ENVIRONMENTAL REVIEW
of
PROPOSED INLAND WETLAND AND WATERCOURSE ACTIVITIES

"THE PRESERVE"

Old Saybrook, Connecticut

NLJA # 0719-0012

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LIST OF ABBREVIATIONS

ac	acres
BMPs	Best Management Practices
CB	Catch Basin
cf	cubic feet
CNs	Curve Numbers
DEP	Department of Environmental Protection
FB	Filter Basin
GPD	gallons per day
IWWC	Inland Wetlands and Watercourses Commission
MAC	Maximum Allowable Concentration
mg/L	milligrams per liter
MH	Manhole
lbs/d	pounds per day
MAC	maximum allowable concentration
MR	Mud River
NDDB	Natural Diversity Data Base
NRCS	Natural Resources Conservation Service
OR	Oyster River
SC	scupper
sf	square feet
SSAS	subsurface soil absorption system
TB	Trout Brook
Tc	Time of Concentration
TRM	turf reinforcement mat
TSS	Total Suspended Solids
TST	Temporary Sediment Trap
UG	Underground Gallery
USGS	United States Geological Survey

1.0 Introduction

This review has been prepared for the Town of Old Saybrook Inland Wetlands and Watercourses Commission. The purpose of this document is to assess the potential environmental impacts upon wetland and watercourse habitats that will result from the proposed development of property in Old Saybrook, Essex, and Westbrook known as "The Preserve".

The Preserve is a 999 acre parcel, with approximately 926 acres located within Old Saybrook. With the exception of a short section of access road to Route 153 in Westbrook, all of the proposed development activities will occur within Old Saybrook. The entire property is currently undeveloped, and can generally be characterized as having rugged topography with large unbroken tracts of forest land and extensive wetland systems.

The Preserve is unique for a variety of reasons. It is the largest, privately owned unbroken tract of forested land still extant within the communities of its location. Important wetland resources on the property include Pequot Swamp, a bog-like wetland of local significance, and numerous viable vernal pools. At least four state-listed plant species and three wildlife species are also known to occur on or adjacent to the site.

The proposed project is a residential and recreational community which, upon completion, would include 221 residential units, a network of roadways to provide access to the lots, a private eighteen-hole golf course with club house and other amenities, a golf course maintenance building, a fire house, an above ground water storage tank, an onsite wastewater treatment facility, a network of trails, a nature center and four athletic fields.

In preparation of the review provided in this report, field visits to the site were conducted and the information identified in Appendix A was reviewed.

1.1 Prior Inland Wetland and Watercourse Permit Application

The current "Inland Wetlands and Watercourses Permit Application" is identified by the Applicant as Alternative #12. Of the twelve development alternatives considered, the first two were the only ones which were previously submitted to the Commission as formal permit applications.

1.1.1 Alternative #1: October 21, 1999 Review

The first wetland application, which was submitted on April 28, 1999 and withdrawn in October 1999, was for a proposed development which included 308 residential building lots, a network of roadways to provide access to the lots, an eighteen hole golf course with clubhouse and recreational amenities, a maintenance building, guest cottages, and a wastewater treatment facility.

This prior application was the subject of a similar review, which was prepared by the same peer review team, and presented in a bound report, dated October 21, 1999, entitled "Environmental Review of Proposed Wetland and Watercourse Activities, 'The Preserve – Phase I', Old Saybrook, Connecticut". This report will be referenced hereinafter as the "first review", and the associated application as the "first application".

1.1.2 Alternative #2: March 15, 2000 Review

Alternative #2, which included both the second and third wetlands applications were simultaneously submitted to the Commission in January 2000. The second application, which was subsequently denied, included the roadway infrastructure and twenty-four Phase I single family residential lots. While only Phase I of the residential development was included in the application, it should be noted that the overall layout for the residential component of the development was scaled back to a new total of 283 single family residential building lots. Other notable modifications included individual subsurface sewage disposal systems for each lot (instead of a centralized community system) and a reduction in the length of roadways. The third application, which was eventually approved, included the country club and golf course. This component of the project also included some modifications to that which was presented in the first application, including adjustments to the layout of the golf course and maintenance facility to reduce the area of activity within the wetlands and the one hundred foot (100') regulated upland review area.

The second and third applications were the subject of a similar review effort, prepared by the same peer review team, and presented in a bound report, dated March 15, 2000, entitled "Environmental Review of Proposed Wetland and Watercourse Activities, 'The Preserve – Phase IA', Residential Subdivision & Golf Course Lot and 'The Preserve Golf Course', Old Saybrook, Connecticut". This report will be referenced hereinafter as the "second and third review", and the associated application as the "second and third application".

1.2 Alternative #12

As compared to the second and third applications, the current application has been further modified to reduce the number of proposed residential units from 283, to a total of 221 (as directed by the Planning Commission), consisting of 67 single family residential lots and 154 clustered residential units. Accordingly, the network of roadways necessary to provide access to building lots has also been reduced. The potential impact to inland wetlands and watercourses, resulting from the development of the residential component of this project will be associated with three proposed roadway crossings of watercourses and roadway construction work located within the one hundred foot (100') regulated upland review area. In addition, site work associated with the development of four of the proposed single family residential building lots and a portion of the central village also occurs within the one hundred foot (100') regulated upland review area.

While the recreational elements included in the current application are similar to those proposed in the previous applications, adjustments to the layout of the golf course and maintenance facility have been made to reduce the area of clearing within wetlands and to improve the connectivity between some of the adjacent vernal pools. In this regard, based on the information prepared by the Applicant, the area of tree clearing in wetlands and at golf play-over areas has been reduced from 5.5 acres to 4.0 acres. However, tree clearing and grading within the one hundred foot (100') regulated upland review area has been increased from 25.6 acres to 32.6 acres.

1.3 Alternatives Analysis

Throughout our review, the very basic issue of the analysis of prudent and feasible alternatives has been paramount. In our first review, we noted that the two alternatives presented ("no build" and "conventional subdivision") were inadequate, and that "...the total or cumulative impact of the proposed project raises the question of whether a fresh look should be given to the overall layout with an emphasis on preservation of wetland buffers, and vernal pools." The second and third application, while somewhat of an improvement, still failed to adequately address alternatives to the proposed design.

In our opinion, while the current application is much improved, it does not explore or discuss the feasibility of what would appear to us to be some basic alternatives, such as reducing the length of the golf course, or conversion of some of the proposed single family residential estate lots to clustered residential units. The latter alternative could have the potential to free up an area of sufficient size that would allow for the relocation of at least a portion of the golf course to non-regulated areas, thus retaining more natural buffers adjacent to the wetlands.

In making this observation, we note that The Preserve property contains approximately 1,000 acres of land, with a sizable portion located within uplands, beyond regulated areas. In Section 10.2 (Criteria for Decision) of the Inland Wetlands and Watercourses Regulations of the Town of Old Saybrook, the Commission must take into consideration "...feasible and prudent alternatives to, the proposed regulated activity which alternatives would cause less or no environmental impact to wetlands." The same section further states that "such activities should include, but not necessarily limited to, requiring actions of different nature which would provide similar benefits with different location for activity."

In short, while the current golf course layout is an improvement from previous applications, and has reduced the area of play-over clearing, it is still located in and around sensitive regulated wetland systems.

1.4 General Comments and Concerns

Based on a review of the design drawings, the following apparent omissions and/or errors were found in the "Summary of Regulated Activities" presented in Engineering Report Volume I entitled "Project Information and IWWC Application":

1.4.1 Roadways

- While it has been stated that there will be no dredging or filling of wetlands, Sheet GDP-20 shows a riprap plunge pool to be constructed in wetlands at the drainage discharge from Road "F."
- The summary does not show, or appear to include, work within the one hundred foot (100') regulated area that is associated with proposed off-site road improvements at the intersection of Road "B" and Bokum Road (Sheet GDP-17) and the intersection of Bokum Road and Route 154 (Sheet PLN-29).

1.4.2 Housing

- While it has been stated that no residential unit is located within a regulated area, Sheet GDP-20 shows small portions of proposed houses on Lots #31, #32, and #34 to be located within the one hundred foot (100') regulated area.
- The summary does not show, or appear to include, a small area of clearing within the one hundred foot (100') regulated area on Lot #6 that is associated with a proposed footing drain.
- The summary does not show, or appear to include, a small area of clearing within the one hundred foot (100') regulated area on Lot #25 (Sheet GDP-26) and Lot #27 (Sheet ESC-26).

1.4.3 Golf Course

- While it has been stated that there will be no dredging or filling of wetlands, the "GRA" plates entitled "Summary of Regulated Activities" included in Engineering Report Volume I shows the main irrigation lines crossing through wetlands on Holes #2, #8, #13, #14, and #16.
- While it is stated that seven temporary wetland crossings are proposed, we counted thirteen temporary crossings including eight on the front nine and five on the back nine as shown on the "Golf-Erosion Control Plans."
- The summary does not show, or appear to include, the stormwater discharge and associated clearing within the one hundred foot (100') regulated area on the west side of the golf cart wetland crossing located between the green on Hole #2 and the tees on Hole #3.
- The summary does not show, or appear to include, the stormwater discharge and associated clearing within the one hundred foot (100') regulated area located to the southwest of the green on Hole #11.

2.0 Wildlife Habitat

The Applicant has provided a detailed wildlife study that includes special surveys for both bird species and bats. These studies were both completed by outside consultants and the bird study prepared in conjunction with a previous application. The Applicant's biologist has listed the mammals observed and/or expected to utilize the site and has included descriptions of each of the mammal species. A separate and comprehensive herpetological study has also been provided.

As can be expected for a site of this size, The Preserve is rich in faunal life. A total of twenty-one species of mammals were directly observed with the potential for eleven additional species using the site. Four of the observed mammals are bat species that were netted during the bat survey. Of these, one is the Eastern red bat (*Lasiurus borealis*), a State Species of Special Concern. The breeding bird survey identified forty-nine avian species on The Preserve with an additional eight species nearby and likely to be utilizing the site. Amphibians and reptiles found on site include two State-listed species, the Eastern box turtle (*Terrapene carolina carolina*) and the Eastern ribbon snake (*Thamnophis sauritus*), both of which are State Species of Special Concern. The site boasts a "Snake Den" in which Black rat snakes (*Elaphe o. obsoleta*) and Northern black racers (*Coluber c. constrictor*) are breeding.

There can be no doubt that this species richness will be impacted by the proposed project due to the fact that development of any type has negative consequences for wildlife species. This development which includes several types of housing units, a roadway network, and a golf course will result in shifts in animal populations. There is some information regarding the avian species post-development; however, projections regarding other faunal species have not been provided. The author of the bat study recommends that, for the Eastern red bat, additional data should be collected to determine the degree to which this species uses the site in terms of roosting and foraging, and how the population may be affected by habitat modification. It is not clear that this has been done. Four of the five locations that this bat was observed appear to be directly within either the golf course development or the village complex. It therefore seems possible that the Eastern red bat population will decline or possibly disappear.

We recommend that predictions be made concerning the other State-listed species on the site and that consultations with the Connecticut Department of Environmental Protection Natural Diversity Data Base (NDDB) be held in order to develop strategies to protect all of the State-listed faunal species. It would also be helpful to have one list of all of the species observed or presumed to utilize the site in its current undeveloped state and a comparative list of species expected to be on site following development. With this information consolidated, it will be easier to analyze the impacts upon overall biodiversity.

3.0 Buffers

The importance of wetland buffers has been well documented. A natural buffer around inland wetlands will maintain water quality within inland wetlands by filtering sediments and other pollutants. The buffer may act as a sink for nutrients, particularly nitrogen, which can be taken up by plants within the buffer area. Naturally vegetated buffers will protect wetland dependent and other species of wildlife from direct and indirect disturbance. The buffer can reduce noise levels, resulting from development, which might interfere with courtship, mating, prey location, and predator detection. The buffer can also minimize parasitism and predation of avian (forest interior) broods and nests by forest edge species such as brown-headed cowbird, crow, starling, or grackle. Wide buffers may also aid in maintaining populations of interior species.

Buffers also preserve the integrity and functioning of riparian systems as corridors for the movement of wildlife. This is particularly important during times of flooding. Please note that the Connecticut Department of Environmental Protection Fisheries Bureau recommends a minimum one hundred foot (100') buffer to all watercourses. In addition, on page 51 in the *Eastern Connecticut Environmental Review Team Report* for the first application, it was stated that, "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." Likewise, the 2004 Connecticut Stormwater Quality Manual states "as a general rule one hundred feet (100') of undisturbed upland along a wetland boundary or on either side of a watercourse is recommended as a minimum buffer width depending on the slope and sensitivity of the wetland or watercourses."

We recognize that strict adherence to a one hundred foot (100') buffer would essentially eliminate much of the golf course. As such, if it is the Town's desire to maintain the golf course as an element of this plan and to permit construction, we would recommend a **minimum twenty-five foot (25') buffer** with a larger buffer preferable, particularly adjacent to large contiguous wetland systems and vernal pools, in order to preserve the functions and values of the wetlands. Most wetland biologists recognize that buffers to wetlands play a critical role in protecting the quality and quantity of surface waters and providing habitat for aquatic and/or wetland dependent terrestrial species of wildlife. Ideally, buffer widths should be determined on a case-by-case basis depending upon the protection goals. Because it is not always practical to determine buffer widths for each individual situation, a generally recognized buffer width of one hundred foot (100') is supported in the literature as providing necessary wetland protection for most situations. We wish to make it clear that our recommendation for a minimum twenty-five foot (25') buffer is viewed by our Peer Review Team as an absolute minimum, "better than nothing" criterion and neither supported by the scientific community nor what we would recommend under most circumstances. As indicated above, a wider upland review area would only be achievable with the elimination of the proposed championship 18-hole golf course.

The golf course design includes 32.6 acres of tree clearing, regrading, fairway and green construction, and cart path construction within the one hundred foot (100') regulated upland review area. The magnitude of this disturbance will alter wetland ecology.

4.0 Vernal Pools

As noted in the Herpetological Survey and Vernal Pool Analysis with Conservation Planning Recommendation and Strategies, the majority of the thirty eight vernal pools identified on the property are ranked "Tier I" pools based upon the methodology provided in *Best Development Practices, Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeast United States* (2002) by Calhoun and Klemens. As noted in Calhoun and Klemens (2002), Tier I pools are exemplary pools and the Management Recommendations detailed in the Best Development Practices manual should be applied for the Vernal Pool Depression, Envelope, and Critical Terrestrial Habitat.

The Applicant's consultant has taken an approach which "conserves" eighteen of the thirty-eight pools, slightly less than half, in order to promote long term vernal pool conservation, and, as claimed in his report, the conservation of seventy-six percent (76%) of the biological productivity of the vernal pools on the site. This claim is not substantiated by an impact assessment related to the proposed development. The conserved pools exhibited high spotted salamander egg mass counts; however, many of the nonconserved pools contained high egg mass counts and in another context (i.e. traditional development proposal) would be afforded maximum protection due to the fact that they are Tier I pools.

As specified by Calhoun and Klemens (2002): "The Critical Terrestrial Habitat extends 650 feet beyond the upland edge of the vernal pool envelope (i.e. 750 feet beyond the edge of the pool). This area provides habitat for amphibians during the non-breeding season for foraging, dispersing, and hibernating. During the breeding season, adults migrate to pools through this zone."

The same document spells out the desired management for this area as follows (with emphasis added):

- "Maintain or restore a minimum of 75% of the zone in **contiguous (i.e., unfragmented) forest** with undisturbed ground cover.
- Maintain or restore forested corridors connecting wetlands or vernal pools.
- Provide suitable terrestrial habitat for pool-breeding amphibian populations by maintaining or encouraging at least a partially closed-canopy stand that will provide shade, deep litter, and woody debris.
- Minimize disturbance to the forest floor.
- Where possible, maintain native understory vegetation (e.g. shrubs and herbs)."

The document further states that "roads (and associated development) within this zone limit the amount of terrestrial habitat available to amphibian populations, fragment and isolate remaining pieces of habitat, facilitate further development, and directly result in mortality of individuals."

Most of the conserved pools are in and near the golf course. Even though approximately seventy-five percent (75%) of these pools Critical Terrestrial Habitat will not be developed, the remaining undeveloped area is in most cases fragmented by golf course fairways. For example, Vernal Pool #7 has a roadway to the east and a golf hole to the west. We believe that fragmentation of Critical Terrestrial Habitat by golf course fairways and roadways will negatively impact the population of pool-breeding amphibians and the ecological integrity of the site's natural resources. The migration of metamorphs (juvenile salamanders) across fairways will be impeded with the additional potential for increased predation and desiccation. We ask the Applicant to provide documentation attesting to the fact that amphibians, specifically juveniles will **not be impeded** by golf course fairways and that mortality will **not be increased.**

A recent peer-reviewed study by Betsie B. Rothermel (Ecological Applications 14(5):1535-1546) referenced in the REMA review dated January 7, 2005, demonstrated that migrating juvenile spotted salamanders are impeded by open pasture. The study found that an average of only nine percent (9%) of juveniles survived traveling across 165 feet of pasture to a forested edge. This is most likely due to the pasture's physical characteristic, which is drier and offers less protection from desiccation than forested habitat. It is important to note that fairways shown on sheets MP-1 through MP-4, that are within the vernal pool Critical Terrestrial Habitat, are commonly two hundred to three hundred feet (200' to 300') across. We expect that these mowed fairways will have less cover than a pasture, and will therefore impact the success of migrating juvenile amphibians. In addition, in the study juveniles migrating across pastures were not able to selectively orient themselves towards the nearest forest edge. This suggests that once on a fairway, some of the juveniles will not find the shortest path (or perhaps any path) across the fairway.

Spotted salamander larvae have been observed to remain in vernal pools well into August and sometimes later. Therefore maintaining vernal pool hydrology throughout the summer months is critical to their survival. A pumping test was conducted by the Applicant of the proposed golf course irrigation wells with two of the three proposed wells located in the vicinity of Wetland #19. The test showed impacts to the hydrology of several "conserved" vernal pools. These pools are all highly productive containing between 211 to 462 egg masses in 2005. The Applicant's herpetologist considers these pools to be "conserved." However, if water levels are drawn down and larval amphibians fail to develop as a result, we question whether or not they will be truly conserved. Since this pumping test was impacted by an early significant rainfall event, there is the potential that larger impacts to the vernal pools surface and ground water hydrology would occur.

The Applicant's consultant has conducted thorough studies of the vernal pools on site and has collected at least two years of data on the pools. However, no analysis of potential impacts upon either the conserved or the nonconserved pools has been provided. For example, in respect to a nonconserved pool such as Vernal Pool #25, with 159 spotted salamander egg masses, will amphibian use of the pool cease entirely, dwindle over time, or continue with reduced numbers. **We believe the Commission should be provided with an impact evaluation for all vernal pools on site in order to be able to**

thoroughly assess the consequences of the proposed development and to arrive at an informed decision regarding this project.

4.1 Vernal Pool Guidelines

It is recommended that the following general guidelines be implemented by the Applicant for the protection of vernal pools:

- Hydrology is a key element in the functioning of a vernal pool. It is imperative that the hydrology, both ground water and surface water, not be altered. It is therefore critical that **no point source stormwater discharges be directed into or towards a vernal pool.**

- The pumping test for golf course water supply wells showed hydrologic impacts to Vernal Pools #7, #9, and #12. Even a small drawdown within a vernal pool can have a major impact upon the survival rates of amphibian larvae. **We strongly recommend that no drawdown of surface water occur within vernal pools.**

- **No contaminants from either the road system or the golf course should be directed toward vernal pools.** In particular, fine sediments entering a vernal pool during the breeding season can coat egg masses of salamanders and wood frogs and can harm vertebrate and invertebrate species.

- **We recommend a minimum one hundred foot (100') buffer surrounding all vernal pools.** However, it is our understanding that the roadway system may be difficult to realign due to other roadway design considerations. As such, it is recognized that maintenance of the one hundred foot (100') buffer in these specific circumstances may not be reasonably attainable. In addition, Vernal Pool #27 is so compromised by surrounding development that it is the peer review team's opinion that this will cease to function as a vernal pool and therefore maintaining the one hundred foot (100') buffer at this location will serve no useful purpose.