Environmental Analyst III DEP - Inland Water Resources Division (860) 424-3903

Ann Kilpatrick	Wildlife Biologist DEP - Eastern District (860) 295-9523
Dawn McKay	Biologist/Environmental Analyst III DEP - Natural Resources Center (860) 424-3592)
Peter Picone	Wildlife Biologist DEP - Wildlife Division Sessions Woods WMA (860) 675-8130
Judy Singer	Hydrogeologist, RPG, CHMM DEP - Pesticide Management Division Groundwater Protection System (860) 424-3326
Thomas Worthley	Forester UCONN Cooperative Extension System Forest Stewardship Program (860) 345-4511

I would also like to thank Leslie Starr, Haddam IWWC member, Roger Alsbaugh, wetland enforcement officer, Harry Eberhart, town planner, Robert Tommell, town engineer, Wade Thomas, town consultant engineer, Ralph Vynalek, owner and applicant and Michael Wrang, engineer for the applicant, for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were given additional plans and information. 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 plans 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 applicant. 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 Town and applicant. 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 reviewing this proposed golf course.

If you require additional information please contact:

Elaine Sych, ERT Coordinator
CT ERT Program
P.O. Box 70
Haddam, CT 06438
(860) 345-3977

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Introduction

I. Introduction

The Haddam Inland Wetlands and Watercoaurses Commission (IWWC) has requested assistance from the Eastern Connecticut Environmental Review Team in reviewing a proposed 18-hole golf course.

The 18 hole golf course is proposed for 146.4 acres of land located on both sides of Candlewood Hill Road near the Durham town line. The first nine holes will be located to the south of the road in an uncleared area of upland forest and three intermittent streams which lead downhill to a large red maple swamp. This section will also contain a clubhouse, maintenance building and two parking lots. Holes 10 through 18 will be located on the northern side of the road along with a practice area. This is an area of partially cleared land with two existing ponds and a perennial stream.

II. Objectives of the ERT Study

The town has asked for assistance in reviewing this project because it represents a significnat change in land use. Concerns include construction and post-construction impacts to water, wildlife and vegetation resources, and information on soil erosion and sediment control, pesticide use and archaeological significance. The following sections of this report and the materials in the appendix provide basic natural resource information, a review of plans and recommendations and management guidelines relevant to this this specific project.

III. The ERT Process

Through the efforts of the Inland Wetlands and Watercourses Commission this environmental review and report was prepared for the Town of Haddam.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the Town. Team members were able to review maps, plans and supporting documentation provided by the applicant.

The review process consisted of four phases:

1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted on Tuesday, April 21, 1998 and some Team members made additional site visits. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

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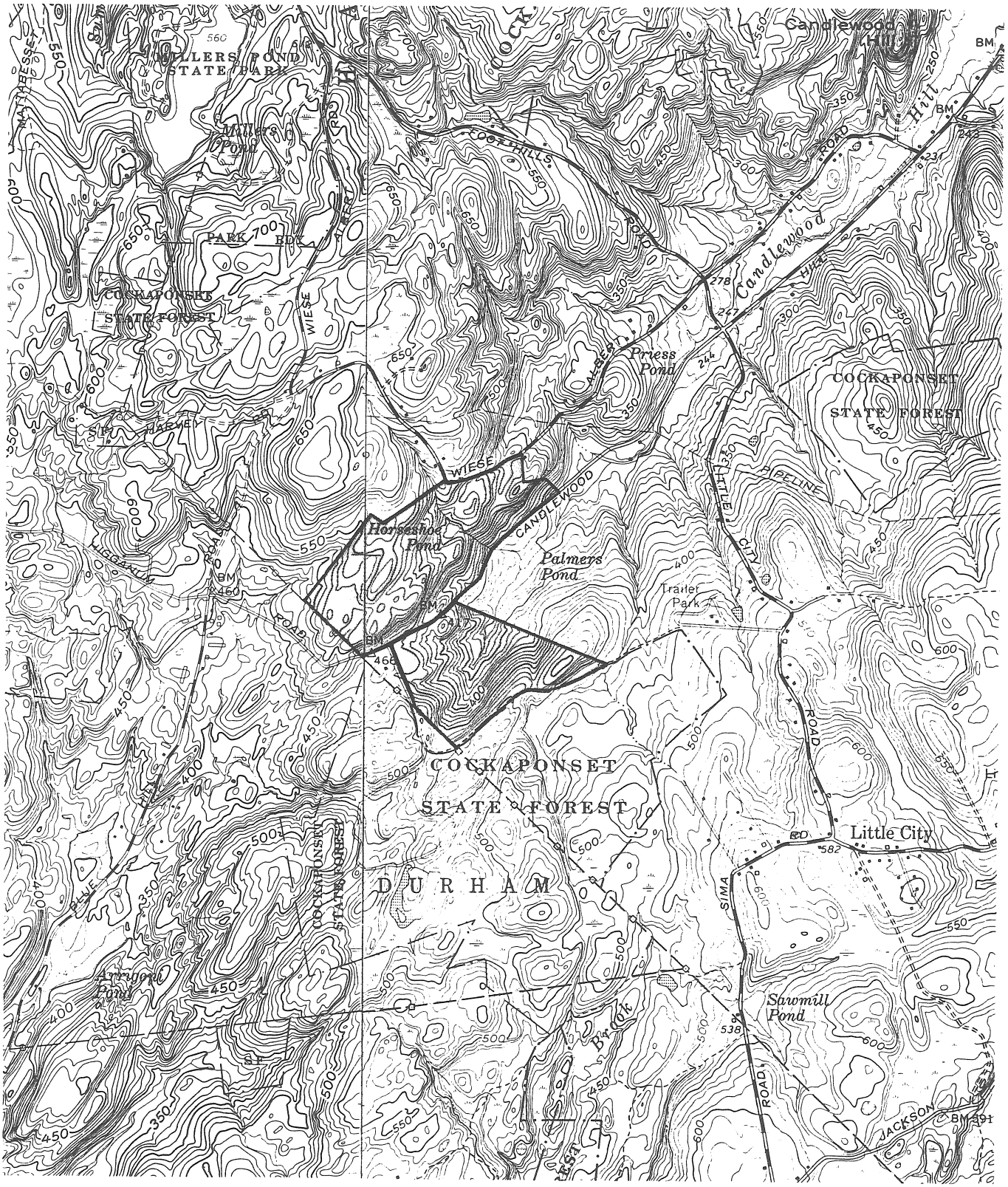
Location and Topographic Map



Topography and Geology

I. Topography

The proposed Vynalek Property 18 hole golf course straddles a major drainage divide between the Connecticut River and Long Island Sound. The greatest portion of the property drains to the northeast along Candlewood Hill Brook into the Connecticut River at Higganum. The northwestern corner of site drains to Long Island Sound via Arrigoni Pond and the Hammonasset River.

II. Geology

Candlewood Hill Brook has deeply incised its valley along the contact between two distinctly different rock types - the Middletown and Monson gneisses. Although the area has been glaciated and is discontinuously covered up to several feet of a sandy glacial till (material ground up and dragged along at the base of the last major ice sheet to cover Connecticut 20-30,000 years ago) outcrops are common. The present day topography is influenced more by the nature of the underlying bedrock than by glacial erosion or deposition. The north side of the valley is underlain by interlayered amphibolites, granite gneisses, pegmatites and rusty weathering schists belonging to the Middletown Formation. The amphibolites are strikingly black in color and are composed of millimeter-sized grains of hornblende (a hydrous iron-magnesium silicate) and plagioclase feldspars Calcium, sodium aluminum silicate). The granite gneisses and pegmatites are light pink to white in color and are made up of quartz, feldspar and micas. The pegmatites are extremely coarse grained and individual crystals range up to 10's of centimeters in size. The rusty weathering gneisses are

mineralogically similar to the granite gneisses but the presence of small amounts of pyrite and/or pyhrrotite (iron sulfides) has made them much more vulnerable to decomposition. The small amount iron released on weathering the sulfides stains the rock deep red. The acid produced by the oxidation of the sulfur to sulfate speeds up the weathering of the feldspars and results in the complete disaggregation of the rock. The rusty schists form the valleys and the more resistant pegmatites and gneisses the hills. The various rock layers are oriented parallel to the Candlewood Hill Brook and dip 20 to 40 degrees towards the Northwest. The outcroppings of the erosion resistant pegmatites and granite gneisses thus form a series of northeast-southwest elongated ridges separated by small valleys underlain by the readily eroded decomposed rusty gneisses.

Reflecting a difference in the underlying rock type the topography on the south side of Candlewood Hill Brook is characterized by rounded rock knolls rather than elongated ridges and valleys. The bedrock on the south side is the Monson gneiss; a comparatively homogeneous granite gneiss. The rock is poorly foliated and is essentially unlayered. Consequently, the topography is controlled by a widely spaced rectangular fracture network rather than by lithological differences.

III. Bedrock Hydrogeology

The differences in density and orientations of the fractures in the Monson and Middletown gneisses on either side of Candlewood Hill Road must affect the hydrogeology of the two separate parcels included in the proposal. Fractures observed in the outcrops of the Middletown gneisses north of the road all dip shallowly to the northwest parallel to the prominent foliation and layering. The fractures on the south side in the homogeneous Monson gneiss are spaced widely and are predominantly vertical. Wells drilled on the northern parcel are thus likely to be most productive. On the other hand, any contamination of the local groundwater due to the cultivation of the golf course grasses would be most likely to show up first on the north side of the road along the trend of the southwest-northeast shallow fractures.

IV. Additional Information

Both the Bedrock and Surficial Geology of the site are included on maps published by either the United States Geological Survey (USGS) or the Connecticut Geological and Natural History Survey (CT).

USGS GQ-756 Surficial Geology of the Durham Quadrangle by Howard E. Simpson, 1968.

CT QR-36 The Surficial Geology of the Haddam Quadrangle by Richard F. Flint, 1978.

QR-37 The Bedrock Geology of the Haddam Quadrangle by Lawrence Lundgren, 1979.

Hydrogeologic Setting and Potential Impacts By Pesticides to the Water Resources Environment

This section of the Environmental Review Team (ERT) report presents an evaluation of the site hydrogeology and its vulnerability to potential impact from pesticides use by the proposed golf course. The initial meeting of the ERT team to begin review of the proposed project took place on April 21, 1998. The meeting was followed by a field walk to inspect the site. Additional background materials were reviewed and included various town reports, maps, well completion reports and other documents.

I. Purpose and Methods

According to ERT guidelines, an ERT report provides information concerning effects from a proposed project to the existing natural resources environment at the project site. In some cases, commentary on possible mitigation measures may be provided to address effects anticipated from a proposed project. This section, therefore, will evaluate the hydrogeology of the site related to the use of pesticides at the proposed golf course and potential impact to the water resources environment of the area.

A standard model to use when evaluating pollutant effects on water resources employs the concept of *source, pathways* and *receptors*. This is a useful model since it considers the transport method of how a pollutant moves to and occurs in water. In this case, the *source is* the pesticide usage, *the pathways* are described by the hydrogeology and the *receptors* are the water resources. Here, the water resource receptors include surface water in the form of streams, ponds, and wetlands; and,

groundwater occurring naturally and that which is extracted from wells for consumption or irrigation.

II. Hydrogeology of the Site *(Pathways)*

The entire 146.6 acre site, both the surface and the subsurface constitute the site's hydrogeologic setting. Evaluating the hydrogeology considers all the forms in which surface water and ground water can occur and can include ponds, streams, wetlands and the groundwater that moves under vertical and horizontal hydraulic gradients through the soil layer, the underlying surficial sediments and through the fractures in the bedrock. Groundwater occurs beneath the entire project area and is evident in some ponds as the point where groundwater intersects the land surface. A major drainage divide occurs in the northern section of the project area. The area to the west of the divide is the drinking water supply watershed of the South Central Connecticut Regional Water Authority. The groundwater classification here is GAA, the highest classification, where water quality is known or presumed to meet water quality criteria to support an existing or potential public drinking water supply. The GAA groundwater classification applies to groundwaters within a public water supply or within the area of influence of community and noncommunity water supply wells. It is presumed suitable for direct human consumption without the need for treatment. Water quality must be maintained in this condition. The surface water quality classification is AA, again, the highest classification where water quality is known or presumed to meet water quality criteria which supports an existing or potential drinking water supply. The remainder of the property east of the drainage divide is classified GA for groundwater and A for surface water. Here, the GA designation means the groundwaters are within the area of influence of private wells and potential public water supply wells. The water is presumed suitable for direct human consumption without the need for treatment. Class A surface waters, likewise, are known or presumed to meet water quality criteria to support a potential drinking water supply and must be maintained in that condition. The main distinction between GAA and GA is that the GAA applies to an *existing* public drinking water supply. (1) In addition to

stream channels the main surface water bodies are Horseneck Pond and a constructed pond (1992) in the northern section of the project area and Palmers Pond is in the southern section of the area south of Candlewood Hill Road

The dominant control on the groundwater flow paths at the site is the degree of fracturing and the degree to which fractures in the bedrock intersect. Surficial geology or the glacial till that thinly covers the upland bedrock areas modifies the hydrogeology insofar as the vertical permeability of the till permits infiltration to the underlying rock layers. Another influence in this type of setting in the degree to which the surface of rock is weathered. A thick weathered layer on the top of rock can function to impede surface infiltration. This rock weathering condition was not observed during the site inspection at any bedrock outcrops. A major significant feature at the site that influences groundwater flow is roughly coincident with Candlewood Hill Road. Here, the contact between the two major rock type occurs. To the north of Candlewood Hill Road is the Middletown formation, a very dark orthoamphibole gneiss and to the south, the Monson Gneiss, a gray quartz-plagioclase gneiss with amphibolite layers. A contact of two rock types can function preferentially as a significant groundwater flow path. (2)

Down gradient of the site are the glacial ice-contact stratified drift deposits along Candlewood Hill Brook. These materials consist of an assortment of sand, gravel, silt and clay in various proportions. This type of material may be very permeable. Some well completion reports along this stretch of Candlewood Hill Brook record thickness of up to 60 feet of the glacial materials. These deposits are mapped a short distance from the point where Palmers Pond drains into Candlewood Hill Brook and are distributed broadly along the Candlewood Hill Brook valley. These glacial deposits overlain by alluvial sediments are likely to be quite permeable in both the vertical and horizontal direction for ground water and its constituents. (3)

III. Pesticide Usage *(Source)*

According to the above described model evaluating *source, pathways and receptors*, pesticide usage at a golf course must be linked to the specific hydrogeology of the site in question and to the identified receptors. Once the hydrogeology and the receptors are identified, a preliminary selection of all pesticides contemplated for use on the golf course must be made and subjected to an analysis regarding their potential impact to the water resources environment. This analysis is done by examining each pesticide's particular physical and chemical properties. Commonly, the pesticide's properties of water solubility, hydrolysis half-life, soil half-life, volatility, the soil/water distribution coefficient (Kd) and the partitioning coefficient between water and soil organic carbon (KOC) are considered. (See Appendix for definitions of pesticide physical and chemical properties.) These properties will influence how a pesticide will react with the ground and surface water and the soil/sediment matrix. For instance, a pesticide may readily solubilize in water and thus function as a "leacher" by infiltrating through to the groundwater. The amount of organic material present in the surface soil layer may influence this downward migration of a pesticide. Some pesticides exhibit a tendency to sorb onto or stick to soil particles. This tendency, while lessening the downward percolation of the pesticide, will function as a "source" for possible migration off-site together with the soil particles and surface water runoff. Usually, a pesticide will fall into one or the other category (to leach or to sorb). Unfortunately, it is difficult to satisfy both these conditions in order to mitigate impact to both surface water and groundwater.

Historically, the three of the major categories of pesticides; herbicides, insecticides and fungicides, have been routinely and abundantly used on golf courses. Today's trend in golf course design and maintenance is toward more natural, less manicured conditions and less pesticide usage. The "greening of golf courses" is the term used to describe the approach toward more natural, environmentally sensitive golf courses. Water quality concerns and wildlife habitat issues have shifted the focus away from

heavy pesticide usage toward keeping and maintaining this naturally-occurring vegetation and, therefore, diminished uses of pesticides. According to a 1995 Golf Digest survey, 87% of readers favor golf course measures to prevent golf course pollution or to conserve water. Limiting pesticide usage is a cost-saving measure as well. One typical Connecticut nine-hole golf course applied about 7000 lbs. of pesticide products for the 1994 season. Using the Integrated Pest Management (IPM) measure of eliminating the golf course rough from pesticide treatment would have cut pesticide usage and costs by about half.

Another reason to explain the change of attitude toward more environmentally sensitive golf courses is the fact that water quality data generated nation-wide since about 1971 has revealed pesticides occurring in the groundwater as a result of normal usage practices in addition to that which could be explained by spills, leaks or mishandling. Numerous studies document pesticide occurrence in groundwater with detections usually in the part per billion range. Specifically, 2,4 D, dicamba and DCPA, all products known to be used at golf courses, have been detected in groundwater in some areas of Connecticut. (4)

IV. Water Resources *(Receptors)*

Receptors at the site include the watercourses, existing domestic wells, Horseshoe Pond, Palmers Pond, the constructed/altered ponds in the northern portion of the property, the two proposed wells for the golf course and wetlands. The wells are potentially recharged by infiltrating surface water and groundwater transported to a well under pumping conditions.

The two major ways in which pesticides can reach the water resources environment, surface water or groundwater are:

1) by the vertical infiltration or percolation of pesticides with rainwater or irrigation water through the soil, sediment and rock reaching the groundwater at the water table.

2) surface runoff or overland flow into streams depending on the antecedent moisture conditions in the soil profile, bedrock at the surface or impermeable (paved) surfaces.

As described under the section **Pesticide Usage** ***(Source)***, the physical and chemical characteristics of a pesticide determine its leachability or surface runoff potential. For instance, a low solubility pesticide may be less likely to migrate with percolating water down to the water table but its KOC value may enhance its potential to adsorb onto eroded soil particles that are subject to surface runoff forces.

Two critical elements related to the selection of pesticide products are; #1 how and when a pesticide's active ingredient degrades into a metabolite and how toxic that metabolite may be. The half-life property of a pesticide is related to the conversion of some of the pesticide's active ingredient into its respective metabolite. The second critical element is to know what the "inert" or carrier products are that are combined with the active ingredient of a product. Inerts can be ingredients as simple as water or be oils, surfactants or solvents that in themselves represent potential contaminants to water quality As an example, one popular golf course fungicide contains 85% solvents as the inerts. Obviously, such a product could not be used in a GAA groundwater classification area. The percentage amount of active ingredient and inerts of the product will appear on the label but the actual identification of what the inerts are may not. A good way to find out what the inerts are is to have and refer to the Material Safety Data Sheets (MSDS) for the product.

To reiterate, it is difficult to satisfy all the criteria that would inhibit movement of pesticides to both groundwater and surface water. Consequently, planning ahead of time to prevent pesticide migration to the water resource is of paramount importance since corrective clean-up measures after the fact can be expensive, lengthy and difficult to achieve completely.

V. Suggestions and Recommendations

- Any development proposal for the Vynalek parcel should be weighed against the attributes of the area as shown in the Town of Haddam, Connecticut, Proposed Land Use map. Existing open space and preservation areas and special concern areas are the two categories of proposed land use that occupy nearly all of the area under review. Special concern areas that apply to this site include: 200 foot buffer of watercourses and waterbodies in water company watershed lands; 100 foot buffer of watercourses, waterbodies and wetlands; areas of 15% or greater slope adjacent to watercourses. (5) A quote in the New York Times edition of July 12, 1998 reports that the state, Audubon and open space groups do not consider that a golf course is the same as open space.

- Minimize pesticide usage by employing Integrated Pest Management (IPM) techniques into golf course management plans and practices. The underlying principle behind IPM is to strive for the reduction of or elimination of pesticide usage. An essential element of IPM is to correctly identify the pest, be it a weed, insect or fungus. Does the presence of the correctly identified pest constitute an infestation? In other words, there are threshold levels within which a pest population can be tolerated and no treatment measures are necessary.

- Employ curative rather than preventative measures when pest treatment is necessary. Curative deals with an actual pest problem after the fact while pre-emergent or preventative treatments deal with the assumption that a pest problem may occur.

- When considering the selection of herbicides, insecticides and fungicides for potential use on a golf course, it is recommended that a computerized risk assessment be conducted to determine the leachability and runoff potential of each

pesticide evaluated with regard to the particular soil types at the site. Three available systems are: (1) NPURG, National Pesticide/Soils Database and User Decision Support System for Risk Assessment of Ground and Surface Water Contamination (2) The SCS/ARS/CES Pesticide Selected Properties Database and, (3) NAPRA, the National Agricultural Pesticide Risk Analysis, an automated pesticide risk screening process. Not all pesticide compounds are included in these systems, however.

- Pesticide selection for a golf course should consider the pesticide's solubility levels in addition to the KD or KOC and the half-life in soil and water. Suggested criteria values would be:

  Solubility = less than 10 ppm;
  KOC more than 300;
  half-life = less than 7 days.

  Another protective criteria might be the use of the GUS or Groundwater Ubiquity Score of small or extremely small for leachability potential. The relevant pesticide characteristics should be evaluated in conjunction with the particular soil type on which it is applied. To repeat, while the pesticide's characteristics may be favorable to impede infiltration to groundwater, those characteristics may result in a higher runoff potential to surface water.

- An important concept to be aware of are the degradation products of the original pesticide active ingredient, called the metabolites. Some metabolites are as toxic, some are less toxic and some are more toxic than the parent compound. These compounds must be identified and considered as well with regard to their potential to contaminate the water resources.

- Many golf courses, both existing and proposed, are planning for or have in place a strategically designed monitoring well network to monitor for pesticide occurrence

and movement in groundwater. Surface water including ponds and streams should also be monitored for pesticide occurrence. Refer to attached documents in the Appendix . When considering this option, it is ***important*** to ascertain the feasibility and practicality of conducting the laboratory analysis for the particular compounds of interest and their metabolites. Before pesticides are chosen for use, a determination should be made about whether laboratory equipment, methodologies and expertise are available to test for these compounds.

- To set up the water quality monitoring program, consider utilizing the services of the Audubon Cooperative Sanctuary System which has developed the Audubon Signature Program, a program for golf courses to provide a comprehensive integrated approach to environmental planning. See attached materials on this program in the Appendix. In Connecticut there are 32 golf courses enrolled in this program and three are fully certified as a "Certified Audubon Cooperative Sanctuary."

- Pesticide storage provisions should include spill contingency plans. Concrete bermed secondary containment should be built around a ***separate*** structure for pesticide storage.

- Finally, pesticide applications and applicators must conform to the statutes and requirements of the Connecticut Pesticide Control Act, C.G. S. Chapter 441, Part I and II, particularly in regard to the appropriate certification of the applicator, and the registration of the product contemplated for use. Extreme care must always be used when handling and applying pesticide products. Special attention must be directed to label directions for use, proper mixing and loading procedures and any precautionary statements that appear on the label.

VI. References

(1) Murphy, James, E., compiler, Water Quality Classifications Map of Connecticut, 1987.

(2) Lundgren, Lawrence, Bedrock Geologic Map of the Haddam Quadrangle, Connecticut, 1974 1975.

(3) Flint, Richard Foster, Surficial Geologic Map of the Haddam Quadrangle, Connecticut, 1972 and 1973.

(4) Mullaney, J.R. et al, Pesticides in Groundwater, Soil and Unsaturated-zone Sediments at Selected Sites in Connecticut. Connecticut Water Resources Bulletin No. 42, 1991.

(5) Proposed Land Use, Town of Haddam, Connecticut Map.

Inland Wetland Review

For a thorough description of the wetland vegetative communities on this site, refer to "Wetland Vegetative Study - Proposed 18 Hole Golf Course - Candlewood Hill Road, Haddam, CT" by Priscilla W. Baillie, Ph.D. and dated 1/8/98.

The amount of direct wetland impact proposed is 2.7 acres of fill/excavation and 1.9 acres of wetland vegetation alteration. The excavation will be in the form of the construction of one pond and expansion of another (2.5 acres), while fill is proposed for four golf cart path crossings and four elevated bridges (0.2 acres). The wetland vegetation alteration will be in the form of tree removal for 11 fairway "crossings." In all, direct impacts to wetlands as currently proposed will total 4.6 acres. The area of direct wetland impact for this project may increase once the impact resulting from the irrigation system is added to the total. The irrigation system was not included on the plans reviewed.

Furthermore, there will be a total of 8.4 acres of activities within the delineated 100 foot setback as shown on the plan including 3.1 acres of grading and 5.3 acres of clearing for the development of greens, tees and fairways.

Taken altogether, the area of regulated activities on wetland soils as well as within the 100 foot upland review area (URA) is equal to 13.0 acres which represents 62% of the total area of wetland soils and URA (21 acres according to the 2/25/98 ERT memorandum).

It is recommended to first avoid and then minimize any proposed impacts to wetland areas. Once the least environmentally damaging alternative has been achieved and areas of wetland impact are still necessary and approvable by the Haddam Inland Wetlands and Watercourses Commission (HIWWC), compensation should be provided by the applicant to mitigate for unavoidable wetland impacts. This compensation should be undertaken with the goal of replacing the wetland functional values lost as a result of those unavoidable impacts and should be prioritized in the following manner: restoration of degraded wetland areas (highest priority), enhancement of existing wetland areas and creation of new wetland areas (lowest priority). In the case of an application which receives a public hearing based on a finding of significant impact, the HIWWC must find, in writing, that a feasible and prudent alternative to the proposed wetland alteration does not exist prior to issuing a wetlands permit.

In legitimizing an alternative, it should be kept in mind that it should feasibly and prudently achieve the basic purpose of the applicant, in this case, the basic purpose of the applicant appears to be to build and operate a golf course.

The Team wetland specialist has requested from the applicant documentation of the site plan alternatives which have led up to the current proposal. None has been delivered. One possible alternative is for a smaller golf course with less holes, usually in the form of a nine-hole golf course. It is recommended that the applicant propose to the HIWWC why the above alternative is not feasible or prudent. The most applicable test here would appear to be for prudence. "Prudent" is defined in Connecticut's Inland Wetland And Watercourses Act as meaning "[E]conomically and otherwise reasonable in light of the social benefits to be derived from the proposed regulated activity provided cost may be considered in deciding what is prudent and further provided a mere showing of expense will not necessarily mean an alternative is imprudent."
It is recommended that any subsequent alternatives offered by the applicant maximize the conservation of an undisturbed upland areas adjacent to wetlands. These areas have been proven to "buffer" the effect that upland land uses may have upon abutting

wetland areas and helps to maintain several functions and values of the wetland itself. The question of "How far is far enough?" has resulted in several studies on the topic. In general, it depends on what function you are trying to preserve. The focus in this case should be temporary sedimentation & erosion control, nutrient retention/sediment trapping, water quality attenuation (pesticides) and wildlife utilization. Buffers suited for these purposes could range from 50 to 200 feet (the greatest distance needed for the wildlife buffer).

If the southern pond is necessary for irrigation purposes, proposed pond spillways and inlets should be indicated on the plan.

Permanent diversion of the watercourses around the pond perimeter should be considered in order to avoid long-term sedimentation of the pond. As positioned now, there is an intermittent watercourse which will breach the northern perimeter of the proposed pond.

Converting the four proposed culverted cart path wetland crossings to bridged crossings should be considered by the applicant to reduce direct impacts to wetlands. Most of the impacts to wetlands for this project will be of a "conversion" nature. That is, there is relatively little loss of wetland area through filling, but there is a considerable amount of conversion from one land cover to another. The ponds will convert forested wetlands and emergent marshes to open water habitats, while clearing of forested areas will result in a predominance of early successional shrub/scrub habitats. While the applicant's environmental consultant is correct in predicting a post construction increase in the number wildlife species utilizing this area, this increase will come at the expense of those species which require large acreages of unbroken forest such as the neo tropical migrating warblers. These "deep-forest" species are becoming increasingly rare as forests become more fragmented.

Additional State Programs

If this project will impact between 5,000 square feet and one (1) acre of wetlands, project review is required by both the U.S. Army Corps of Engineers (A.C.O.E.) and this division of the CT-DEP. If this project will impact more than 1 acre of inland wetlands, an individual 404 application to the A.C.O.E. will be required. However, these are basic guidelines. A.C.O.E. or CT-DEP action may be required for other specific activities proposed for wetland areas. For questions regarding these regulatory programs contact the A.C.O.E. at 617-647-8338 / 800-343-4789 or Sally Snyder of the CT-DEP at 424-3019. Be advised that inasmuch as it causes the alteration, modification, or diminution of the instantaneous flow of the waters of the state, may require a permit from this division as called for in the Connecticut Water Diversion Policy Act (sections 22a-365 through 22a-378 of the Connecticut General Statutes). If not done so already, it is recommended that the applicant call Bob Gilmore of this division at 424-3019 to determine the need for such a permit.

If construction activities covering five acres or more are approved, the applicant is required to apply to the CT-DEP for a general permit for the discharge of stormwater under the National Pollutant Discharge Elimination System (NPDES) program. For further information on this permit program contact Christopher Stone of the DEP Permitting Enforcement and Remediation Division at 424-3850.

Soil and Water Conservation District Review

This review is based on the following materials and did not involve a field review: Site Plan sheets SP1-SP9 at a 1" = 40' scale prepared by Michael J. Wrang, P.E. (November 1997); Hydrologic Evaluation: Proposed 18 Hole Golf Course prepared by Gary R. Nash, P.E. (November 1997); and Water Plan for Proposed 18 Hole Golf Course prepared by John F. Sima III, P.E. (June 1994).

The following comments and recommendations on the project pertain to the above referenced materials.

1. The soil and water conservation district Team member has concerns about the factors used in the TR-55 drainage calculations prepared for the site by Gary R. Nash, P.E. (November 1997). She does not agree that the post-construction Time of Concentration (Tc) would be the same as pre-construction. The runoff curve number for post construction should change due to the change in ground cover. Also, due to the steep slopes at the site, the calculations should show less sheet flow and more open channel flow for both the pre- and post-construction calculations. This would also change the post-construction Tc. A change in the runoff curve number and the Tc will affect the post-construction peak discharge rates.

In addition, it is not clear on why the "Point of Analysis 1" was taken so far off site for the hydrologic analysis. This point was taken 800 feet downstream of Palmers Pond and includes a large area outside of the limits of the project. If we want to see

how the development changes affect the area closer to the site, why wasn't the analysis point taken closer?

2. The plans should show detailed information on how water would be diverted around work areas during pond construction, and how sedimentation would be controlled during this work. Also, information about dredging and dredge spoil dewatering should be included.

3. Since more than 5 acres of land will be disturbed for this project, a State of Connecticut Stormwater General Permit for Construction Activities will be required. There are a number of items that would be required for the Permit that are missing from these plans. They include the following:

- A construction sequence and detailed narrative;
- Information on doing this project in small phases;

Drainage calculations for all culverts to be installed; detailed information on culvert installation and work to be done at times of low flow; construction entrances and temporary work roads; soils information on the plans to help determine areas of high erodibility; location of equipment storage areas; design information and location of sedimentation basins; discussion of the use of numerous temporary sedimentation and erosion controls such as earthen berms, slope drainage diversion, addition of extra erosion controls in the area of steep slopes; location and erosion controls for temporary soil stockpiles; erosion controls and management for installation of cart path wetland crossings; complete vegetation plan and seeding information including seeding dates; temporary shut-down provisions for stabilization of the site outside of the seeding dates.

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question.

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. Consultations 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.

It is now possible for you to conduct an initial endangered species review using the "State and Federal Listed Species and Significant Natural Communities" maps available for viewing through each town's Town Hall. The Town Planner should have a copy of the map. This map shows the generalized locations for listed species and communities as gray-shaded areas on a 1:24,000 scale map of the town. See the attached sheet for instructions on how to use the map to conduct an endangered species review.

Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Forest Vegetation

The review area for the proposed golf course comprises approximately 146 acres located on both sides of Candlewood Hill Road in the northwestern portion of the town of Haddam, near the boundary with Durham. The southern portion is entirely forested, and contains 66 acres more or less. The remaining portion, north of Candlewood Hill Road contains approximately 56 acres of forest cover, the remaining portion being ponds, pastures and hayfields. Surrounding properties are either residential lots of various sizes, agricultural land (primarily beef cattle and horse grazing), or other forest land which is part of Cockaponset State Forest. Acreage estimates for the study area and forest cover types were scaled from the Golf Course Plan Map prepared for the owner and from the Map and Geographic Information Center database at the UCONN Library.

Forest Vegetation on the site can be separated into three distinct cover types, based on differences in age, species mix, density or other factors (see Forest Cover Type Map).

Type A - Oak, with associated hardwoods - 80 acres

Type B - Mixed Hardwoods - 35 acres

Type C - Shrub or edge area - 7 acres

These types are described in detail under the heading of *Forest Vegetative Description*. Non-forest vegetation is described in other sections of this report.

The value of the existing forest on this property is moderate, when considered as the value of the trees as raw material for forest products. In areas where the forest has not been cleared for planting grass, trees of commercial value are growing, and do not appear to have been subjected to harvesting activities recently. These stands are even-aged, relatively dense and appear to be growing at a slow to moderate rate. Other values the forest provides in this area include aesthetics, wildlife habitat and rainwater catchment and storage.

Forest Vegetative Type Description

Type A - Oaks and Associated Hardwoods

The bulk of the forestland on this property is occupied by stands in which oaks are the dominant species, although other hardwood species are present as well. Red oak, black oak, scarlet oak, white oak and chestnut oak are the main species present in the overstory, with black birch, red and sugar maple, hickories and ash occurring in less abundance. These stands are even aged, estimated to be 80 to 100 years, and appear to have originated from stump sprouts following clearing for charcoal manufacture around the turn of this century. Most of the overstory is approaching a stage at which the trees are near or at a size to be commercially valuable, and is somewhat uniform in appearance. The understory contains scattered suppressed trees of similar species composition as the overstory, some shade-tolerant American beech and shrubs such as mountain laurel, witch hazel, dogwood, and highbush blueberry. No significant amount of advanced natural regeneration of desirable species is apparent.

Type B - Mixed Hardwoods

In three locations on the property are stands which are best described as mixed hardwoods. Although similar in age and appearance to the oak type, these stands have a greater component of other types of hardwoods in the overstory. Oaks are still present, but in a more evenly balanced mix with sugar maple, red maple, hickory, black

and yellow birch, ash, beech and tulip poplar. The shrub layer is also more diverse, containing spicebush, viburnum, barberry and honeysuckle, as well as the species described above. Many of the overstory trees are of commercial value, but the lack of serious disturbance in the past results in what appears to be a dense and slow growing stand.

Type C - Shrub and Edge Area

Although this type is not indicated on the map, it is mentioned because a forest edge condition is developing along most of the areas on the northern part of the property where the forest has been cleared for grass or pond construction. The actual acreage of this type is only estimated, but wherever a clearing has been made, a layer of low growing shrubs, seedlings and saplings is developing between the new opening and the original forest. These edge areas favor sun-loving and pioneer species like gray birch, oaks, black cherry, tulip, ash, hickory, and raspberries.

Management Considerations

The proposed golf course development will convert approximately 60 acres of the forest cover to open grassland, parking areas, buildings greens, ponds, etc. This development will fragment the continuous forest cover into margins, fingers and islands of forest, and consideration must be given to the health of the residual forest area, so that it may remain an effective buffer, habitat, and aesthetic resource. Fragmentation of the forest in this area, although permanent, may be less of a problem than it might be elsewhere because of the proximity of the property to open agricultural land and residential properties, and merely has the effect of extending their effect. While certain species of plants and animals will take good advantage this type of irregular clearing, attention must be given to the control of nuisance wildlife and invasive exotic species which may also be attracted to the area.

Construction of facilities can affect the health and vigor of residual stands of trees. Care must be exercised to minimize the disturbance of soils and root systems of retained forest areas. Disturbed and damaged trees may take several seasons to succumb to injuries or diseases to which they become susceptible after site disturbance. Dead trees will be a liability to users of the site if adequate care is not exercised in construction. Areas to remain in forest cover should be clearly marked on the ground to insure they are not disturbed.

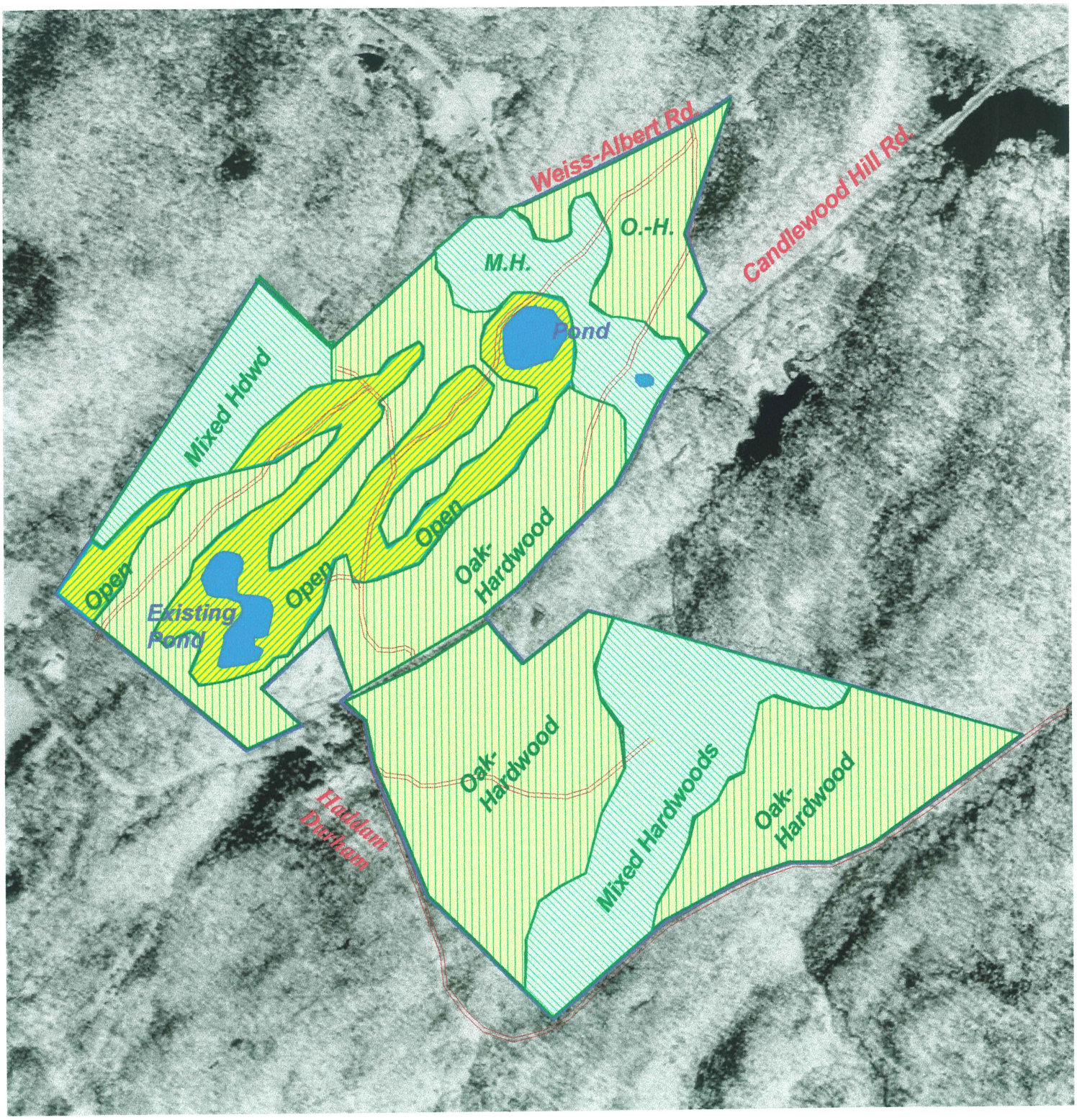
Changes in the water table resulting from the constructions of ponds and crossings may also affect the windfirmness of certain trees, and species composition in affected areas.

Individual trees which are deemed overmature, unhealthy, or low in vigor due to crowding can be removed from the forested areas as part of the clearing process, to avoid the need to impact these areas again after construction. During this process conditions can also be created which will stimulate the growth of younger native vegetation, making buffer areas more effective.

Unique or specimen trees, by virtue of size or form could be released from competition and opened to public viewing.

These suggestions and others which effect the management of the forest vegetation should be conducted under the guidance of a professional forester licensed by the State of Connecticut. A current listing of these individuals is available from the State Forester's Office. (CT Dept. of Environmental Protection, Forestry Division, 79 Elm St. Hartford, CT 06106, (860) 424-3630. For the long term management of the acreage in this project which remains forest land The CT Forest Stewardship Program is available, offering technical and financial assistance in the development and implementation of a Forest Stewardship Plan. Contact the Forest Stewardship Program Coordinator, UCONN Cooperative Extension, PO Box 70, Haddam, CT ()6438 . (860) 345-4511.

Forest Cover Type Map
Vynalek Property, Higganum, Ct.



1000 0 1000 2000 Feet

N
W E
S

Pondarea.shp
Woodroad.shp
Mixedhdwd80-100.shp - Mixed Hardwoods, 80 to 100 years
Oak_hdwd80-100.shp - Mostly oak with other hardwoods, 80 to 100 years
Openfield.shp - Open areas with grass cover
Vynbounds.shp - Property boundary locations are estimates only.

Wildlife Resources

The following section is based on the site and review of the environmental report submitted by Mr. Ralph and Mr. Ronald Vynalek to the Town of Haddam. The forestry section of this ERT report and the environmental report by Priscilla Baillie of Marine and Freshwater Research Service provide a fairly thorough description of the property's vegetation and physical characteristics. Therefore this section will provide only general habitat descriptions which emphasize the functional values of each habitat to wildlife and provide an assessment of post-development impacts in which some of the statements made in the consultant's report will be addressed. Finally, general recommendations will be provided to help maintain as much wildlife value as possible during course development.

I. Existing Wildlife Habitats & Values

The majority of the property consists of mature hardwood forest dominated by oaks (red, black, scarlet, white, chestnut). Other overstory trees include black and yellow birch, red maple, sugar maple, hickory, white ash, American beech and tulip poplar. Understory shrubs consist of mountain laurel, highbush blueberry, witch hazel, spicebush, barberry, viburnum and sweet pepperbush. The southern portion of the property (south of Candlewood Hill Road) is entirely forested and contains three intermittent streams which merge into a large red maple swamp. Portions of the northern section of the property, which was once entirely forested, now contain lanes of grasses and forbs, two man-made ponds, an existing pond, a few small wetland pockets and a perennial stream. Connected to one of the man-made ponds is a sedge meadow which formed as a result of a wetland mitigation project. Low growing shrubs,

seedlings and saplings are developing in some areas between the original forest and new openings. The landscape surrounding the property consists of large tracts of mature forest, portions of which are managed as part of Cockaponset State Forest, with clusters of residential development and agricultural lands.

Uplands

The mature hardwood forest provides shelter and an abundance of food in the form of buds, catkins, hard mast, berries and insects for wildlife. Acorns, hickory and beech nuts provide excellent forage for a variety of mammals and birds such as white-tailed deer, gray squirrels, southern flying squirrels, eastern chipmunks, white-footed mice, eastern wild turkeys and blue jays. The snags (standing dead trees), large cavity trees and fallen logs provide feeding sites, den/nest sites and shelter for various small mammals, birds, reptiles and amphibians such as short-tailed weasels, short-tailed shrews, great-horned owls, barred owls, downy, hairy and pileated woodpeckers, great-crested flycatchers, black-capped chickadees, tufted titmice, white breasted nuthatches, brown creepers, northern black racers, ringneck snakes and red-backed salamanders.

Forests that contain a well-developed tree, shrub and herbaceous ground layer support a wider variety of wildlife. Each layer provides habitat for a unique set of birds. For example, the red eyed vireo feeds on insects in the upper canopy, the black and white warbler gleans insects from the trees and shrubs in the mid to lower canopies, and the ovenbird forages on insects and fruits on the forest floor. The value of the property to forest breeding birds is relatively high given that the property south of Candlewood Hill Road is unfragmented and connected to Cockaponset State Forest and other large blocks of forest land. Some birds that require large tracts of continuous forest for breeding, such as the ovenbird, scarlet tanager, veery, black and white warbler and eastern wild turkey likely inhabit the property.

The clearings contain a mix of grasses and forbs, which, if maintained only on a periodic basis (once a year), provide food and cover for small mammals such as the meadow vole, eastern cottontail rabbit and woodchuck, and numerous species of

insects and butterflies. These animals in turn provide a source of food for red-tailed hawks, American kestrels, larger mammals such as red fox and coyote and various songbirds. The soft edges (i.e., wide areas of vegetation of varying heights found between two contrasting habitat types) that are developing between the clearings and the forest enhance the value of the clearings for wildlife. The grass openings and forest edges are likely used by a variety of birds such as the northern flicker, least flycatcher, eastern phoebe, great-crested flycatcher, eastern kingbird, tree swallow, blue jay, American crow, eastern bluebird, American robin, American goldfinch, grey catbird, northern mockingbird, brown thrasher, cedar waxwing, white-eyed vireo, yellow-throated vireo, blue-winged warbler, yellow warbler, chestnut-sided warbler, American redstart, northern cardinal, rose-breasted grosbeak, indigo bunting, eastern wood peewee, rufous-sided towhee, American tree sparrow, chipping sparrow, field sparrow, white-throated sparrow and killdeer.

Wetlands

A diversity of wildlife are attracted to wetlands due to the complex vegetative structure and abundance of food present in the form of insects, berries and seeds. The value of any wetland increases if it is connected to a larger wetland complex and protected upland habitat. Maintaining the connection between wetlands and upland habitats is of particular importance to certain species of amphibians that use woodland pools for breeding and then migrate hundreds of feet into adjoining uplands to forage.

Many species of birds will use the forested wetlands and adjacent uplands on the property at various times of the year for breeding, feeding and shelter. Some of these birds likely include the hermit thrush, tufted titmouse, northern waterthrush, rufous-sided towhee, common yellowthroat, veery, eastern phoebe, American woodcock, eastern wild turkey, woodpeckers (downy, hairy and pileated) red-shouldered hawk and great horned owl. The large diameter cavity trees may serve as den and nest sites for various small mammals and birds such as raccoon, fisher, Virginia opposum, barred owl, big brown bat and wood duck. Other examples of wildlife that are likely using this

habitat type are short-tailed weasel, star-nosed mole, wood frog, pickerel frog, northern spring peeper, gray tree frog, eastern garter snake, spotted turtle and wood turtle.

The wet meadow likely is used as a breeding site by such species as the spotted salamander, blue-spotted salamander, red-spotted newt, spring peeper, gray treefrog, wood frog, pickerel frog, eastern American toad and green frog. Other wildlife species which likely use this wetland include raccoon, mink, eastern cottontail, short-tailed shrew, star-nosed mole, big brown bat, red winged blackbird, house wren, eastern bluebird, cedar waxwing, common yellowthroat, song sparrow, tree swallow and painted turtle.

Open water ponds with grass mowed down to the water's edge provide low wildlife value. Ponds containing a diversity of emergent and submerged aquatic vegetation interspersed with open water and surrounded by a buffer of vegetation tend to support a greater diversity of wildlife. The open water ponds on the property are likely used by species such as bullfrog, green frog, snapping turtle, painted turtle and eastern box turtle and may be used as nesting and resting sites by mallards and Canada geese.

II. Assessment of Impacts to Wildlife

A. Wildlife Habitats Before and After Development

It has been documented that isolated patches of forest smaller than 100 acres are characterized by a low density and diversity of forest interior breeding birds. High rates of cowbird parasitism and nest predation have been reported where small forest patches are surrounded by open habitat. Although some species, such as the white-breasted nuthatch and hairy woodpecker are found in small, remnant patches of forest, the extensive amount of clearing proposed will eliminate the habitat required for successful breeding by forest-interior birds. Fragmented habitats tend to attract more

common "generalist" species such as raccoon, woodchuck, Virginia opossum, striped skunk, grey squirrel, white-tailed deer, house wren, northern flicker, European starling, song sparrow, brown-headed cowbird, northern oriole, house finch, American robin and American crow.

Statement (Pg 20): "It is widely recognized that animals and birds respond favorably to patchy distributions of vegetation... In fact, a study of fauna inhabiting a golf course in Massachusetts revealed the presence of over 163 species of birds, 12 species of mammals..."

Comment: It is widely recognized that **some** animals and birds respond favorably. Patch size and distribution effect whether individual species will be present or absent in a given area. Some birds require large blocks of open habitat and others require large blocks of continuous forest. Species diversity alone is not an accurate indicator of the value of an area to wildlife.

Statement (Pg. 22): "Wildlife habitats on the property before and after development were identified using the categories described by DeGraaf and Rudis (1986)... Golf course habitats are not specifically described in the DeGraaf and Rudis publication, but the categories "grass" and "pasture" were used to approximate the habitat provided by fairways and rough."

Comment: Frequently maintained and insect-free fairways and roughs where there is a consistent flow of human traffic cannot provide the same habitat benefits as grasslands and pastures. All comparisons using this classification are misleading.

Statement (Pg. 22): "Also, the presence or absence of a species is not controlled solely by habitat. Many factors influence species distributions including predation, competition, disease, etc. However, this approach does give some indication of potential changes in wildlife which might be attributed to the development." (Pg. 27) "A total of 22 new species could move into the area once their required habitats are provided by the golf

course. This net gain of 18 species represents a significant potential increase in species diversity on the site."

Comment: It is correct to say that many factors influence species distribution. However, by erroneously comparing the fairways and roughs to grassland and pasture habitat and not taking into consideration the effects of human disturbance, habitat patch size, forest fragmentation and distance to nearest habitat of similar type, the figures for pre- and post-development use by wildlife are inaccurate and very misleading. Some of the species listed in the consultant's report as occupying the property pre- and/or post-development do not and will not inhabit the property given that they have very specialized habitat requirements, have limited distributions in Connecticut, or do not occur anywhere in the state. A few examples are American widgeon, common loon, glossy ibis, gray partridge, great grey owl, pine siskin, rough-legged hawk and yellow-crowned night heron.

The same holds true for the list of species gained after development. Although the amount of open grass habitat will greatly increase, many of the grassland species listed will not colonize the golf course because they have very specific habitat requirements and are negatively effected by insufficient habitat size, frequent mowing and human disturbance. Grasshopper sparrows and upland sandpipers for example, only nest in large expanses of continuous grasslands (i.e., minimum grassland size 30 and 150 acres, respectively) that contain a mosaic of short grass and meadows of tall grass and wildflowers. Other grassland specialists, such as the eastern meadowlark and horned lark, are particularly sensitive to human disturbance during the nesting period.

B. Filling and Excavation

Due to the direct impact of filling and indirect impact of vegetation alteration, the wetlands left behind will be reduced in value because the now contiguous wetland-upland complex particularly south of Candlewood Road will be greatly reduced and in some cases completely eliminated. Although the wetlands are important in and of

themselves, most species that use wetlands also require upland habitat. For example, the red-spotted newt, which may use the small ponds also require upland forest to live out their adult stage. Species such as the spring peeper and gray treefrog, which may use some of the ponds and ephemeral wetlands on site, spend much of the non-breeding period in forested uplands.

Statement (Pg. 30): "The upgrading of existing ponds and the creation of a new pond will be beneficial to wildlife ...."

Comment: The applicant proposes to expand Wetland A by excavating a portion of the regraded mitigation area and upland. Maintaining the shallow water sedge meadow on the property would contribute to greater habitat diversity than expanding the original pond.

C. Grading in Buffer Zones

Statement (Pgs. 30-31): "Before the work commences, silt fence should be installed around nearby wetlands."

Comment: Silt fences/haybales should be staggered in shorter lengths so as not to impede amphibian migration to and from the wetlands.

D. Tree Canopy Removal

Those wildlife species that rely on continuous closed canopy forest will be drastically reduced in abundance and diversity or eliminated from the property altogether due to the extensive amount of clearing proposed. Removal of the forest canopy will stimulate the growth of shrubs and herbaceous plants; this may benefit some birds that use shrublands and young forests and do not require large habitat patches.

Statement (Pg. 32): "Trees will be cut and shrubs trimmed, but stumps, roots and soils will remain intact. The vegetation should be cleared by hand, and brush and logs should be removed from the wetlands with a winch."

Comment: In addition to leaving all stumps intact, the logs, limbs and brush that are currently found in the wetlands, should remain intact to minimize wetland and wildlife disturbance.

III. General Recommendations

Growing attention has been given to the concept of golf course "naturalization" in attempt to reduce the negatives typically associated with the creation and maintenance of golf courses, i.e., forest fragmentation and water quality problems due to increased water, fertilizer and pesticide use. Naturalizing non-play areas can increase the wildlife habitat values of the course, help to protect water quality and reduce routine maintenance costs. Some management recommendations that should be considered include:

Uplands

1) Avoid creating small isolated islands of habitat. Preserve travelways for wildlife by maintaining wide corridors of natural vegetation (100'+) between islands of habitat, particularly those that link wetlands to undeveloped uplands.

2) Maintain certain forest wildlife requirements whenever possible during land clearing:

a) Avoid cutting during the peak bird nesting period from mid-April through mid-July.

b) Retain the larger mast-producing trees i.e., oaks, hickories, beech (a minimum of five mast-producing trees per acre, 14 inches dbh or larger) as a food source.

c) Leave a minimum of 3 to 5 snags per acre (preferably 12 inches dbh or larger) to provide nesting and feeding sites for various birds and mammals.

d) Retain exceptionally tall trees which are used by raptors for perching and nesting sites.

e) Retain structural diversity in the understory by maintaining various "levels" of vegetation, i.e., from ground cover to shrubs, sapling and pole-sized trees. Leaf litter and woody debris, e.g., logs, stumps and downed limbs, also should be left undisturbed; they contribute to a healthy forest ecosystem by returning nutrients to the soil and provide cover for small mammals, birds, reptiles and amphibians.

3) Use natural landscaping techniques which avoid or minimize the creation of manicured grass and chemical applications wherever it will not disrupt daily course activities:

a) Designate "low maintenance" areas where grasses and wildflowers will be allowed to grow tall such as along forest and pond edges. This will provide habitat for beneficial insect populations, reduce maintenance costs and help protect water quality. If keeping shrubs from invading these area is desired, it will be necessary to mow once every two years, preferably outside of the peak bird nesting period (mid-April through mid-July).

b) Implement backyard habitat management practices around buildings and other developed public use areas to enhance wildlife habitat, aesthetics and wildlife viewing

opportunities for golf course visitors. Landscaping these areas with a diversity of wildflowers and berry-producing trees, shrubs and vines will attract numerous species of songbirds, small mammals and butterflies. Nest boxes placed on posts in semi-open habitat with scattered trees and short ground cover may provide nest sites for species such as bluebirds and tree swallows. If nest boxes are considered, a monitoring and maintenance program should be implemented perhaps with a local birding club or interested course users. *Information on native wildlife plantings and nest box design and monitoring may be obtained by contacting the CT DEP Wildlife Division (Session's Woods Wildlife Management Area, Burlington - 860-675-8130).*

Wetlands

Take all prudent measures to buffer the wetlands and limit the amount of chemicals used in the operation of the course. If water quality and insect populations are negatively effected, the entire species complex using the property, from the invertebrate life to bird and mammal life, can be negatively impacted, both on and off site.

1) Avoid extensive cutting in and adjacent to the wetlands to minimize impacts to reptiles and amphibians and to maintain travel corridors for wildlife. A minimum of 100 feet of undisturbed vegetation left between any stream/wetland and any development or disturbance is recommended. Although this is a minimum standard recommendation, the buffer will preserve at least some measure of habitat value, help to filter sediments and excess nutrients and reduce disturbance within the wetlands.

2) Construct ponds with gently sloping sides and varying water depths (6"-3') to provide a diversity of aquatic plants interspersed with open water. Preserve or plant a buffer of vegetation around the ponds to provide additional food and cover. Maintaining even a small buffer (25' in width) of taller grasses and forbs around the ponds would lessen the potential for attracting nuisance Canada geese to the course

by creating a natural physical barrier to their movement on and off the ponds. Minimizing pond size (1/2 acre max.) and the amount of feeding habitat (i.e., short grass areas) adjacent to the ponds, also may decrease their attractiveness to geese.

Aesthetics

The reaction of some golf course visitors to naturalizing portions of the course may be negative because park-like settings with well-manicured lawns and ponds are generally considered to be more visually appealing. However, most will likely develop an appreciation of this type of management if an effort is made to inform them (e.g., interpretive signs, written materials, guest lectures) of the wildlife values and other environmental benefits gained.

Note: Audubon International in cooperation with the United State's Golf Association has developed a golf course certification program to promote sound environmental stewardship on golf courses. Information may be obtained by contacting the Audubon Cooperative Sanctuary System in Selkirk, NY at 518-767-9051. Also see information in the Appendix.

IV. References

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Archaeological Review

A review of the State of Connecticut's archaeological site files and maps shows no know archaeological sites on the property, however our files do indicate three prehistoric Native American sites within very close proximity. In fact, a couple of the sites are associated with Candlewood Hill Brook which drains through the project area. In the early 1980's the State of Connecticut conducted archaeological surveys through Cockaponset State Forest in Haddam and parts of Durham and numerous archaeological sites were found in association with the forest area.

Upon field review of the property, there are three areas of primary archaeological concern. Those are to the southeast portion among a minor drainage that has flat topographical features that would allow for small encampments. These areas are easily defined and can be easily tested. In addition, to the northeast of the property along Candlewood Hill Road, there are a series of ledges that could have provided shelters for native peoples during their hunting and gathering rounds. The Office of State Archaeology recommends is that there should be an archaeological survey prior to any blasting that would affect those ledges The northwest portion of the property looks as though it already has been disturbed to a great degree in anticipation of a golf course. As a result no archaeological sensitivity is there. However, archaeological surveys are recommended for the ledges and along the drainage in the southeast portion of the property adjacent to Cockaponset State Forest.

In addition to Native American sites the property does appear to have certain features that are associated with historic resort camps in the area. These resort campgrounds may go back to the early part of this century when much of Haddam and East Haddam had resort camps for people coming from New York and other areas. While these features, namely the one around Horseshoe Pond, may not be historically significant and require any additional archaeological field work, it is recommended that all features be photographed and documented on maps if they are to be dismantled in any way. It is understood that Horseshoe Pond is going to be part of the golf course landscape. It would be good to preserve this area within the context of the proposed golf course.

The Office of State Archaeology would be happy to work with the town of Haddam as well as the developer in identifying the archaeological components and working out a mitigation plan as the project moves forward. The Office is available for any technical assistance in conducting the above-recommended archaeological survey.

Appendix

- Selected physical and chemical properties of pesticides and metabolites.
- Audubon International - *The Signature Program*
- The Audubon Cooperative Sanctuary System (ACSS)
- Water Quality Management for Golf Courses - ACSS
- IPM Strategies for Golf Course Maintenance - ACSS
- Pest Monitoring: A Key to Integrated Pest Management for Turfgrass - Cornell University
- Minimizing the Impact of Golf Courses on Streams - Watershed Protection Techniques, Technical Note 20
- Groundwater Impacts of Golf Course Development in Cape Cod - Watershed Protection Techniques, Technical Note 27
- Is Golfing Greener? - The Impact of Golf Courses on the Coastal Environment - a symposium held in North Carolina in March 1998

For Appendix Information please contact the ERT Office at 860-345-3977

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: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.