FAIRVIEW FARMS GOLF COURSE

Harwinton, Connecticut

King's Mark Environmental Review Team Report

King's Mark Resource Conservation & Development Area, Inc.

FAIRVIEW FARMS GOLF COURSE

HARWINTON, CONNECTICUT

Environmental Review Team Report

Prepared by the
King's Mark Environmental Review Team
of the
King's Mark
Resource Conservation and Development Area, Inc.

for the
Inland Wetlands and Watercourses Commission
Harwinton, Connecticut

February 1998

CT Environmental Review Teams
1066 Saybrook Road
P.O. Box 70
Haddam, CT 06438
(860) 345-3977

ACKNOWLEDGMENTS

This report is an outgrowth of a request from Harwinton Inland Wetlands and Watercourses Commission to the Litchfield County Soil and Water Conservation District (SWCD). The SWCD referred this request to the King's Mark Resource Conservation and Development Area (RC&D) Executive Council for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental Review Team (ERT).

The King's Mark 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 Thursday, October 16, 1997.

Ken Bisi	Transportation Engineer CT DOT - Bureau of Policy and Planning 860-594-2146
Christopher Fray	Technical Director Litchfield County SWCD 860-626-8258
Norman Gray	Geologist UCONN - Dept. of Geology and Geophysics 860-486-4434
Doug Hoskins	Wetland Specialist/Environmental Analyst III DEP - Inland Water Resources Division (860) 424-3903
Richard Lynn	Executive Director Litchfield Hills Council of Elected Officials 860-491-9884
Dawn McKay	Biologist/Environmental Analyst III DEP - Natural Resources Center (860) 424-3592

Don Mysling	Fisheries Biologist Habitat Conservation and Enhancement Program DEP - Fisheries Division 860-567-8998
Larry Rousseau	Service Forester DEP - Western District Headquarters 860-485-0226
Judy Singer	Groundwater Hydrogeologist, RPG, CHMN DEP - Groundwater Protection Program Pesticide Management Division 860-424-4060
Judy Wilson	Wildlife Biologist DEP - Sessions Woods WMA 860-675-8130

I would also like to thank Bob Ferraresso and Bruce Parrar, members of the Harwinton Inland Wetlands and Watercourses Commission, Susan Alender, conservation commission member, Marie Knudsen, first selectman, Pete Salwoki, selectman, Loda Sheehan, selectman's office, Bob Ferrarotti, the applicant, Chris Mason, environmental consultant for the project and Dave Wilson, the project engineer, 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 plans, and additional reports. 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 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 town and landowner. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in reviewing the 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

TABLE OF CONTENTS

List of Figures

INTRODUCTION

Introduction

The Harwinton Inland Wetlands and Watercourses Commission has requested assistance from the King's Mark Environmental Review Team in conducting an environmental review of the proposed Fairview Farms Golf Course.

The ±163 acre parcel is located along Delay Road and Barber Road (Route 222). The site is currently an active farm with barns, outbuildings, farm roads, cow paths, four dug ponds, fenced pastures and woodland.

The proposed project is an 18-hole public golf course with associated clubhouse, driveway/entry, parking area, driving range, cart paths, water supply ponds and an irrigation system.

Wetland impacts involve the conversion of wetlands to non-wetlands in areas of existing disturbance (a pasture wetland and an existing farm road crossing). Most of the wetland impacts involve temporary disturbance during construction. Three new ponds are proposed to be constructed.

Objectives of the ERT Study

The Town has asked for assistance with the review of this project with regard to the physical and biological resources of the site to aid in their decision making. Specific concerns voiced by the Town include wetland impacts and their minimization; soils, geologic, and topographic suitability and limitations; erosion and sediment control; aquatic resource impacts; wildlife habitat impacts; vegetation/forest impacts; review of water supply and irrigation plans; and golf course pesticide and turfgrass management.

The ERT Process

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

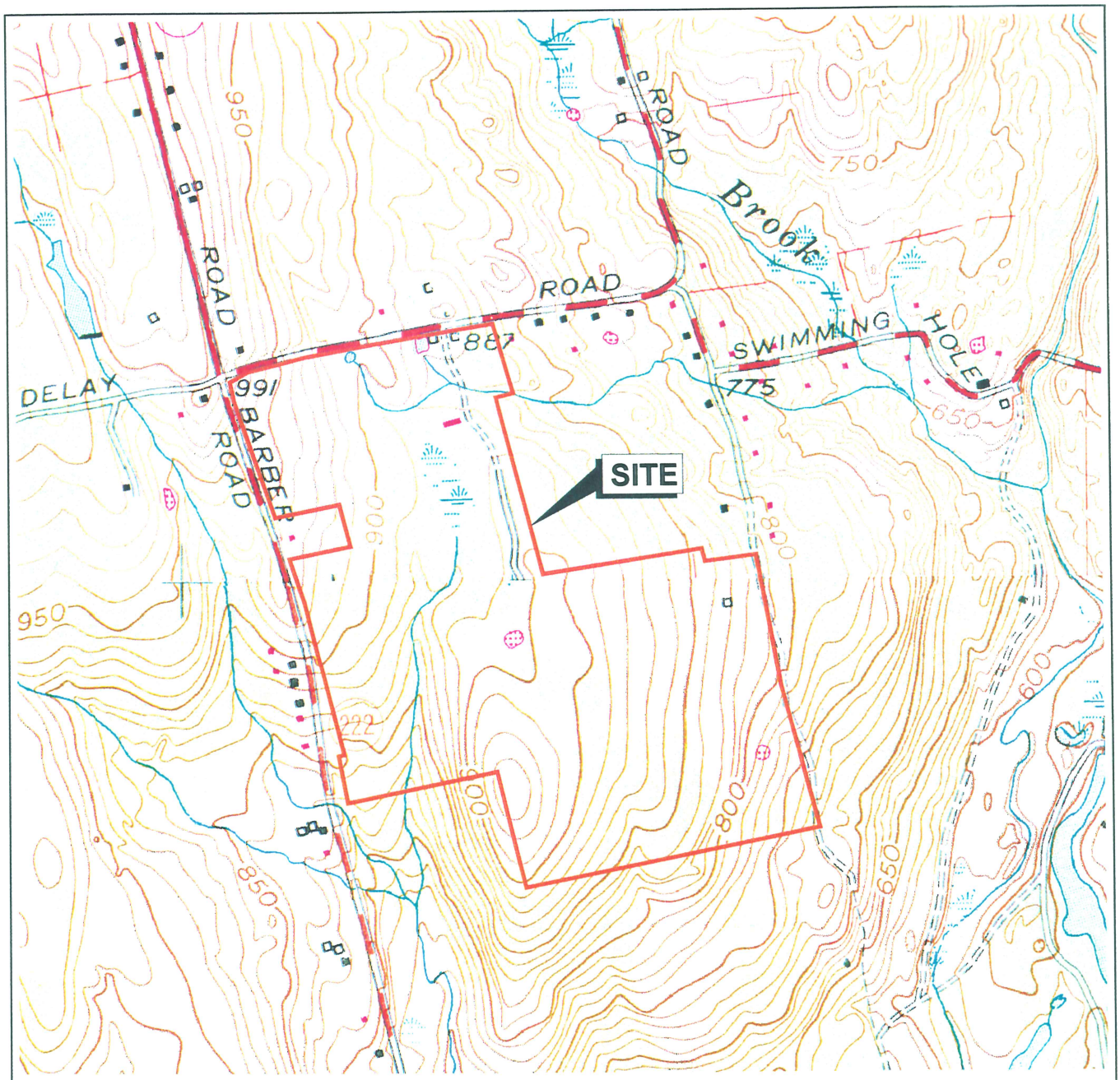
This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the Town. Team members were able to review maps, plans and supporting documentation provided by the applicant.

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 October 16, 1997, and various Team members also made separate and/or additional field 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.



Source: United States Geological Survey 7.5 Minute Series Topographical Quadrangles: Torrington, CT (photorevised 1984) and Thomaston, CT (photoinspected 1976)

Fairview Farms Golf Course
Harwinton, Connecticut

Figure 1

Topographic and Location Map

MASON & ASSOCIATES, INC.
Environmental Consulting & Projects
771 Plainfield Pike, North Scituate, Rhode Island 02857

Project No. 970201

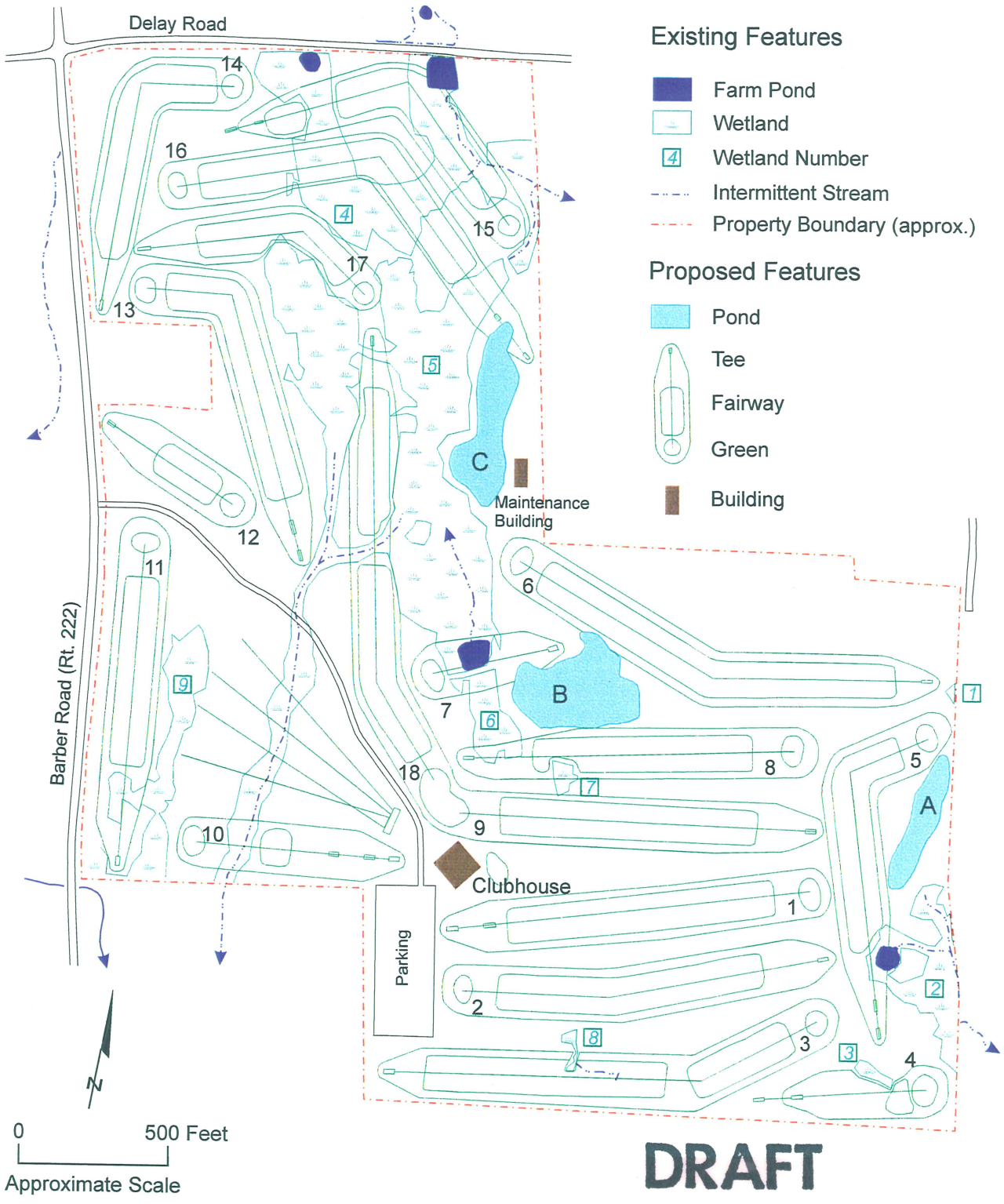
Fairview Farms Golf Course
Harwinton, Connecticut

Figure 2

Aerial Photograph

MASON & ASSOCIATES, INC.
Environmental Consulting & Projects
771 Plainfield Pike, North Scituate, Rhode Island 02857

Project No. 970201



Fairview Farms Golf Course
Harwinton, Connecticut

Figure 3

Draft Proposed Project Plan

MASON & ASSOCIATES, INC.
Environmental Consulting & Projects
771 Plainfield Pike, North Scituate, Rhode Island 02857

Project No. 970201

GEOLOGY

Surficial Geology

The proposed Fairview Farms Golf Course covers an area of 163 acres straddling a drainage divide between Leadmine Brook and one of its larger tributary streams. The site is mantled by a thick (perhaps 100 feet thick in places) blanket of glacial till, mounded up by flowing ice into streamlined SSE trending drumlinoid hills. A glacial meltwater stream, confined by an ice crevasse, cut deeply into the till eroding the steep westerly facing hillside along the southwestern portion of the property and forming the valley draining south from the central wetland area. Till is a ground-up mixture of rock particles, ranging in size from clay through large boulders, which was dragged along at the base of the last continental ice sheet, 20,000 years ago. When the ice began to retreat 14,000 years ago, meltwater streams flowing along temporary channels provided by crevasses was able to locally erode the till. The clay, silt and sand size particles were carried away but the larger cobbles and boulders were left behind as "lag" deposit. The ground surface in the central part of the area is covered with boulders left behind by the transient melt waters that eroded the steep sided south trending valley. High up on the hillside, well above the level of the lag deposits, an unusual number of 10 to 20 foot glacial erratics are strewn across the ground surface. These large blocks were plucked from rock cliffs to the north and were being carried in, not beneath the ice. They must have melted out of the ice and "slid" down the sloping walls of the ice valley formed by enlargement of the original crevasse. Once the ice disappeared from the area the glacial drainage system was abandoned and a new stream originating at the north end of the central wetland established an easterly route directly downslope to Leadmine Brook.

The nature and distribution of the surficial materials has only limited impact on the plans for the proposed golf course. However, the developers might find it useful to be aware of the following facts:

- The permeability of the till could prove to be highly variable over the site. The bouldery lag deposits in the area of the proposed pond C may be quite sandy and porous. How significant this might be for the storage pond design depends on the thickness and the easterly extent of the lag deposit. In the hydrological analysis and irrigation plans for the golf course, no account was taken of the water loss by the storage ponds to groundwater. If, as called for in the present plans, the water level in pond C is to be higher than the adjacent wetlands the potential for leakage through excavated sandy till should be addressed. The least permeable till is likely to be encountered on the smooth east-facing slope in the southeastern corner of the property.

- The large, 10-20 foot size, glacial erratics lie only on the surface of the till. The boulders buried in the till are probably no larger than those seen in the lag deposits; 3 to 5 feet across. Except along the southeastern edge of the property, below the 850 foot contour, bedrock (ledge) is not likely to be encountered given the extent regrading envisaged in the current plans.

Bedrock Geology

Except along the southernmost edge of the property the underlying bedrock is not seen to outcrop on the property. A distinct break in slope between 800 and 850 foot contours seems to mark the limit of the thick till of the drumlinoid hills. The published Bedrock Geology Map (QR-25) suggests two different rock types would be found on the site. Given the lack of outcrops the lithological boundaries shown on that map are somewhat speculative. Nonetheless, it is reasonable to assume that the most common rock type would be Ratlum Mountain Schist (see Rodgers, 1985, 1: 125,000, Bedrock Geological map of Connecticut. The original 1:24,000 geologic quadrangle map refers to the same rock unit as the "Hartland Schist"). Lithologically the rock is gray in color with an average grain size of a few millimeters and is composed of alternating layers of varying amounts of quartz, feldspar, mica and garnet - a typical rock for the highlands

of western Connecticut. The other bedrock type on the site is the so-called Nonewaug Granite. This rock is white to pink in color, with grains averaging 0.5 centimeters to several centimeters, and composed of quartz, feldspar and mica. The Nonewaug Granite intrudes the Ratlum Mountain Schist and is found both as irregular massive bodies as well as in thin tabular dikes. One such dike of very coarse (10's of centimeters) granite pegmatite outcrops just off the southwest corner of the property. This site retains signs of extensive trenching and blasting, presumably related to prospecting in the 1940's for beryl and mica.

Sources of Geologic Information for the Site

USGS Geological Quadrangle Maps

GQ-939 Surficial Geology of the Torrington Quadrangle by Rodger B. Colton, 1971.
GQ-984 Surficial Geology of the Thomaston Quadrangle by Charles R. Warren, 1972.

CT Geological and Natural History Survey

QR-25 The Bedrock Geology of the Torrington Quadrangle, by Charles W. Martin, 1970.
Bedrock Geological Map of Connecticut, by J. Rodgers, 1985.

WETLAND RESOURCES AND REVIEW

1. The information gathered as part of the Draft Environmental Impact Report (EIR) was extensive and presented in a well organized format.

2. The overriding concern for this application is the amount of direct wetland impacts proposed: 1.4 acres of fill/excavation and 3.4 acres of wetland vegetation alteration. A majority of the wetland fill is proposed for the pasture area in the north corner of the property. Even though this wetland area has been historically altered through grazing activities, it still possesses notable functions and values as documented in the EIR. Additionally, if and when grazing is discontinued here, the existing hydrology should be able to support the re-generation of a more natural wetland ecosystem.

3. 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 Harwinton Inland Wetlands and Watercourses Commission (HIWWC), only then should compensation be considered to mitigate for unavoidable wetland impacts. This compensation should be undertaken with the goal of replacing those 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.

4. 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.

5. The EIR describes several alternative site development plans which the applicant has considered during this planning process. One alternative which was not listed is the possibility 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."

6. It is recommended that any subsequent alternatives offered by the applicant incorporate the use of 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. Given the higher than average functional value ratings assigned to many of these wetlands within the applicant's EIR, the preservation of a suitable development "setback" for the purpose of buffering the effects is highly recommended. 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 should range from 50 to 200 feet (the greatest distance needed for the wildlife buffer).

7. Although addressed in the EIR, a more refined wetland restoration/enhancement creation plan should be developed for consideration of

wetland impact mitigation. The EIR states that a 1:1 replacement ratio will be achieved, however specific acreage and locations are not specified. It appears that some of the creation is proposed as part of pond construction. The creation of open water wetlands to directly replace function and value of wet meadow, shrub/shrub and forested wetlands is not recommended due to a general loss of habitat diversity.

8. Once constructed, the proposed ponds will become "regulated areas" as defined in Harwinton's Inland Wetland And Watercourses regulations. As such, irrigation water withdrawals from these ponds could be considered regulated activities in that they may have negative impact on pond habitat as well as any perimeter shallow marshes constructed as part of the mitigation plan.

9. Proposed pond spillways should be indicated on the plan. The applicant should also provide information to the HIWWC to demonstrate the stability of these areas, as well as areas downstream of the spillways, during high flow periods.

10. Two areas of proposed wetland impacts have not been indicated on the 1"=100' plans. The first is an area between the 15th hole and the 16th tee which, according to the 1"=40' plans will be filled. The second is a small area of wetlands on the east edge of the 18th tee which has not been indicated as being disturbed on the 1"-100' plan. Additionally, it is recommended to include those areas proposed for irrigation lines which appear to be in wetland areas as areas of temporary impact.

11. Although erosion and sedimentation control is addressed elsewhere in this ERT report, one area of potential impact should be re-emphasized. If not handled correctly, construction of fairways 1, 2, 3, 6, 8, 9 may have a significant impact on down-slope wetlands and off-site watercourses. The planned use of construction phasing, construction sequencing, surface water diversions and sediment barriers should be indicated on the plan in detail to help avoid these impacts.

12. 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 the Inland Water Resources 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 860-424-3019.

13. 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 the DEP Inland Water Resources (IWR) 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 the DEP-IWR Division at 860-424-3019 to determine the need for such a permit.

14. 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 860-424-3850.

SOIL CONSERVATION DISTRICT REVIEW

Erosion and Sediment Controls (E&S)

1. A "Limit of Disturbance" line should be included on the site plans. It is not clear from the current plans as to where construction activity will be allowed and where it will not occur.

2. Diversions and other sediment and erosion control measures should be indicated on the site plans. This information should be clearly illustrated for ease of reference, proper installation, proper control of erosion which is likely to occur on an exposed soil, and to insure that wetland areas are protected. Sediment and erosion control notes which are included in the "Draft Environmental Report: Fairview Farms Golf Course" should also be included in the site plans in narrative form.

3. It was difficult to differentiate between silt fencing and streams or wetland boundaries on the site plans. While it is discernible, clarification would benefit contractors and inspectors of the erosion control measures.

4. Hole #4: E&S control measures should be illustrated on the site plans as protecting the local wetland at hole #4.

5. Hole #5: No E&S control measures are shown for this hole. As designed, the hole will cut into the existing wetland and pond. Is it possible to move the tee area north to remove any impact to the pond or wetland? If not, silt fence or other sediment and erosion control measures should be installed to protect the remaining wetlands and indicated on the site plans.

6. Hole #6: Silt fencing or other E&S control measures should be installed at the bottom of this proposed hole, as a small wetland exists just below the tee area.

7. Hole #7: There did not appear to be any detailed site plans (1:40 scale) for this hole. No sediment and erosion control measures are shown despite plans to construct the hole in the central wetland corridor. A detailed drawing depicting proper E&S controls should be made.

8. Hole #8: No sediment and erosion control measures are indicated as protecting the wetland which exists between the proposed hole #8 and hole #9. Silt fence or other control measures should be indicated. Additionally, no sediment or erosion control measures are indicated as protecting the wetland located adjacent to the proposed tee area. Is it possible to shorten the tee area to begin north of the central wetland area?

9. Hole #10: There are no E&S measures currently illustrated on the site plans. E&S control measures should be illustrated on the plans to protect the central wetland corridor.

10. Hole #11: E&S measures should be indicated as protecting the area adjacent to the impacted wetland and any areas upslope of the adjacent wetland.

11. Hole #15: Additional silt fence is needed around the construction area perimeter. As depicted on the 1:40 plans (sheet 1), the fairway edge is currently outside of the silt fence. The silt fence should be shown exterior to the work area. Additional silt fence is also needed to prevent silts from entering the wetland area between hole #15 and #16. Extending the existing fencing would accomplish this.

12. Hole # 16: Additional silt fence is necessary to sufficiently protect the adjacent wetlands. Why does the silt fence terminate when it should continue? The silt fence needs to be extended to provide complete coverage of the central wetland corridor. The proposed tee area should also have sediment controls along both its northern and

southern edge. The tee area clearly cuts through wetland areas, yet no E&S control measures are shown.

13. Hole #18: This proposed fairway sits adjacent to the central wetland corridor, yet sediment control measures are minimal. Silt fence should be installed around the perimeter of the work area, as it sits between two wetland areas.

14. After being utilized for equipment traffic during construction, it appears that the existing farm road will be left "as is." Should it be decided that the road be graded or altered otherwise, sediment and erosion controls should be placed around the work perimeter. Clarification as to the intended use of the existing farm road would be beneficial.

15. While the "Erosion and Sediment Controls, General" narrative does state that "The above construction events are to be phased to minimize the amount of area disturbed at any one time," there should a detailed sequence, which should be included on the site plans, as to the exact phasing. This is necessary for the contractor to reference and follow, and ensures a proper construction.

16. Under the "Erosion and Sediment Controls, General" narrative, it states "construction of fairways, cart paths, and service paths" as part of the construction sequence. The construction of any substantial cart path or service path should be indicated on the site plans, as they may well impact or enter a regulated wetland area. Additionally, it is likely that these paths would require additional E&S control measures.

17. The "Erosion and Sediment Controls, General" narrative does state that "sediment barriers to protect wetland area and crossing downslope of area of construction" will be installed. However, this detail is not presented on the site plans. The access road is proposed to climb roughly 70 feet up the slope of the hill. At the base of this hill is a

portion of the central wetlands corridor. Silt fence or other sediment control measures should be indicated on the site plans.

18. Boardwalks: No sediment or erosion control measures are indicated for the seven proposed elevated wood crossings which are to be constructed. As they will be passing through wetland areas, E&S control measures are required and should be indicated on the site plans.

19. Note that while the project is proposed to be phased, silt fence or other erosion and sediment control measures can also be used as internal control structures. One silt fence is generally accepted to control up to 150 feet of slope length or up to one acre of exposed soil. Should the cleared or excavated areas exceed these parameters, then additional silt fences will be needed.

20. Under "Erosion and Sedimentation Controls, Pond Construction," it states that "Pond dewatering to be pumped to settling pond constructed outside of wetland areas at start of each construction day." The location of the settling ponds should be indicated on the site plans. If necessary, erosion and sediment controls should be placed around the areas of construction to prevent any movement of silts or debris.

21. All diversions should be illustrated on the site plans, as the contractor will be using the site plans as a guide during construction. According to the narrative, diversions are proposed to being created along the majority of fairways where slope length, running with land contours, exceeds 100 feet. This information should be included on the site plans.

Clarification

1. Proposed "pond B": As presently designed, the perimeter of "pond B" overlaps the perimeters of hole #6 and hole #7. Clarification should be made as to whether the pond will be redesigned to not impact these two fairways or if the fairway perimeters will be

redesigned to conform to the shape of the proposed pond. In either case, the correction should be detailed in the plans.

2. Sheet no. 2 depicts proposed "pond B" and proposed "pond C," apparently adjacent to one another, while on the 1:100 scale map, they are several hundred feet away. It appears that the location of "pond B" and "pond C" have been shown together to illustrate detail, but this is not indicated on the map nor should it assumed to be the case. Clarification should be made and the site plans adjusted accordingly.

3. Sheet no. 2: It is unclear as to the location of the spoils areas which are indicated on this sketch. Do the two spoils area correspond with proposed "pond B," or, with proposed "pond C?" Clarification should be made. It would be helpful if the "spoils areas" were indicated on the 1:100 scale map.

4. A detailed cross section of each of the pond designs should be illustrated in the site plans. These should be designed and/or reviewed by a professional engineer.

Wetlands

1. Whereas the wetland areas are defined in the field and indicated on the overall site map, none of the wetlands, watercourses, or existing ponds are identified with a buffer zone. Buffer zones are critical to the protection of wetland ecosystems and streams and are used to identify the area in which activity should be regulated. With this information, the commission and all interested parties would be better able to understand the extent of the proposed development and the potential impacts.

2. An example of where this information would be beneficial is hole #3, where a perennial stream exists midway along the fairway. No buffer is indicated on the site plans. It appears then that construction activity could occur at any point along the stream with no sediment and erosion controls in place. Additionally, there is no documentation in the plans as to the sediment and erosion control measures which

will be installed for this stream or the wetland area of hole #3 (1:40 scale plans are provided for the other areas which are impacted).

3. Due to the proposed land grading and construction of hole #7 and hole #8, the wetland area located between the two will become isolated. By isolating this wetland area, it is likely that the level or hydraulic recharge to the soil will diminish, resulting in a degradation to the wetland. As such, additional "wetlands" not accounted for may be lost.

4. Holes #15 and #16: The grading of land in this area will effectively bisect a portion of the central wetland corridor (in an "upper" and "lower" location). The remaining wetland soils located between these two holes will become isolated from the central wetland corridor, save a culvert which is to be installed under hole #16. While it is difficult to determine to what extent, it is likely that the remaining wetland hydrology will be altered and possibly become drier than it's current state.

Alternatives

1. "Feasible and prudent alternatives" design alternatives should be considered before a permit is issued. While the plans do include a number of overall course alternatives, the proposed holes/fairways should be looked at on an individual basis and regarded for improvement. Whenever possible, the goal is to limit or prevent the disturbance, destruction, or alteration of wetlands and watercourses.

2. It may be possible to minimize the impact along the central wetland corridor by modifying the current proposal. It may be possible to skew the run of hole #6 more towards the northerly property boundary, adjusting the angle of the hole to maintain the dogleg effect. If so, this would result in an increased space between holes #6 and #8. With this modification, it may be possible to move hole #7 out of the central wetland corridor and relocate it between holes #6 and #8. The location of proposed "pond B"

may have to be adjusted should this be considered. Again, "feasible and prudent alternatives" must be considered prior to the approval of a wetlands permit.

3. Driving range: Feasible and prudent alternatives should be considered rather than selectively harvesting a portion of the central wetland corridor. If there are no feasible and prudent alternatives, then soil and erosion control measures (silt fence or other) should be installed above the wetland area to prevent any silts from entering due to the work which will occur upslope (i.e. clearing of field, land grading, preparation of tee area, installation of proposed netting).

Irrigation

1. Irrigation design: The irrigation map, as provided, indicates the system as proposed for the golf course. It does not, however, indicate wetland boundaries, streams, or buffers. This information would be beneficial when trying to determine the impact the design may have on the wetland ecosystem. For example, on hole #17, the main feeder line lies to the north/northwest of the proposed fairway. Corresponding to the 1:100 map, which does not illustrate the irrigation system, it appears that the line will be running through a portion of the central wetland corridor. It would at first appear that there would be no disturbance to this area, but considering the installation of the line, it would appear that a trench would have to be dug through the wetland. An alternative route should be investigated. Additional sediment and erosion control measures would be required to isolate the trenching activity (to be indicated on plans).

Also, there may be some additional movement of groundwater due to the trenching activity through the wetlands. Once installed, the lines and trench bedding may serve as a conduit for additional groundwater flow. Local groundwater levels may fluctuate slightly due to these new pathways.

Other areas of similar concern include: A. Between holes #15 and #16, and B. Above fairway #18 (into the central wetland corridor).

HYDROGEOLOGIC SETTING AND POTENTIAL IMPACT BY PESTICIDES TO THE WATER RESOURCES ENVIRONMENT

Introduction

This portion of the ERT report addresses the issue of potential impact by pesticides from the proposed golf course to the water resources environment of the area. The 163 acre site is a topographically upland area located south of Delay Road and east of Barber Hill Road in the town of Harwinton, Connecticut. The groundwater classification in this area of Harwinton 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 and other purposes.

Information was obtained at an initial meeting of the ERT Team, local officials. the developer and consultant on October 16, 1997. On-site field inspections of the area were made on October 16 1997 and on December 29, 1997. Review of additional background information included the following - the developer's draft environmental report and associated plans, some area well completion reports, a limited literature search, and references noted at the end of the report. Information was also gathered from a routine golf course inspection conducted by the Pesticide Management Division of the DEP on January 13, 1998 at Stonybrook Golf Course in Litchfield, Connecticut, operated by the developer/applicant.

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 water resources and the hydrogeologic setting and its vulnerability to potential impact by the use of pesticides at the proposed golf course.

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 pesticide usage is the *source,* the hydrogeology describes the *pathways,* and water resources are the *receptors.* Here, the water resources include surface water in the form of streams, ponds, and wetlands, and, groundwater occurring naturally and that which is tapped from wells for consumption or irrigation.

Hydrogeologic Setting

The entire 163 acre site, both the surface and the subsurface constitute the site's hydrogeologic setting. Evaluating the hydrogeology considers all manifestations of surface water and groundwater and can include, ponds, streams, wetlands and the groundwater that occurs and moves under vertical and horizontal hydraulic gradients through the soil layer, the underlying surficial or glacial 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. According to the Fairview Farms' owner, water is present in some of the ponds year-round, an indication that recharge from groundwater and precipitation is significant and can sustain water levels in the ponds.

Another way to evaluate hydrogeology related to pesticides is to consider the quantity of water subject to surface water runoff versus that which percolates downward through soil layers into sediments and or rock. Each pesticide's particular physical and chemical characteristics (i.e., solubility, soil and water half-life or persistence, and the KOC value or the soil/water partitioning coefficient) will determine whether a pesticide is apt to readily solubilize in water and thus behave as a "leacher" by

infiltrating through to the groundwater or one that is easily adsorbed to soil particles thus functioning as a "source" or migrating off the site together with the particles and surface water runoff. Unfortunately, it is difficult to satisfy these conditions in order to mitigate impact to both surface water and groundwater.

Bedrock Geology

The bedrock geology of the site is mapped as the Hartland Formation, Unit III. (Please also refer to the Geology section of this report for updated information on the bedrock geologic mapping.) This is a thinly interlayered dark gray granulite and a silvery schist containing micas, feldspar, quartz, and abundant graphite. Structurally, the bedrock formation forms a synclinal axis. (1) This feature implies a degree of folding or a slope to the surface of the bedrock. Data derived from drilling exploration has frequently demonstrated that the bedrock/sediment interface can function as a preferred plane along which groundwater and its constituents may flow.

Surficial Geology

The surficial or glacial geology at the site is mapped as Quaternary till, described as a loose and sandy, gray to light gray till, generally about 20 feet thick. (2) Weathered bedrock is also indicated in some areas of the quadrangle as the top of bedrock surface decomposed to a sandy, gravelly material. Of the two widely recognized tills of southern New England, the sandy or upper till is thought to reflect the composition of underlying granitic bedrock. A USGS publication reports on the hydraulic properties of tills in southern New England. The values for hydraulic conductivity which is a flow measurement for the capacity of a geologic material (sediment or rock) to transmit water are the following: the horizontal hydraulic conductivity in tills to range from 3.9 x 10^{-3} feet per day to 65 feet per day and the vertical hydraulic conductivity in tills to range from 1.3 x 10^{-2} feet per day to 96 feet per day. (3) The value for hydraulic

conductivity is useful for computing the time of travel with regard to a pollutant in groundwater.

Well Reports

Well completion reports were examined from recent well drilling and construction in the vicinity of the proposed site, specifically on Delay Road and (Barber) Hill Road. This information aids in determining the subsurface potential to transmit groundwater and its natural and introduced constituents by providing the data on the composition of the geologic materials, depth to water and well yields for each well drilled. According to seven well records, constructed during the period 1997 back to 1992, surficial materials are thicker than indicated on the Surficial geologic map - ranging from 31 to 90 feet thick. Depths to water range from 10 to 25 feet below the land surface. Depth to water values will vary seasonally throughout the year. Well yields ranged from 2 to 12 gallons per minute.

Golf Course Pesticide Usage and Water Quality

Historically, 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 the naturally occurring vegetation and, therefore, diminishing the use of pesticides. Limiting pesticide usage is a cost-saving measure as well. According to a 1995 Golf Digest survey, 87% of readers favor golf course measures to prevent golf course pollution or to conserve water.

Another reason to explain this change of attitude 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 apart from 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 have been detected in groundwater in some areas of Connecticut. (4)

As discussed earlier in the section Hydrogeologic Setting the two major ways in which pesticides can reach the water resource be it surface water or groundwater are: 1) by the vertical infiltration or percolation of pesticides with rainwater or irrigation water through soil layers into the groundwater, 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. 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.

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 difflcutt to achieve completely.

Two critical elements related to pesticide products are #1, how and when a pesticide's active ingredient degrades into a metabolite and, more importantly, how toxic that metabolite may be. The second element of importance 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.

The developer's draft environmental plan contains #1, a list of pesticides that are contemplated for use at the proposed golf course and #2, maintenance records from Stonybrook Golf Course. Both the pesticide list and the maintenance records contain restricted use pesticides that may not be used or purchased without the appropriate certification, in this case the supervisory golf course superintendent certification, which is not held by Stonybrook Golf Course. In addition, the Stonybrook maintenance records contain a product(s) not registered for sale or use in Connecticut. In order to purchase a restricted use pesticide, proof of certification must be shown to a certified dealer. With certification, the maintenance records are incomplete and must also include: EPA registration numbers of products, the target pest, the rate for mixing and the rate for use.

Suggestions and Recommendations

- 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. Suggestcd 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 characteristiw may result in a higher runoff potential to surface water.

- Another 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 present compound. These compounds must be identified and considered as well with regard to their potential to contaminate the water resource.

- 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 documents in Appendix B. In 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 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 comprehensive integrated approach to environmental planning for proposed developments. See materials in Appendix B on this program. In Connecticut there are 32 golf courses enrolled in this program and three are fully certified as a "Certified Audubon Cooperativc Sanctuary."

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

- 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.

References

(1) Martin, Charles W., Geologic Map of the Torrington Quadrangle, Connecticut and Quadrangle Report #25, 1970.

(2) Colton, Roger B., Surficial Geologic Map of the Torrington Quadrangle, Litchfield and Hartford Counties, Connecticut, 1971.

(3) Melvin, Robert L. et Al, the Stratigraphy and Hydraulic Properties of Tills in Southern New England. USGS Open File Report 91-481, 1992.

(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.

AQUATIC RESOURCES

Site Description

Four streams and four ponds are located within the 163 acre parcel proposed for development of the Fairview Farms Golf Course. The four unnamed streams are tributary to Leadmine Brook. Each is contained within channels which range between 5 to 8 feet in top of bank width and 2 feet in depth. Stream substrate is composed of small boulder, gravel, coarse sand, and sand-silt fines. Dense growths of hardwoods and woody shrubs predominate as riparian vegetation in a relatively broad wetland adjacent to the southerly oriented stream near the parcel's western boundary and the easterly oriented stream at the eastern boundary near Whetstone Road. The riparian area adjacent to the two easterly oriented streams at the parcel's northern boundary have been altered due to long standing agricultural land use. Riparian vegetation along these streams is limited to grasses and woody shrubs. Boulders, undercut banks, and fallen or overhanging vegetation, provide physical in-stream habitat. Each stream is intermittent in surface flow.

The four unnamed ponds on the parcel range in surface area from 1/4 to 1/2 acre. All are artificial in origin. Reportedly each pond has an average depth of approximately 5 feet. Abundant growths of submergent aquatic vegetation are found throughout much of each pond along with emergent aquatic vegetation species along the shoreline; such a condition would categorize the ponds as moderately eutrophic. Surface water from the ponds discharge to the parcel's unnamed streams.

Although the parcel has been subject to agricultural development, primarily grazing fields, buffers of wetlands adjacent to most of the surface waters have been maintained. This has provided an effective means of protecting aquatic habitats and surface water quality located not only on the Fairview Farms parcel but those off-site such as that within Leadmine Brook. The Department of Environmental Protection classifies the

surface waters of the Fairview Farms Golf Course parcel and that of nearby Leadmine Brook as *Class AA* surface waters. Designated uses for *Class AA* surface waters are existing or potential public drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other purposes. Recreational uses may be restricted.

Aquatic Resources

With each being intermittent in flow, the unnamed streams on the Fairview Farms Golf Course parcel are not anticipated to contain populations of finfish or aquatic insects.

Although formal finfish resource inventories of the four ponds have never been conducted by the Fisheries Division, the reported shallow average water depth and abundant aquatic plant growth, would classify each as a warm-water resource. Finfish species commonly associated with such ponds in Connecticut would include bluegill sunfish *(Lepomis macrochirus)*, pumpkinseed sunfish *(Lepomis gibbosus)*, largemouth bass *(Micropterus salmoides)*, golden shiner *(Notemigonus crysoleucas)*, and brown bullhead *(Ameiurus nebulosus)*.

While not within or adjacent to the proposed Fairview Farms Golf Course, surface runoff from the parcel contributes a water supply to Leadmine Brook. Routinely conducted Division surveys indicate that this major watercourse is supportive of a diverse coldwater finfish assemblage. Species collected in those surveys include brook trout *(Salvelinus fontinalis)*, brown trout *(Salmo trutta)*, rainbow trout *(Oncorhynchus mykiss)*, fallfish *(Semotilus corporalis)*, creek chub *(Semotilus atromaculatus)*, blacknose dace *(Rhinichtys atratulus)*, longnose dace *(Rhinichtys cataractae)*, tessellated darter *(Etheostoma olmstedi)*, and white sucker *(Catostomus commersoni)*.

Several age-size classes of brook trout and brown trout are commonly observed in the finfish survey and is indicative of a natural reproduction.

Being in close proximity to highly urbanized areas, Leadmine Brook is a significant recreational angling resource. In an effort to meet angler demand, the Division provides a supplemental stocking of trout with approximately 1600 adult sized brook, brown, and rainbow trout released annually.

Resource Impacts

As previously mentioned, the Fairview Farms Golf Course parcel has been subject to agricultural development conducted in a manner which, to a large extent, has maintained buffers of wetlands adjacent to surface waters which has subsequently provided an effective means of protecting both on- and off-site aquatic habitats and surface water quality. Taken as a whole, redevelopment of the existing agricultural property to a golf course as proposed should not produce a physical land use change adversely impacting aquatic resources proximate the parcel.

However, the following components of site design and future maintenance are of concern:

1. Crossing structure design for the main golf course access road. A culvert is currently proposed to allow access to the golf course from Route 222 across an unnamed stream. Although the stream is not anticipated to support an aquatic species assemblage given the intermittent flow regime, the proposed culvert may alter storm flows in a manner compromising localized stream bank stability which in turn may be of consequence to habitats or resources found off-site.

2. Fertilizer, herbicide, and pesticide application. Maintaining vegetated filter strips along surface waters and applying compounds at curative rates may minimize off-site transport. Should excess nutrients from fertilizer runoff reach surface waters, there will be a stimulation of aquatic plant growth potentially to levels decreasing habitat diversity. Herbicide or pesticide runoff may result in fish kills and water quality

degradation. Especially susceptible would be the four existing and three proposed ponds.

3. Soil erosion and subsequent sediment transport through runoff from areas removed of vegetation during parcel redevelopment. Excessive erosion, sediment transport, and sediment deposition can degrade both water quality and physical habitat, in turn affecting the resident finfish population. Specifically, excessive siltation has the potential to cause a depletion of oxygen within the water column; disrupt fish respiration and gill function; reduce water depth resulting in a reduction of habitats used by finfish for feeding, cover, and spawning; reduce finfish egg survival; reduce aquatic insect production; and promote excessive aquatic plant growth. Again, the four existing and three proposed ponds would be subject to the greatest impact.

4. Alteration of riparian habitats. Changes to existing riparian vegetation from golf course encroachment can:

- remove the natural "filtering" effect of vegetation which has the ability to prevent sediments, nutrients, fertilizers, and other non-point source pollutants from upland sources from entry into streams; such non-point source pollutants can degrade habitat and water quality, decrease stream bank stability thereby increasing siltation and habitat degradation.

- decrease the riparian corridor's ability to serve as a "reservoir" storing surplus runoff for gradual release back into the streams during summer and early fall low flow periods.

Mitigative Recommendations

A number of measures have been incorporated into preliminary design of the proposed Fairview Farms Golf Course in effort to protect the parcel's aquatic resources. The

Fisheries Division recommends the following to further protect the aquatic habitats and resources found on the parcel as well as those found in immediate off-site locations:

1. Redesign the access road stream crossing structure. Preferred alternatives would be a span or an arch culvert as these structures most adequately preserve physical in-stream habitat. A third alternative likely well suited to the proposed crossing location would be a box culvert set with the base approximately 1 1/2 feet below the existing stream grade. The culvert bottom should be refilled with the stream substrate materials excavated for it's placement.

2. Maintain, at a minimum, a 50 foot buffer zone of undisturbed habitat adjacent to the parcel's four streams. The buffer zone boundaries should be measured from either, (1) the edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of riparian wetlands, the edge of the stream bank based upon bank-full flow conditions. Research has indicated that a buffer zone of this widths preserves the functions of intermittent streams. Please refer to Appendix C for documentation presenting Fisheries Division policy and position regarding riparian buffers for additional information.

3. Eliminate the proposed driving range. Relocate Hole #10 easterly of the unnamed stream in the area which in part had been slated for the driving range. Relocate Hole #11 westerly of the unnamed stream. The combination of these three measures will prevent impacts to two wetlands associated with the unnamed stream.

4. Redevelop the four existing ponds to marsh or wetland habitat. These ponds presently are moderately eutrophic, a condition exemplified by abundant growths of aquatic vegetation. It is likely that the eutrophication process will accelerate following golf course development due primarily to nutrients from fertilizers. An overabundance of aquatic plants visually confirms advanced eutrophication. Physical in-water habitat is dramatically limited or completely eliminated by advanced

eutrophication and water quality is significantly reduced. A reduction in water quality discharging from the parcel may impact off-site resources. The redevelopment of the ponds to marsh or wetlands should enhance the "biofilter" capability of the existing wetland complex and further the wetland's capacity for nutrient removal.

Finfish and other aquatic faunal species should be "salvaged" prior to redevelopment of the existing ponds. It would be preferable to relocate these species to the three proposed ponds.

5. The proposed ponds should be constructed with irregular shorelines and bottom variations as habitat enhancement. The ponds should have a minimum water depth of 10 feet through 25% of the total pond area to prevent summer and winter fish kills. The Division can provide additional guidance relating to issues of finfish management and/or habitat enhancement.

6. Establish comprehensive erosion and sediment control plans with mitigative measures (haybales, silt fence, etc.) to be installed prior to and maintained through all phases of golf course development. Land clearing and other disturbance should be kept to a minimum with all disturbed areas being protected from storm events and restabilized in a timely manner.

7. Limit regulated activities adjacent to riparian buffer zones to historic low precipitation periods of the year. Reduced precipitation periods of summer to early fall provide the least hazardous conditions when working near aquatic environments.

FOREST VEGETATION

The review area is approximately 163 acres of which 51% or 84 acres is tree covered. The remaining 49% is comprised of agricultural fields, open water, and buildings. The present use of the site is agricultural with beef cattle as the most recent crop. The surrounding properties appear to be residential lots of varying sizes, and private and State owned woodlands. The acreage of the study area and the forest cover types were scaled from aerial photographs and derived from the Draft Environmental Report: Fairview Farms Golf Course, Harwinton, Connecticut by Mason & Associates, Inc., North Scituate, Rhode Island - October 16, 1997.

The forested vegetation description for the site can be divided into four cover types (see Figure 4 - Forest Cover Type Map).

Type A	Wetland Forest - 18 acres
Type B	Hedgerows and Islands - 11 acres
Type C	Mixed Hardwood Sawtimber - 35 acres
Type D	Shrub/Sapling/Poletimber - 20 acres

These types are described in detail under the heading Forest Vegetative Description.

The nonforested vegetation appears to be adequately described in the consultant's report and will be addressed in the Wildlife Resources section of the ERT report.

The economic value of the wood products growing on the property are low to moderate due to past timber harvesting activities which removed the bigger and better quality trees. The exception is a mixed hardwood sawtimber stand in the southeast portion of the property. Abusive harvesting was not done in this area. Here trees of moderate to high economic value still grow. Of greater value is the forest types play in the aesthetics, the storm water storage capacity of the landscape, the wildlife habitat diversity, and the dispersed recreational opportunities of the area.

Forest Vegetative Type Description

Type A - Wetland Forest

This type is comprised of six parcels which are labeled A-1 through A-6 on the Forest Cover Type Map. These mixed hardwood/softwood poletimber/sawtimber stands occur on poorly drained soils with a high water table. Red maple is the predominate tree species followed by hemlock, white ash, elm, black birch, yellow birch, black gum, aspen, white oak, red oak, hickory, sassafras, black cherry, white pine, white birch, apple, and Norway spruce. Shrub species present in varying abundance are spicebush, multiflora rose, alder, witch hazel, barberry, highbush blueberry, mountain laurel, winterberry, swamp azalea, and arrowwood. Vine growth present are grape, poison ivy, and bittersweet.

Type B - Hedgerows and Islands

This type is dispersed throughout the property bordering open fields along wire fences and stone walls, and amongst rock outcrops within the fields. Tree species present are aspen, sugar maple, white ash, butternut, red maple, black cherry, white oak, hickory, red oak, and apple. Trees range in size from sapling to large sawtimber. Shrubs present are multiflora rose, barberry, honeysuckles, blackberries, staghorn sumac, dogwoods, autumn olive, privet, and viburnums. Extensive vine growth of bittersweet, grape, and poison ivy are present.

Type C - Mixed Hardwood Sawtimber

This type is comprised of ten stands which are labeled C-1 through C-10 on the Forest Cover Type Map. The sawtimber sized hardwood species present are red oak, black oak, white oak, scarlet oak, red maple, sugar maple, black birch, yellow birch, white ash, hickories, aspen, yellow poplar, black cherry, butternut, and black locust. Softwood species found in the main canopy are hemlock and white pine. The understory

contains saplings and seedlings of hemlock, sugar maple, hickory and red oak, and shrubs of witch hazel, maple leafed viburnum, mountain laurel, and spicebush. Grape is the predominant vine present in the type.

Type D - Shrub/Sapling/Poletimber

This type is located in the east-southeast portion of the property. Sapling and poletimber stems of white ash, sugar maple, red maple, apple, black cherry, hickories, white pine, red cedar, juniper, gray birch and aspen occupy the type. Shrubs found here are multiflora rose, dogwood, barberry, autumn olive, juniper, honeysuckle, and highbush blueberry. The tree and shrub species present are typical of an old field reverting to forestland. In the eastern corner of the property is an overgrown Christmas tree plantation with white spruce and white pine planted here.

Management Considerations

Several factors have to be considered in the maintenance of a forest. The potential for windthrow of trees growing on wetland soils, as in Type A, is greater due to the shallow root penetration into such soils. Light thinnings of trees may help to improve the stability of the remaining trees. Alterations in the wetlands which permanently change the water table height and or restricts the natural drainage may have a negative impact on the health of vegetation in and around these sensitive areas.

The proposed golf course development will convert 45 acres (54%) of the forestland to non-forested. Cover types C and D will be most impacted. The construction of the tees, fairways, greens, ponds, and buildings will fragment the continuous forest cover into fingers and islands. Overall concern therefore should be for maintaining and enhancing the vegetation that can remain. It would be desirable to incorporate the retention of individual trees and clumps of trees and shrubs into the final site plan. Trees are sensitive to changes in soil conditions. Development activities near trees may disturb their root zone and ultimately their health and vigor. Dead and dying trees

reduce the aesthetic appeal of the property, become a safety hazard, and are expensive to remove. Wherever practical, clumps or clusters of trees should be let to reduce the possibility of soil disturbance and mechanical injury to individual trees. These plants should be identified and marked on the ground to insure their retention and protection.

Trees in the other types which are presently unhealthy and exhibit low vigor due to crowded conditions, old age and or past land use are more susceptible to further degradation from the stresses of development and environmental factors. The removal of theses trees would benefit the healthier trees by reducing the competition for sunlight, water and nutrients. Properly applied these removals would not only improve the remaining trees, but improve the property's aesthetics, wildlife habitat and safety for the public.

In types A and D the softwood growth should be favored since this tree cover is lacking and would add to the area's habitat diversity. Softwood species found in these types should be added to the list of native plant material selected for buffer purposes in section 4.3 of the Draft Environmental Report: Fairview Farms Golf Course, Harwinton, Connecticut.

Trees of unique size and form should be released from the competition of other trees and opened to public viewing.

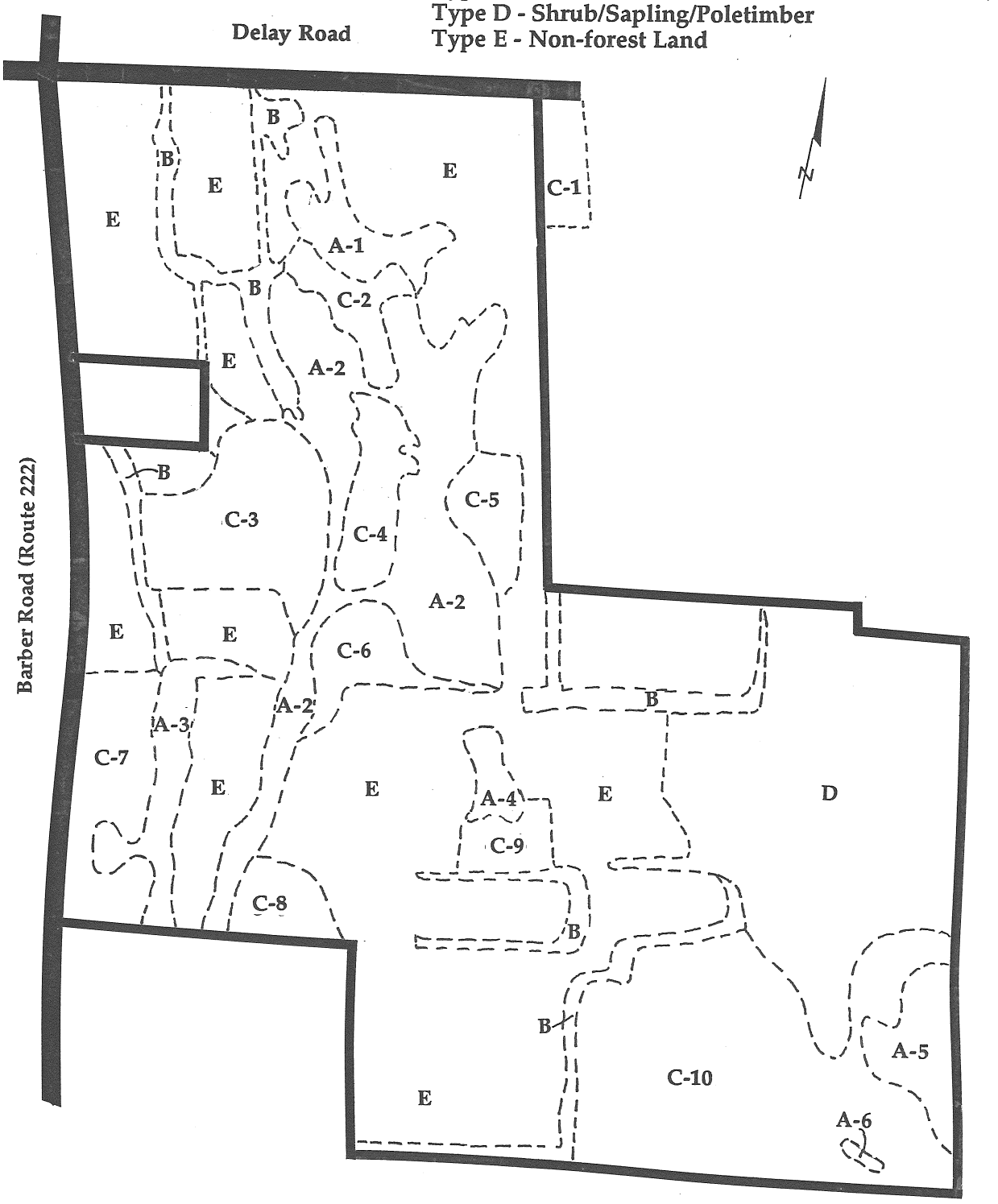
Any manipulation of the forest vegetation should be done under the guidance of a State certified forester. A current listing of these professionals may be obtained by contacting the State Forester's office at the Department of Environmental Protection, Bureau of Natural Resources, Forestry Division, 79 Elm Street, Hartford, CT 06106, Telephone: (860) 424-3630.

Figure 4

Forest Cover Type Map

Scale 1" = 500'

Type A - Wetland Forest (stands 1-6)
Type B - Hedgerows and Islands
Type C - Mixed Hardwood Sawtimber (stands 1-10)
Type D - Shrub/Sapling/Poletimber
Type E - Non-forest Land



THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the project site 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 on the maps 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.

WILDLIFE RESOURCES

NOTE: This section is being completed by Judy Wilson, wildlife biologist, DEP, Sessions Woods Wildlife Management Area, Burlington, CT, telephone: 860-675-8130. It was not completed in time for inclusion in this report and will arrive under separate cover and should be considered part of this ERT report.

CONNECTICUT D.O.T. REVIEW

- It is recommended that the developer's engineer follow the guidelines published by the American Association of State Highway and Transportation Officials' policy on geometric design of highways when designing the golf course access roadway.

- Since access to the site will be gained via Hill Road (State Route 222), all design and construction activities will be coordinated through the DOT District IV Office in Thomaston.

PLANNING REVIEW

Zoning and Compatibility of Proposed Project with Surrounding Land Uses

The subject site is located within Harwinton's "Country Residential" zone where the minimum lot sizes are 87,000 square feet. Golf courses are allowed within this zone subject to the granting of a special permit by the zoning commission.

Land use surrounding the project site consists of a mix of open fields, woodland and residential development on large lots. The State of Connecticut's Roraback Wildlife Area abuts the project site along the southern and eastern borders of the site.

Provided sufficient environmental controls are implemented to protect the integrity of water quality and wetlands on the property, the project appears to be generally compatible with adjacent land uses and zoning. The proposed locations of the clubhouse, parking lot, and maintenance building are well separated from nearby roads and residences which will serve to soften the impact of the project. In addition, the applicant has stated that the old barns on the property will be retained and a vegetated buffer along Rte. 222 will be established and/or retained. Care should be taken, pursuant to Harwinton's Zoning Regulations, in the development of signage, outdoor lighting, and landscaping to ensure that the project enhances the character and appearance of the existing neighborhood.

The average daily traffic for Rte. 222 in the project vicinity is 1100 trips according to ConnDOT's 1996 Traffic Log. This segment of roadway is not projected by ConnDOT to have capacity deficiencies over the next twenty years.

Consistency of Project with State Regional and Local Plans

The Conservation and Development Policies Plan for Connecticut 1992-1997 is a statement of the growth, resource management and public investment policies of the State. The Plan was prepared by the Office of Policy and Management (OPM) and adopted by the Connecticut General Assembly in 1992. The objective of the Plan is to give a balanced response to human, environmental and economical needs in a manner which best suits the future of Connecticut. Regional planning organizations and local governments have been encouraged by OPM to foster implementation of the Plan at the local level.

According to the Locational Guide Map that accompanies the State Plan, the subject site is classified as a conservation area. The State action strategy for conservation areas is to plan and manage, for the long term public benefit, the lands contributing to the state's need for food, fiber, water and other resources, open space, recreation, and environmental quality and ensure that changes in use are compatible with the identified conservation values. The subject site is classified as a conservation area because it is located within the watershed of Leadmine Brook, a potential public water supply watershed. Provided adequate water quality protection measures are defined and implemented with project construction, the proposed plan appears to be generally compatible with the goals established by the State Plan.

The Litchfield Hills Council of Elected Officials (LHCEO) is the official regional planning organization for the 11-town Litchfield Hills Region which includes the town of Harwinton. According to LHCEO's "Regional Growth Policy Map," the subject site is classified as a rural watershed area. The proposed project is generally compatible with this regional plan designation provided care is taken to minimize disturbance to wetlands and water quality with project implementation.

The LHCEO has also prepared a Regional Economic Development Plan entitled "Building on a Diverse Foundation: An Economic Development Strategy for the

Litchfield Hills Region." Although the development of additional outdoor recreational facilities is not specifically addressed in the Plan, the Plan does recognize the importance of maintaining the region's rural character while at the same time encouraging appropriate new business development for job creation and tax revenues. According to the applicant, the project is expected to employ between 16 and 20 people during the height of the golfing season.

The 1995 Harwinton Plan of Conservation and Development advocates as a fundamental policy the continued protection and enhancement of the rural quality of the town. The Plan also emphasizes that the key to the maintenance of Harwinton as a rural community is the protection of the natural environment. The Plan also states that the existing zoning controls in Harwinton (which allow golf courses in the country residential zone by special permit) "are sound."

To conclude, the proposed project generally appears to be compatible with state, regional, and local plans provided the project is sensitively designed to maintain rural character and sufficient environmental controls are implemented to protect water quality and wetlands on the property.

APPENDIX A

Soil Map

Soil Map Legend

Nontechnical Soils Description Report

Building Site Development Soils Report

Sanitary Facilities Soils Report

For Appendix Information Please Contact
the ERT Office at 860-345-3977

ABOUT THE TEAM

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, soil scientists, foresters, climatologists and landscape architects, recreational specialists, engineers and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC&D) Area - an 83 town area serving western Connecticut.

As a public service activity, the Team is available to serve towns within the King's Mark RC&D Area - **free of charge.**

Purpose of the Environmental Review Team

The Environmental Review Team is available to assist towns in the review of sites proposed for major land use activities or natural resource inventories for critical areas. For example, the ERT has been involved in the review of a wide range of significant land use activities including subdivisions, sanitary landfills, commercial and industrial developments and recreation/open space projects.

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

Requesting an Environmental Review

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of an administrative agency such as planning and zoning, conservation or inland wetlands. Environmental Review Request Forms are available at your local Soil and Water Conservation District and through the King's Mark ERT Coordinator. This request form must include a summary of the proposed project, a location map of the project site, written permission from the landowner/developer allowing the Team to enter the property for the purposes of a review and a statement identifying the specific areas of concern the Team members should investigate. When this request is reviewed by the local Soil and Water Conservation District and approved by the King's Mark RC&D Executive Council, the Team will undertake the review. At present, the ERT can undertake approximately two reviews per month depending on scheduling and Team member availability.

For additional information regarding the Environmental Review Team, please contact the King's Mark ERT Coordinator, Connecticut Environmental Review Team, P.O. Box 70, Haddam, CT 06438. The telephone number is 860-345-3977.