The Ethel Walker School Residential Subdivision

Simsbury, Connecticut

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation and Development Area, Inc.

The Ethel Walker School Residential Subdivision
Simsbury, Connecticut

Environmental Review Team Report

Prepared by the
Eastern Connecticut
Environmental Review Team

Of the

Eastern Connecticut Resource Conservation and Development Area, Inc.

For the

Conservation and Inland Wetlands Commission
Simsbury, Connecticut

August 2006

Report #598

Acknowledgments

This report is an outgrowth of a request from the Simsbury Conservation and Inland Wetlands Commission to the North Central Conservation District (NCCD) and the Eastern Connecticut Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The Eastern Connecticut Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Wednesday, March 29, 2006.

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I would also like to thank Howard Beach, Simsbury conservation officer, John Netherton, Landquest, consultant for the Ethel Walker School, and Tom Daly and Ted Crawford, Milone and MacBroom, project engineers, for their cooperation and assistance during this environmental review. Nisha Patel from the DEP stormwater section also accompanied the field walk.

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 plans and other reports and maps available. Some Team members made separate or follow-up visits to the site. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

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

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in reviewing the proposed residential subdivision.

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Introduction

Introduction

The Simsbury Conservation and Inland Wetlands Commission has requested Environmental Review Team (ERT) assistance in reviewing a proposed residential subdivision.

The project site is located on Bushy Hill Road (CT Route 167) and is approximately 453 acres in size. The parcel, located on the west side of the road, is proposed for a residential subdivision consisting of 103 building lots, a new road network with several cul-de-sacs and dedicated open space. The average lot size is 60,000 square feet. The homes will be served by individual on-site sewage disposal systems and an extension of the existing water service located on Town Forest Road.

The site is zoned R-40 Residential and has road frontage along Bushy Hill Road and Town Forest Road. Of the 453 acres, 160 will be utilized for the subdivision, 218 acres will be dedicated open space and 75 acres will continue to serve the Equestrian Center. The property is bordered by residential property to the north and south, undeveloped land to the west, Bushy Hill Road, the Ethel Walker School and residential properties to the east.

Elevations on the site range from 240 feet to 440 feet above sea level. The site is a diverse combination of dense woodlands, open meadows, wetlands, vernal pools, and swamp/floodplain with a corresponding diversity of habitat and resulting wildlife. The parcel represents a major wildlife corridor, connecting the traprock ridge on the western side of town with the Farmington River Floodplain system. It is also the primary recharge zone for the Stratton Brook Aquifer which provides roughly 60% of the source water for the Aquarion Water Company's system in town. The wetland/stream system is a trout stream. There are miles of groomed trails throughout the project site that are used as part of the Ethel Walker School's equestrian program. The school has made these trails available for public use.

Objectives of the ERT Study

The town staffs, the Simsbury Conservation and Inland Wetlands Commission, local residents and environmental groups have all expressed concerns with the proposed project. The town has requested this review for the following reasons:

- The site represents the largest contiguous parcel of undeveloped land in town;
- It has many valuable and environmentally sensitive features;
- It contains significant wetland complexes with vernal pools;
- It is a major east-west wildlife corridor; and
- It is the primary aquifer recharge for the Stratton Brook Aquifer.

Other areas of concern include: soils limitations, erosion and sediment controls, significant amount of cuts and fills, post-development hydrologic changes, aquatic habitats, wetland/vernal pool protection, maintaining biodiversity, traffic and access concerns, and the loss of recreational trails.

The ERT Process

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

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.

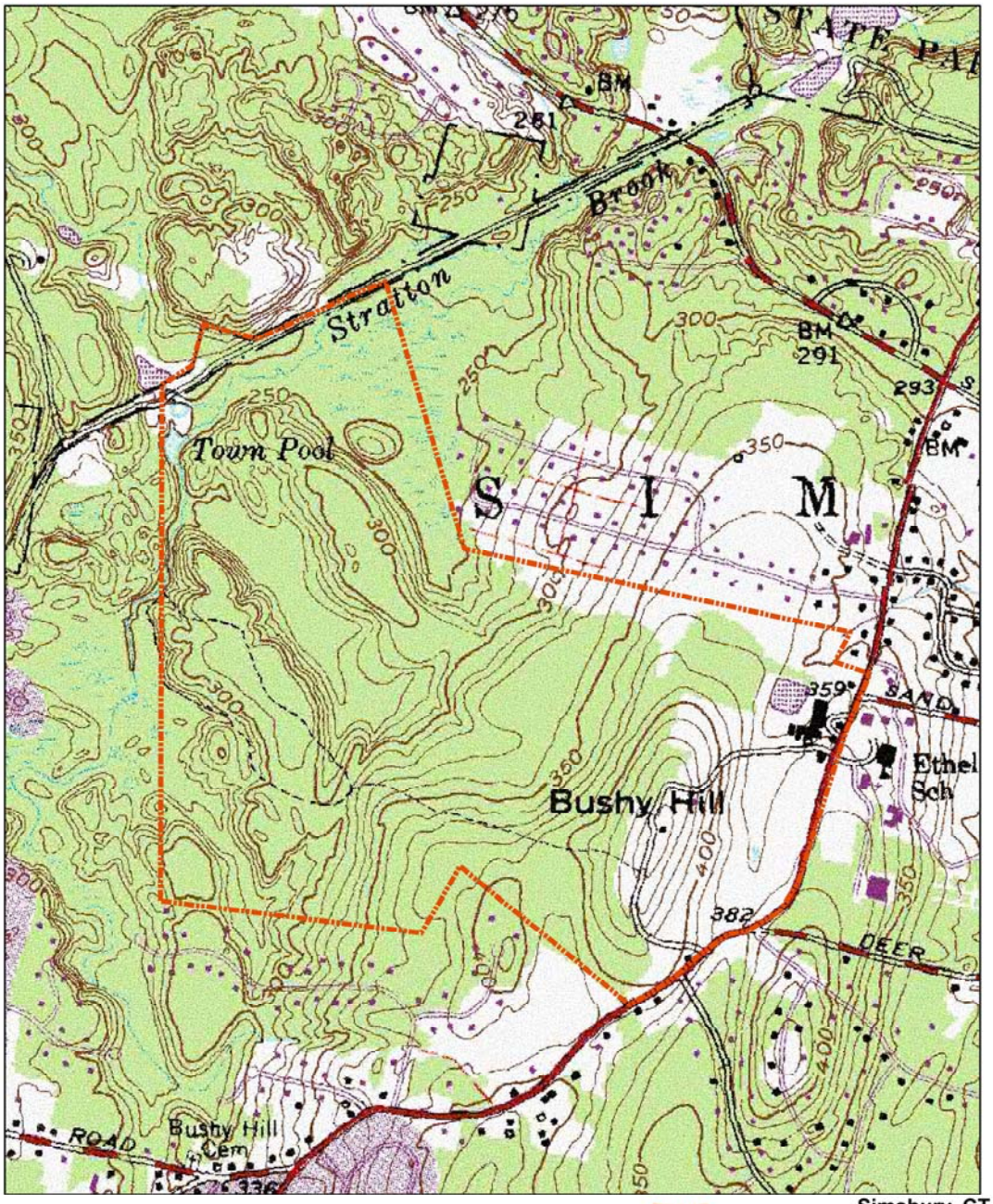
The review process consisted of four phases:

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 Wednesday, March 29, 2006. 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.

Ethel Walker School Location Map



The Connecticut Environmental Review Team

This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team. This map is for educational use only. It contains no authoritative data. July 2006.

Ethel Walker Aerial Map

The Connecticut Environmental Review Team

This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
July 2006.

Approx. Site Location

0 0.05 0.1 0.2 0.3 Miles

Simsbury, CT

N

Lot Layout
Proposed Subdivision
277 Bushy Hill Road (Route 167)
Simsbury, Connecticut
February 3, 2006

Not to Scale

Topography and Geology

Topography

The parcel of land that Ethel Walker School proposes to subdivide has two distinct topographic areas *(Figure 1)*: the first on the east, is a rounded roughly north/south-oriented hill, called Bushy Hill, and the second on the west, are two flat-topped hills oriented roughly northwest/southeast. The two regions are connected by a northwesterly-oriented slope.

Bushy Hill is oval-shaped in plan view with its long axis oriented actually about 10^{o} east of north. It stands with a relief of about 70 feet above the Ethel Walker campus. Its elevation is slightly greater than 440 feet above sea level. It has a rounded crest *(see Figure 2)* and smooth rather gentle slopes extending in all directions. This is the typical shape of a glacial drumlin. Several drumlin-shaped hills are found in this area *(Figure 1)*: one is immediately southeast of Bushy Hill.

The land slopes off to the west and northwest of Bushy Hill to a region of hummocky topography characterized by hills with relatively flat-tops having elevations between 300-320 feet. The flat topped areas are the prime sites for house-lots in the planned subdivision. Two large hills and one smaller one to the south are separated by low swales that may contain wetlands. The hummocky hills have a maximum relief of about 60 feet. The slopes into the adjoining swales are steep-sided, some standing near the angle of repose for loose sand and gravel, of which the hills in the region of hummocky topography are composed.

Stratton Brook heads in the low lands surrounding the proposed subdivision. The southern drainage basin (watershed) boundaries enclose all the proposed development area *(see Figure 1)*. Because most of that area is underlain by porous sand and gravel, most of the run-off will not flow directly into Stratton brook but rather will infiltrate and become part of the groundwater that recharges the brook. Indeed, a number of infiltration basins have been designed by the planning engineers to catch run-off from the paved areas and prevent erosion by stormwater run-off.

Geology

Bedrock is nowhere exposed on the parcel. It was not encountered in any of the test pits (6-10' deep). The area is covered by unconsolidated material deposited by glacial ice or glacial melt-water streams. The bedrock surface may be 50 or more feet below the ground surface. The closest bedrock exposed in this area (in the bed of Minister Creek) is composed of pink colored fine- to medium-grained arkosic sandstone and reddish-brown siltstone referred to as the New Haven Arkose (Schnabel, 1960, Rodgers, 1985), of Triassic age (220 million years ago). Basalt is exposed in prominent hills several miles distant in both east and west directions. The eroded edge of the eastward dipping (tilted) Jurassic-aged (160-200 million years) basalt-lava flows form the cliffs of Avon and Talcott Mountains to the west and diabase (a coarse-grained basalt) dikes and sills (originally underground pools of molten basalt that fed the then overlying and since eroded lava flows) form the Onion Mountain and The Sugarloaf to the west and northwest.

The topography of the parcel and locally adjacent land is a direct reflection of the surficial geology of the area. Bushy Hill is a smooth, stream-lined hill composed of glacial till. Stone et al. (2005) map the area as "thick till" (50 feet or more thickness). The land adjacent to Stratton Brook has a hummocky topography and is composed of sand and gravel.

Smooth streamlined hills composed of glacial till are referred to as drumlins. Bushy Hill was mapped as a drumlin by Schnabel (1962) and Stone et al. (2005) and is shown as such on *Figure 1.* Drumlins are formed by deposition beneath active (flowing) glacial ice that also sculpts the deposit into the streamlined shape. Glacial till is non-sorted debris carried by the glacier and, in this case, deposited directly beneath the glacial ice. (Some till is deposited when the ice melts and debris frozen in the ice is left strewn over the land surface similar to how road sand is left by the side of the road after plowing and later melting of snow.) The till is made-up of debris of all sizes ranging from silt and clay sized mud to cobbles and boulders. Numerous boulders may be seen at the ground surface in the woods surrounding the fields on top of Bushy Hill *(Figure 4)*. The clay and silt matrix of till makes it more poorly drained especially when compared to the sand and gravel hills near Stratton Brook.

The western half of the parcel is part of a larger region of hummocky topography that is underlain by sand and gravel (Schnabel, 1962). Numerous irregular shaped hills have a common maximum elevation around 320 feet above sea level. Further to the north the elevation of the flat-topped hills increases slightly. Intervening swales are irregular shaped and some form closed topographic

depressions (kettles). The deposit is like a gently south-sloping terrace interrupted by irregular-shaped swales.

Field inspection (and engineering descriptions) of backfilled test pits in the hummocky-topography section indicate that the hills are composed fine- to medium-grained sand *(see Figure 5)* and pebbly sand. The pebbles are all rounded, characteristic of stream-deposited sediment. Coarse cobble gravels were not observed (this limits the value of the deposit as a construction material). Coarse cobble gravel was observed by Schnabel north of the parcel. The grain-size of the deposits decreases from north to south (Schnabel, 1962). Stratification was not observed on the field inspection, but Schnabel indicates that the sand was deposited by rivers and streams (an interpretation aided by studying stratification in pits that he observed on or near the parcel). The progressive decrease in grain-size and slope of the terrace suggest deposition by south flowing streams fed by glacial melt-water. Schnabel also noted that collapse features (faults and disturbed bedding) are present, particularly in the northern portions of the area he studied.

As the last Ice Age came to an end, climate warmed and the glaciers started melting. Because it is generally warmer to the south the ice disappeared there at an earlier date, ~20,000 years ago for ice that was in Long Island Sound (data of Stone, B.D., cited in McHone, 2004, p.46) compared to the Simsbury area (~16,000+ years ago). Ice melt was not uniform, being controlled by many factors, such as slope and sun angle, original ice thickness, impurities (sediment) in the ice, and fractures. Thus, remnant chunks of ice were left behind, especially in the valleys. Melt-water streams washed sand around and over the remnant ice blocks, forming a relatively smooth flood plain terrace. The smooth plain became pock-marked and hummocky when the remnant blocks later melted, allowing the sand to collapse into the space thus created.

Discussion

Soils develop extremely slowly on sandy deposits. Engineering data indicate that soil thickness on the sand deposits is less than half as thick as that that developed on glacial till. In some places top soil on the sand is less than 4" thick. In addition, the sandy soils generally are lacking in fine clayey material, especially in the subsoils. Will this affect septic tank effluent by limiting the opportunity for cation exchange?

The permeability of the fine-grained sand (as indicated by perk-tests) is good but not extreme. Organic matter from septic tank effluent and stormwater run-off should be adequately oxidized and filtered by seeping through the sandy material before recharging the local ground-water.

As the area becomes increasingly more developed consideration should be given to ground-water quality. Approximately 30% of groundwater recharge on an acre of residential developed land will have passed through a septic system. Even if the systems work as designed renovation does not include removal of anions and ionic radicals such as nitrates and phosphates. Fertilizer application for lush green lawns, so desirable in suburban settings, is likely to be slightly heavier on the sandy soils than on thicker more loamy soils. The high permeability of the soils will lead to even more nitrates and phosphates getting into local groundwater as well as possible pesticide residue.

References

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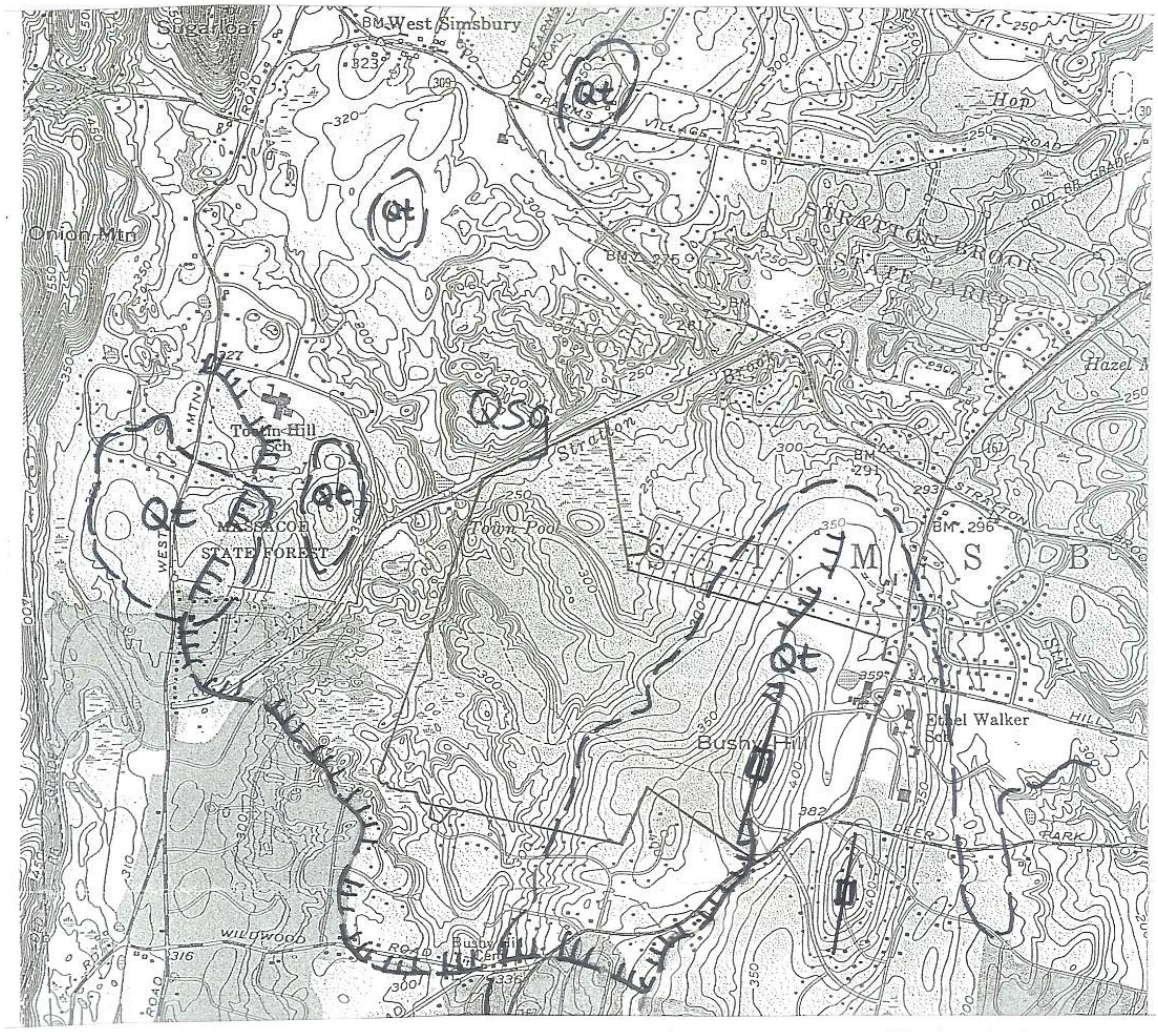

Qsg Stratified sand and gravel deposited by melt-water streams during deglaciation.

Qt Glacial till: non-sorted clay, silt, sand, pebbles and boulders deposited beneath glacial ice and as residue when glaciers melted.

Boundary between till and sand and gravel

Southern part (head waters) of Stratton Brook drainage basin (watershed). Hatchers point into watershed.

Drumlin axis, which is presumed parallel to direction of glacial flow.

Figure 1. Surficial geologic map of Ethel Walker proposed subdivision and surrounding area Scale: 1"=2000'. North direction toward top of page.

Figure 2. Crest of Bushy Hill, looking east from the west slope. Note smooth contour of the land. This is typical of a glacial drumlin.

Figure 3. Relatively steep slopes at the sides of sand hills in hummocky topographic region. Some of the slopes are steeper (approaching 30-35^{o} inclines) than that shown in this photograph. This is characteristic of sand and gravel deposited against or on top of residual ice by glacial melt-water streams. Notice a lack of cobbles and boulders on the surface. Contrast this to Figure 4.

Figure 4. West slope of Bushy Hill in the woods below the cleared fields. Note boulder strewn surface. Although some of the boulders seen in this view may have been dug up during the construction of the road on which the ERT Team members are walking during the field review, cobble and boulder covered slopes are typical of this area. Notice also that the flanks of the drumlin are smooth. Rock composition of the drumlin till is dominated by crystalline metamorphic rocks typical of the upland geology north west of Simsbury.

Figure 5. Fine-grained sand from a shallow test-pit cut into the northern-most of the two flat-topped hills on the parcel. Other test locations exposed more pebbly sand than illustrated here. On some locations, small rounded cobbles were exposed.
(Photograph by Elaine Sych)

A Watershed Perspective

Opening Remarks

These recommendations to the Town of Simsbury are given from the perspective of improving water quality and maintaining and supporting designated uses of the waters of the State in accordance with Connecticut's Water Quality Standards[1]. These recommendations also reflect the Department of Environmental Protection's (DEP) growing commitment to address water quality concerns from a watershed perspective, taking into account the cumulative impact of numerous activities within a given watershed that may affect water quality.

Watersheds are natural drainage divides that vary in size from drainage for backyard ponds to headwaters and tributaries of lakes and rivers. It is an easily identifiable landscape unit that ties together terrestrial, aquatic, geologic, and atmospheric processes. Land use planning at the watershed scale is an effective way to guide future development so as to minimize impact on both water quality and natural resources; direct available technical and financial resources to restoration and enhancement needs; facilitate partnerships to promote land and water resource stewardship; and develop actions to measure progress. Management decisions involving river resources must be made comprehensively and from an overall basin perspective. Integrated water use, water quality, land use data, and the instream biotic resource and habitat needs must be considered in river management decisions.[2]

As an additional consideration, choosing innovative approaches which minimize land disturbance and preserve natural buffers and open space (like cluster housing) not only minimize nonpoint source pollution and protect the environment, but also reduce infrastructure costs while affording neighborhoods opportunities to stay connected with their environment. In this new age of "Smart Growth", greenways, environmental equity, and better land use planning, it is incumbent upon all towns to consider and address all of the impacts associated with new development.

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[1] State of Connecticut, Department of Environmental Protection. Effective 1996 & 2002. Water Quality Standards. Bureau of Water Management – Planning and Standards Division. Hartford, CT.

[2] State of Connecticut, Office of Policy and Management. 2005. Conservation and Development Policies Plan for Connecticut 2005-2010. Intergovernmental Policy Division. Hartford, CT.

Proposed Project

The proposed 103-lot residential subdivision is approximately 453 acres in size and is located on Bushy Hill Road (a.k.a. Route 167) in Simsbury. The site is zoned R-40 Residential and homes will be served by individual on-site subsurface sewage disposal systems and an extension of the existing water service located in Town Forest Road. 218 acres will be dedicated as open space. The property is bordered by the Ethel Walker School and residential property to the east, residential property to the north and south, and undeveloped land to the west, more precisely - Stratton Brook State Park. It lies within the Level B (Preliminary) Aquifer Protection Area for the Stratton Brook wellfield operated by Aquarion Water Co., and is bounded to the northwest by Stratton Brook, tributary to the Hop River, and associated wetlands. On the east side is the Ethel Walker School campus and equestrian center, of which 75 acres of the proposed development will remain available for equestrian use.

Meeting Background

On March 29th, the ERT assembled at the Simsbury Town Hall to review the project proposal with the applicant's representatives from Milone & MacBroom Inc. (MMI) This reviewer later toured the project site on May 10th, guided by MMI staff. The town, whose concerns prompted the request for the ERT, recognizes the site's importance for providing valuable wildlife habitat and as a primary aquifer recharge for the Stratton Brook Aquifer. Other issues include: soils limitations, erosion and sedimentation controls, cuts and fills, changes to site hydrology, impacts on wetlands and vernal pools, maintaining biodiversity, and loss of recreational trails. Based on the initial discussions at the town hall prior to the site walk, the proposed subdivision design appears to have addressed many of these concerns.

Brief Site Description

The site is located within the Hop Brook Subregional Drainage Basin (no. 4318), which lies within the Farmington Regional Basin of the Connecticut River Major Basin. The parcel constitutes approximately 18% of the Stratton Brook watershed, and is mostly sandy loam or silt loam soils underlain by sand or sand and gravel. A ridgeline runs north to south in the eastern half of the parcel with a large vernal pool in the north end; a second, a smaller vernal pool lies roughly in the center of the parcel, and a third vernal pool of notable size lies in the northern end of the western half. Several small vernal pools were identified along the southeastern edge of the parcel. The majority of the site is deciduous forest with clusters of conifers, especially where the terrain becomes sandier and slopes increase. The site is developed on three sides and is the town's largest

contiguous parcel of undeveloped land, supporting numerous trails for hiking and equestrian use. Stratton Brook is a coldwater stream with a sandy riffle-pool complex capable of supporting trout. To its south is a large marsh complex. Stratton Brook State Park to the west has been identified as a "Trout Park"; this is an area designated by DEP as an easily accessible area to enhance trout fishing opportunities for young anglers and novice anglers, as well as for those with mobility challenges. Stratton Brook is frequently stocked generally between Opening Day and Memorial Day to increase an angler's chances of catching fish, making it a more attractive "fishing hole" particularly to children and families.

Water Quality Classification

The surface water classification for Stratton Brook and all wetlands on-site is Class A. The Class A designated uses are: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture. The ground water classification for the area is Class GA. Designated uses for Class GA are: existing private and potential public or private supplies of water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies. As mentioned earlier, this site is within the recharge area for the public water supply owned and operated by the Aquarion Water Co.

As a consequence of the surface and ground waters being designated as high quality, any proposed development merits further consideration of available, practical measures which can be taken to ensure the protection of these resources from development-related impacts and nonpoint source pollution - a growing nationwide concern.

Project Impact Summary

The applicant has made an impressive effort to design the Ethel Walker School proposed subdivision to minimize environmental impacts from stormwater and construction activities. A 100' buffer exists for nearly all surface water resources. Culverted road crossings have been designed with open bottoms to minimize impacts, and several building lots have been shifted or eliminated to avoid impacts or encroachment to wetlands and watercourses (less than $1/10^{th}$ acre total wetlands/watercourses impacts). Dry wells or rain gardens are proposed to decrease stormwater runoff, while detention basins have been designed to catch the first flush, accompanied with a planting plan to help treat stormwater quality. Numerous smaller stormwater basins will be located throughout the site. And phased construction over the next several years will minimize erosion and sedimentation concerns. That being said, the site currently provides significant benefits as wildlife habitat and opportunities for passive recreation.

As an alternative subdivision design layout, consideration of a "cluster" subdivision should be first and foremost. If not practical, those lots which could pose a threat from destabilization as a result of steep slopes, sandy soils and subsurface drainage (i.e. septic systems), should be eliminated or combined - see lots 21, 47, 48, 49, 53, 54, 59, 78, 86, and 87 for further review. Although the developer has decreased the length of pavement by using cul-de-sacs and unpaved emergency access, stormwater runoff could further be reduced by constructing narrower streets and not paving the centers of cul-de-sacs, as well as avoiding curbing. For additional stormwater management techniques and construction best management practices, see below.

Stormwater Management

Runoff from construction and post-construction activities has the potential to pollute wetlands and watercourses downstream of stormwater discharge locations. During the period of construction, the discharge of sediment, particularly during significant storm events, could occur even when non-structural and structural erosion and sediment controls are installed. Post-construction, the increase in the quantity and peak flow of stormwater runoff could contribute to downstream flooding and erosion problems, as well as transport pollutants such as suspended solids (e.g. road sand, grit, particles from vehicular wear such as tires and brake linings, and organic matter); oil, grease and leaking automotive fluids; nutrients and pesticides from applications of lawn care maintenance products.

As impervious area increases, new sources of stormwater pollutants are introduced, accumulating pollutants between storm events. When it rains or snowmelt rolls over the ground surface, it picks up these pollutants and contaminants (including heat from the pavement, known as "thermal" loading), and is subsequently collected by a stormwater conveyance system (e.g. catch basins and storm sewers) and quickly discharged to receiving waters, causing environmental pollution and adverse impacts to fish and wildlife and their habitats. Impervious areas, such as roadways, rooftops, paved driveways, and sidewalks, also decrease the amount of precipitation that percolates through the ground to recharge aquifers which would otherwise be slowly released as base flow to streams during seasonally low-flow periods. In undeveloped areas, natural processes such as infiltration, interception, depressional storage, filtration by vegetation, and evaporation, reduce the quantity of stormwater runoff and act to remove pollutants. The increased volume and velocity of stormwater runoff often exceeds the physical ability of the receiving waterbody to handle such flows, thereby causing flooding, erosion and sedimentation, and physically altering the aquatic habitat.

Discharging stormwater runoff to the river can have a deleterious effect on the riverine system well beyond the point of discharge. These effects include:

- Increased runoff volume (as a result of less infiltration) and velocity
    - increased bank erosion and sedimentation of the river or stream channel
- Increased peak discharges (relating to the timing and magnitude of the runoff occurring from a specific storm event)
- Reduced groundwater recharge
    - reduced stream baseflow
- Increased frequency of bankfull and overbank floods
    - channel scour, widening, and downcutting of the receiving stream
    - streambank erosion and increased sediment loads
    - loss of pool/riffle structure within streams (important habitat areas)
- Destruction of wetlands, riparian buffers and springs, and burying of stream substrate
    - settling of suspended sediments carried or eroded by stormwater discharges which can destroy benthic habitat, thereby impacting the food chain for fish and wildlife
- Reduction in the diversity, richness, and abundance of the stream community (aquatic insects, fish, amphibians)
    - discharge of excess nutrients from lawn fertilizers, detergents, grass clippings, leaves, pet wastes, and atmospheric deposition of air-borne pollutants which can cause excessive algal growth, depleting oxygen from the water and stressing or suffocating aquatic life
    - discharge of other contaminants such as automobile oils and fluids, vehicle and tire wear, pesticides, and atmospheric deposition of air-borne pollutants which can adversely affect the aquatic ecosystem
    - impacts to the aquatic biota due to stress caused by the increased temperature of stormwater runoff
- Exacerbation of the general cumulative effect of stormwater discharges basin-wide which can alter stream morphology and dynamics, leading to increased flooding, erosion, and degraded riverine systems.

From this perspective, treating and reducing runoff from all developed sites and reducing the amount of impervious surfaces, where feasible, will help to minimize surface water pollution and flooding problems caused by storm events.

Stormwater Infiltration

Percolated through the ground, stormwater is filtered by the soil, stored, and gradually released to the river via the hydraulic connection through the riverbed. This slow rate of release benefits the riverine system by moderating fluctuations in the water surface elevation of the river as well as stream temperatures. Where the reduction in impervious surface area is not possible, innovative techniques may be used to minimize runoff. For example, cul-de-sacs can be designed to incorporate landscaped areas in between to help maintain natural recharge. It is not necessary to have a fully paved 50-foot radius cul-de-sac. Reducing the radius of a typical cul-de-sac turnaround from 40 to 30 feet can reduce impervious coverage by nearly 50 percent (Schueler, 1995). A 30-foot radius will accommodate most vehicles. Emergency vehicles and snow removal equipment turning radii have been adequately addressed in other communities with modified cul-de-sacs designed with depressed and pervious (unpaved) centers. A demonstration of this alternative design can be viewed at the Glen Brook Green Subdivision located in the Jordan Brook subwatershed in Waterford, CT. The center of the cul-de-sac can then serve as an effective bioretention treatment or "island" for stormwater runoff before percolating into the ground. Bioretention is a practice to manage and treat stormwater runoff by using a specially designed planting soil bed and planting materials to filter runoff stored in a shallow depression (Prince George's County, Maryland, 1999). Bioretention areas are composed of a mix of functional elements, each designed to perform different functions in the removal of pollutants and attenuation of stormwater runoff. Bioretention removes stormwater pollutants through physical and biological processes, including adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation, and volatilization (U.S. EPA, 2000). These areas can be landscaped with low maintenance perennials or shrubs appropriate for the soil and moisture conditions. If a cul-de-sac island is used, the cul-de-sac radius should allow for a minimum 20-foot wide road. To make turning easier, the pavement at the rear center of the island may be wider (Metropolitan Council, 2001).

Roadway widths may also be minimized to reduce imperviousness. Driveway standards and paving materials that are supportive of minimizing runoff and maximizing on-site infiltration should be considered. Additionally, in lieu of road curbing which is designed to collect and direct stormwater runoff, road sands and pollutants to the storm drainage collection system, it would be less expensive and more prudent to use sheet flow and vegetated drainage swales to promote groundwater infiltration; thereby replenishing groundwater supplies and reducing road maintenance, such as seasonal street sweeping, catch basin cleaning, and maintenance of the infiltration basin. Porous asphalt or concrete, also known as porous pavement, is similar to conventional asphalt but

formulated to have more void space for greater water passage through the material. Traditionally, porous pavement has had limited application in cold climates such as Connecticut due to the potential for clogging as a result of sand application, although porous pavement has been successfully used for some parking lot applications in New England where the underlying soils are sufficiently permeable. For additional information, view UCONN - Cooperative Extension System's NEMO (Nonpoint Education for Municipal Officials) website at: http://nemo.uconn.edu.

Similarly, smaller bioretention areas or "rain gardens" can be used as a functional landscape element that can be incorporated into residential yards, street median strips, roadway shoulder rights-of-way, and under roof downspouts; combining shrubs, grasses, and flowering perennials in depressions that allow water to pool for only a few days after a rain (Metropolitan Council, 2001). The soil absorbs and stores the rainwater and nourishes the garden vegetation. Rain gardens are an effective, low cost method for reducing runoff volume, recharging groundwater, and removing pollutants. These bioretention facilities are most effective if they receive runoff as close as possible to the source and are incorporated throughout the site (Pennsylvania Association of Conservation Districts et al., 1998). A demonstration of these bioretention practices can be viewed at the Glen Brook Green Subdivision, located in the Jordan Brook subwatershed in Waterford, CT.

Note that infiltration may not always be practical or feasible. For example, infiltration practices should not be placed over fill materials and should be located at least 75 feet away from wells, septic systems, surface water bodies, and building foundations (at least 100 feet up gradient and at least 25 feet down gradient from building foundations), although stormwater runoff from rooftops may be directed to the ground, provided that the discharge is located away from the septic system (consult a professional civil engineer, the USDA Natural Resources Conservation Service, or the North Central Conservation District). Dry wells may also be used to receive rooftop runoff. These are small, excavated pits or trenches filled with aggregate that receive clean stormwater runoff primarily from rooftops, functioning as infiltration systems to reduce the quantity of runoff. Dry wells treat stormwater runoff through soil infiltration, adsorption, trapping, filtering, and bacterial degradation (Prince George's County, Maryland, 1999). The use of dry wells is applicable for small drainage areas with low sediment or pollutant loadings, and where soils are sufficiently permeable to allow reasonable rates of infiltration and the groundwater table is low enough to allow infiltration.

Stormwater Treatment

Stormwater treatment practices remove pollutants from stormwater through various physical, chemical, and biological mechanisms. Since many pollutants in stormwater runoff are attached to solid particles, treatment practices designed to remove suspended solids from runoff will remove other pollutants as well. Exceptions to this rule include nutrients, which are often in a dissolved form, soluble metals and organics, and extremely fine particulates that can only be removed by treatment practices other than traditional separation methods. By promoting infiltration, the volume is reduced and impacts to water quality and quantity are minimized. Thus, stormwater must be addressed with appropriate Best Management Practices.

In order to minimize the pollution potential from stormwater, the following is a list of recommended management measures:

- Establish setback or buffer areas (50 feet, minimally, to 100 feet, preferably) within upland areas that are adjacent to wetlands or watercourses.
- Promote sheet flow over land to the maximum extent possible by: eliminating curbs, utilizing pervious pavement, installing and maximizing the use of vegetative swales, employing level spreaders, increasing and lengthening drainage flow paths, and lengthening and flattening slopes, bearing in mind the goal of minimizing land grading and disturbance.
- Infiltrate stormwater discharges to the maximum extent possible to promote groundwater recharge and lessen the quantity of runoff needing treatment.
- Install structural stormwater management measures to treat stormwater runoff during construction. Such measures include, but are not limited to, earthen dikes/ diversions, sediment traps, check dams, level spreaders, gabions, temporary or permanent sediment basins and structures.
- Prepare a stormwater management plan, which considers both quantity and quality of runoff for the entire development site, rather than piecemeal during development of each lot.

If proposed, the use of a pre-fabricated stormwater treatment unit (such as Vortechnics, Downstream Defender, Stormceptor, Stormtreat, or similar) can typically remove grit, contaminated sediments, metals, hydrocarbons and other floatable materials from surface waters. However, for the price of a designed, constructed and properly installed stormwater treatment unit (which are effective with sediment and some nutrient/metals pollutant removal from

stormwater), the applicant/town may be able to install a properly installed detention basin that addresses clean water issues and peak flow retention, reducing the impacts on the stream corridor.

Although stormwater basins are designed to control stormwater runoff and reduce peak flows, they offer limited water quality benefits. Various other treatment methods for renovating stormwater runoff include: nutrient uptake by hydrophytic vegetation, biodegradation of pollutants by microbial activity, and sediment trapping and filtration by organic or synthetic materials and vegetation. As a pre-treatment practice, it cannot be emphasized enough that infiltration should be utilized to the greatest practical extent to reduce water quantity and improve water quality.

Stormwater Quality Manual

DEP's new guidance document, the 2004 Connecticut Stormwater Quality Manual[3], provides guidance on the measures necessary to protect the waters of the state from the adverse impacts of post-construction stormwater runoff. The manual focuses on site planning, source control and pollution prevention, and stormwater treatment practices, and is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management. It also includes innovative and emerging technologies as secondary treatment practices.

The manual describes both primary treatment practices, which provide demonstrated, acceptable levels of water quality treatment, and secondary treatment practices that are not suitable as stand-alone treatment facilities but can be used for pretreatment or as supplemental practices. The five major categories of primary stormwater treatment practices are:

- Stormwater ponds
- Stormwater wetlands
- Infiltration practices
- Filtering practices
- Water quality swales

Examples of secondary stormwater treatment practices described include traditional practices such as dry detention ponds, vegetated filter strips and level spreaders, oil/particle separators, and deep sump catch basins. All stormwater treatment practices should be designed, installed and maintained in accordance with the guidelines specified in the manual. For more information on how to

[3] Connecticut Department of Environmental Protection. 2004. 2004 Connecticut Stormwater Quality Manual. Hartford, CT.

control stormwater, this manual is now available at: http://www.dep.state.ct.us/wtr/stormwater/strmwtrman.htm.

Stormwater Construction General Permit

In addition to local permits and site plan reviews, the proposed subdivision is subject to DEP's General Permit for the Discharge of Stormwater and Dewatering Wastewater Associated with Construction Activities (see http://www.dep.state.ct.us/pao/download/watrdown/Const_GP.pdf). Because the project proposal will result in the disturbance of ten or more acres of land (regardless of phasing) the owner or developer must register the site with the DEP thirty days prior to the commencement of construction activity **and** file a Pollution Control Plan ("PCP") in accordance with Section 6(b)3(C) of the General Permit. Registrants required to submit a PCP must pay an additional plan review fee of $500.00 besides the $500.00 registration fee.

Prior to submitting a registration form to the DEP, a review to verify compliance with State and National Historic Preservation statutes, regulation and policies and Endangered and Threatened Species Statutes must be conducted. Contact Dave Poirier of the Historic Commission at (860) 566-3005 for the historic preservation review. Endangered & Threatened species Information is available online at http://www.dep.state.ct.us/cgnhs/nddb/nddbpdfs.asp. If endangered or threatened species are present in the project area, contact Dawn McKay at DEP at (860) 424-3592. The project will not be permitted under the construction general permit until compliance with these regulations and statutes is achieved.

In order to reduce erosion potential, DEP recommends that construction activities be phased to the maximum extent possible so that unstable areas are minimized. The 2002 version of the Connecticut Guidelines for Soil Erosion and Sediment Control[4], guidelines contain detailed technical guidance on specific best management practices for erosion and sediment control procedures recommended for developing an effective soil erosion and sediment control plan. The PCP must specify a stabilization plan (within and outside of the seeding season) which includes such measures as seeding, applying hay/mulch, and, for slopes 3:1 and steeper, installing an appropriate grade of erosion control matting or a spray-on "soil cement" type of armor mulch. The construction general permit also requires that any inactive area left disturbed for over 7 days be temporarily stabilized. Areas left disturbed over 30 days must be temporarily

[4] The Connecticut Council on Soil and Water Conservation. May, 2002. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Connecticut Department of Environmental Protection, Bureau of Water Management, Inland Water Resources Division. Hartford, CT.

seeded. In order to minimize erosion and sedimentation during and after construction, use of an appropriate seed mix specifically selected based on the site's soil moisture conditions, and adequate amounts of mulch are recommended. Application rates for seed and mulch are prescribed in the E&S Guidelines, but the North Central Conservation District or the USDA Natural Resources Conservation Service may have more current information on the various seed mixes and mulches now available. **Note:** Avoid seed mixes containing Reed Canary grass, an invasive species.

The PCP must demonstrate that the post-construction stormwater treatment system has been designed with a goal of 80% removal of total suspended solids. Such measures may include, but are not limited to, stormwater detention basins, stormwater retention basins, swirl concentrator technology structures, vegetated swales, deep catch basin sumps (4'+) and stormwater infiltration devices. The PCP must also discuss the installation of velocity dissipation devices at all discharge locations as a post construction stormwater management measure. A detail of proposed measures must be provided. If site conditions allow, DEP recommends the installation of retention or detention basins because of maintenance, cost, and efficiency considerations. The elimination of point sources through the use of level spreaders or curb elimination is also recommended.

The construction general permit requires inspections of all areas at least once every seven calendar days and within 24 hours of receiving a 0.1" or greater rainfall event. The PCP must also allow for the inspector to require additional control measures if the inspection finds them necessary, and should note the qualifications of personnel doing the inspections. Additionally, the PCP must include monthly inspections of stabilized areas for at least three months following stabilization.

Buffers

Although the proposed subdivision design does not follow the conservation or "cluster" strategy, significant effort has been made to protect and preserve water quality, wildlife habitat, character and scenic value this area provides. In addition to the reduction of impervious area (shorter and fewer road surfaces), and managing stormwater runoff, approximately 280 acres will remain as either open space or be placed into conservation easement.

DEP supports and recommends the use of buffers to protect surface water resources from environmental impacts. Leaving a vegetated strip helps protect surface and groundwater quality, and fish and wildlife habitats from nonpoint source pollution. Buffers can trap road sands, contaminants and other pollutants

contained in stormwater runoff generated from roadways, parking lots, roof tops, and other impervious surfaces, as well as eroded sediments occurring from natural scour or land moving activities such as site development and other soil disturbances, including farming activities. In addition to the benefits described above, riparian buffers also help moderate the temperature of stormwater runoff before it enters the watercourse, thereby reducing thermal impacts on aquatic wildlife. The riparian corridor is the area immediately adjacent to a watercourse that typically contains wetlands and acts as a buffer to the watercourse. Riparian wetlands may additionally provide valuable wildlife habitat, flood attenuation, water quality renovation, and groundwater recharge, so it is important to protect these areas from degradation. A 50 foot vegetated buffer is typical, but widths can vary depending on such factors as topography, the erosivity of the soil, and the value or sensitivity of the water resource.

The town, land trust or prospective homeowners association who holds the rights to the conservation easement should consider placing deed restrictions on activities or encroachments within the buffer, in addition to providing guidelines on lawn care maintenance adjacent to the buffer. And beyond showing the conservation easement on the subdivision plans or in the land deeds, it is suggested that signage be posted long the edge as a reminder.

To protect riparian buffers from noise, human encroachment, and other development impacts, including stormwater runoff, the CT DEP Fisheries Division recommends a 100-foot buffer along perennial streams, and a 50-foot buffer zone along intermittent streams[5] measured from the upland boundary of the regulated area, including any riparian wetlands. DEP Fisheries further recommends that this buffer zone remain in a naturally vegetated and undisturbed condition.

To help ensure the protection of water quality in the watershed, maintaining the riparian corridor is essential. Although the applicant has minimized encroachment into wetlands and watercourses, and proposes a 100' buffer, this alone may not fully protect the natural resources. Often existing beyond riparian corridors are wildlife corridors. These are typically wide, linear tracts of land that allow wildlife to move freely between natural habitats containing both wetlands and uplands. The 100' buffer will certainly assist in this goal, but roadways can often segment these corridors resulting in wildlife habitat fragmentation, especially for smaller wildlife like amphibians and reptiles. (For example, ordinary road curbing can obstruct passage, while Cape Cod–style curbing is more traversable.) It may be appropriate to consider preserving

[5] CT DEP Fisheries Division. 1991. Policy Statement – Riparian Corridor Protection; Position Statement – Utilization of 100-Foot Buffer Zones to Protect Riparian Areas in Connecticut.

forested uplands beyond the 100' buffer as open space. This site is the last remaining link between the trap rock ridges and the Farmington Valley. Efforts to preserve open space help to maintain these corridors and can provide valuable "edge" habitat for wildlife.

Recommendations

The proposed subdivision plans depict a comprehensive and detailed approach to managing stormwater and minimizing environmental impacts. Notwithstanding, every reasonable opportunity to protect and improve water quality should be employed. One of the most effective means is to maintain vegetative buffers *in their natural state*. To this end, conservation easements and open space should be dedicated to the town or local land trust with restrictions on use; e.g. clearing, mowing, encroachment, etc. Employing primary and secondary stormwater treatment practices will also guard against downstream impacts. Regardless of the current proposed subdivision layout design, or a "cluster" subdivision, the road width can be substantially reduced: 24' is quite sufficient. Twenty feet may even suffice. And curbing is not necessary where grades allow for sheet flow off the roadway. However, if curbing is used, it should be Cape-Cod style to allow for amphibian crossings (based on the numerous vernal pools present). Cul-de-sacs should be designed with pervious centers, if feasible. And as noted previously under Project Impact Summary, several lots should be carefully reviewed for possible bank destabilization as a result of steep, sandy slopes and the juxtaposition of the septic system.

Conservation District Review

District staff inspected the site with the ERT team on March 29, 2006. Staff also inspected the site on three separate occasions during the summer of 2005 to assist the town of Simsbury with verification of the proposed wetland boundary amendment.

The following review includes a discussion of wetlands, soils, erosion control, and stormwater. There is often some overlap between the District's review and the other Team member's stormwater and wetland reviews.

The District defers to other professionals regarding planning and open space issues. However, staff is aware of the significant public interest in this property and understands the importance of this parcel in terms of its size and status as one of the last large "open spaces" in town. The District is also aware of efforts by the town and others to preserve the parcel. The District supports any efforts to preserve the parcel, provided that satisfactory arrangements can be made with the property owner.

The status of the piece as potential open space does not influence the approach the District takes in reviewing the parcel for subdivision. Based on "technical" aspects of the proposal, planners have done a good job of designing the project. As proposed, the project:

1. avoids direct impacts to wetland and steep slopes;
2. provides buffers to sensitive resources (see discussion for exceptions);
3. includes a comprehensive erosion control plan, and
4. includes a comprehensive stormwater management plan.

A significant amount of information has been submitted by the owner's representative, Milone and MacBroom, Inc. A detailed site plan, Engineering Report, and Existing Conditions Analysis and Wetland Impact Assessment have been submitted. The later report includes a description of soils, and a wetland report, which includes a vernal pool study.

Soils and Erosion Control Plan

Section 5.0 of the of the Existing Conditions Analysis & Wetland Impact Assessment describes soil conditions on the property and notes that there is an east-west division between till soils in the eastern section and outwash soils in west. The different soils noticeably affect vegetative cover and drainage

characteristics. As noted in the report, the till soils are typically covered with a layer of fine sand and silt. Generally, the till soils are more limiting in terms of drainage, particularly the moderately well drained Rainbow soils, which have a seasonally high water table. On-site soil testing has been done to determine suitability for septic systems on each lot.

There is a minor error in Appendix I of the report, identifying Windsor as a dominant upland soil. Windsor soils are not found on the site, although the similar Hinckley series is the predominant soil in the western section of the property.

District staff reviewed the new Natural Resources Conservation Service Web Soil Survey of the area. The soils map in Appendix I is an accurate representation of the most recent official soil mapping. Upland soils are accurately reflected on the mapping and wetlands have been identified in the field by soils scientists. The wetland boundaries have been subject to third party review and found to be accurate.

The K-value of soil characterizes its susceptibility to sheet and rill erosion. K values have been determined for all soils on the property using the Web Soil Survey. Generally, K values are expressed by a value of .02-.69 with higher values indicating greater susceptibility to erosion. Soils on this site generally have low to moderate K values. The Broadbrook soil has the highest value of .37. A substantial portion of the development will occur on these soils. Fortunately, drainage areas are well divided on the property and there are few areas with long slopes. The roads are generally oriented along the tops of ridges, with lots on either side, so that most of the lots drain to the rear, with minimal lot to lot drainage. Therefore, erosion during the building phase of development will be relatively easy to control.

The soil map for the property is shown in Appendix A of this report. In addition, K values are provided and are shown on an aerial photograph of the property.

The applicant has prepared a detailed Erosion Control Plan shown on sheets S-1 through S-19. Erosion control measures are shown using symbols from the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. The plan is detailed and comprehensive and includes typical measures such as silt fence and inlet protection. In addition, measures to be used during road construction include stone check dams, water bars, and sediment basins (generally in the location of proposed stormwater basins). Erosion control blankets will be used on steeper slopes. The measures chosen are sufficient and their locations are appropriate.

Typical details for erosion control are shown on sheet D-1 along with a general narrative. A construction phasing plan and sequence must be provided to the town for review. Phasing for this development is not as critical as on other sites because of the small drainage areas.

The District recommends that a separate erosion control plan be shown for road constructions at a scale between 1'=100 and 1'=200. Road construction is typically done as a separate operation and a separate plan will assist the contractor with installation. The existing 40' = 1 inch scale is difficult to review for road construction and is not practical for field use.

Wetlands

Direct impacts to wetlands have been kept to a minimum. In addition, proposed intrusions into the 100' upland review area are generally limited to lot clearing and septic system construction. Only 0.07 acres of wetland will be directly altered by road crossings through relatively low value wetlands.

In general, indirect alterations to wetlands from activities in upland review areas result from stormwater and sediment discharges. Wetland wildlife habitat can also be degraded by adjacent clearing and loss of buffers. Most of the lots in the proposed subdivision have ample room for single family residential construction. However, some of the lots are tight and should be evaluated further. Of particular concern at this stage in the process is the assessment of space requirements for typical residential appurtenances like decks, sheds and swimming pools. The lots should be assessed for their ability to support such structures without degrading wetlands. As a matter of public policy, assessing the lots for potential future alterations may reduce (future) conflicts with homeowners.

Out of 103 lots proposed, ten have small areas of wetland located within the lot boundary. Lots with wetlands include 1, 2, 14, 23, 53, 54, 57, 59, 92, and 93. Currently, no direct alterations to wetlands are proposed by lot development activities. However, these lots should be evaluated to determine if they have adequate area to support typical residential appurtenances.

Forty-one lots contain areas within the 100' upland review area. Of these, lots 2, 5, 7, 13, 14, 53, 54, 57, 59, 86, 92, 93, and 97 currently show clearing, grading, or septic construction within the upland review area. By visual assessment, it appears that the following lots have upland review areas of 10% or more. These should also be assessed for future alterations and "viability" in terms of lot size and the potential for future alterations. They are lots 1, 3, 4, 15, 16, 22, 23, 25, 27, 58, 60, 87, 89, 91, and 98,

Vernal Pools

The following comments are based on information from the document Best Development Practices, Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States (BDP manual, hereafter). Recommendations are provided to assist the town to assess the development and to work with the applicant to make improvements to the plan. Changes to the Inlands Wetlands and Watercourses Act in 2002 limit local Inland Wetland Agency's ability to deny activities or place conditions on approvals based on wildlife and habitat.

Vernal pools are shown on an aerial photograph within the wetland report but their boundaries are not shown on site plans. The District recommends that the locations of the pools be shown on the site plans to allow a more comprehensive review of various aspects of the development in relation to the pools.

Vernal pools 5, 6, and 7 are the most productive and should therefore be afforded the most protection. According to the BDP manual, the vernal pool envelope, measuring 100' from the edge of the pool, is the critical area for maintenance of water quality and pool hydrology. This area also provides shade and organic matter to the pool. Significant areas of lot 57 are within 100 feet of vernal pool 7. A large portion of lot 93 is within the critical area of pool 6. Development of these lots will likely reduce the viability of the adjacent vernal pools and consideration should be given to combining the lots with others or eliminating the lots. A portion of lot 58 is within 100 feet of vernal pool 7, but development is not likely to occur in this area. The lot could be reconfigured to prevent additional alterations by future homeowners.

The BNP manual recommends that no more than 25% of the area within 750' feet of vernal pools be developed. Roads and stormwater structures, particularly hydrodynamic separators, within 750' of vernal pools are associated with direct mortality of amphibians (page 22). Stormwater basins within this area may act as "decoy" breeding sites. Such sites may provide breeding opportunity but do not have a sufficient hydro-period for development of the young.

Stormwater basin 420 is within 200 feet of vernal pool number 7 and has the greatest potential to act as a decoy basin. In addition, it discharges directly to the vernal pool and pool hydrology could be altered by the discharge. The District recommends that alternatives to the existing basin be considered. It appears that relocation of the basin is possible by altering the drainage design of the road so that more of the drainage goes to basin 419. Basin 420 could be relocated to the south and the discharge could be directed into the larger forested wetland,

adjacent to the vernal pool. In addition, conversion of the basin from a wet bottom to dry bottom design may reduce its potential to be a decoy pool.

Hydrodynamic separators close to pools should be evaluated. The two closest separators to pools 6 and 7 are located on Road B. Obviously, the separators provide an important water quality function and that function should be measured against the risk of high amphibian mortalities in locations close to vernal pool migration routes. Catch basins with 4 foot sumps or standard grit separators (without the "hydrodynamic" component) could be better options in these locations. There are two separators within 750 feet of pool number 5. These are located relatively far from the pool and there is a large area of upland habitat to be preserved around the pool. The stormwater system should be re-evaluated in terms of potential impacts to vernal pools as described above and the evaluation should be provided in writing to reviewers.

Stormwater Management

A detailed Stormwater Management plan has been developed and includes measures to address both stormwater quantity and quality. A standard closed road drainage system is proposed for the road. Stormwater will be collected in eleven separate drainage systems so water is dispersed throughout the site. Calculations and details are presented in an Engineering Report prepared by Milone & MacBroom.

Assessment of stormwater quality measures is an evolving process in Connecticut since the release of the 2004 Connecticut Stormwater Quality Manual (2004 Manual, hereafter). The following comments reflect the District's interpretation of the manual.

1. A total of ten stormwater basins are proposed. Three are wet basins and seven are dry basins. It appears that the wet basins are proposed where stormwater discharges are close to sensitive wetlands, but the choice of basin type is not well explained in the Engineering Report. Additional narrative should be provided to clarify the rational behind the stormwater design.

2. Crystal Stream hydrodynamic separators are proposed to remove sediments and hydrocarbons as a pretreatment to stormwater basins. The District is not specifically familiar with the Crystal Stream separators and is not aware of any literature verifying their effectiveness. The effectiveness of some of the other separators, such as Vortechnics, have been evaluated. In addition, the Crystal Stream unit has an internal filter which will require additional maintenance. Additional information

should be submitted to the town regarding the effectiveness of the system. A proposed maintenance plan should also be submitted.

3. The dry basins contain sediment forebays with stone filter berms and will be planted with a facultative wetland mix. These measures may improve the ability of the dry basins to provide some water quality improvement, particularly sediment removal, if they are adequately maintained. The 2004 Manual makes a distinction between "primary" and "secondary" stormwater treatment methods. Primary systems "are capable of providing high levels of water quality treatment" whereas secondary treatment methods "may not be suitable as stand-alone treatment." In the manual, dry detention basins are described as secondary treatment systems which have little or no water quality treatment function. There is no "credit" provided for enhanced design measures such as forebays with stone filter berms, or plantings.

4. The proposed level spreaders located at the discharges of all of the stormwater basins include an innovative design that should provide additional infiltration and filtration. The level spreaders are constructed with septic galleries surrounded by stone.

5. Based on the District's understanding of the 2004 Manual, the proposed system of hydrodynamic separators, (enhanced) dry detention basin, and level spreader outlet can be considered a treatment train and should be meet the water quality treatment performance criteria. However, additional narrative should be provided to explain how the system meets the criteria of the 2004 Manual. Simply determining the Water Quality Volume for a system does not mean that it meets the treatment or design criteria specified in the manual.

6. The 2004 Manual includes design criteria for stormwater ponds (Page II-PI-5) and detailed specifications for different types of pond/wetland systems. The proposed wet basins consist of relatively simple designs compared to the more complex conceptual designs discussed in the manual. The District recommends that additional information be submitted to explain the criteria used to design the proposed wet basins and provide a discussion of how the proposed designs conform to the specifications in the manual. The proposed basins most likely meet the water quality treatment performance criteria, but additional clarifications will assist reviewers to assess the proposed systems.

Wetland Review

The site consists of ± 453 acres of which 218 acres are proposed dedicated open space (48%), 160 acres proposed for the subdivision (35%), and 75 acres (17%) will remain as the equestrian center. One hundred and three (103) residential house lots have been proposed on the 160 acres, yielding an average lot size of about 1.55 acres. The parcel is located in the southwest quadrant of the town.

Milone and MacBroom, Inc. (MMI) prepared and submitted a fine report which describes the existing wetland conditions, vernal pool status, vegetation inventories and various resource attributes of the parcel. There is no need to reiterate the field work reported therein. Instead the following comments will address issues that may have been touched on lightly, or other points this reviewer feels are necessary to add.

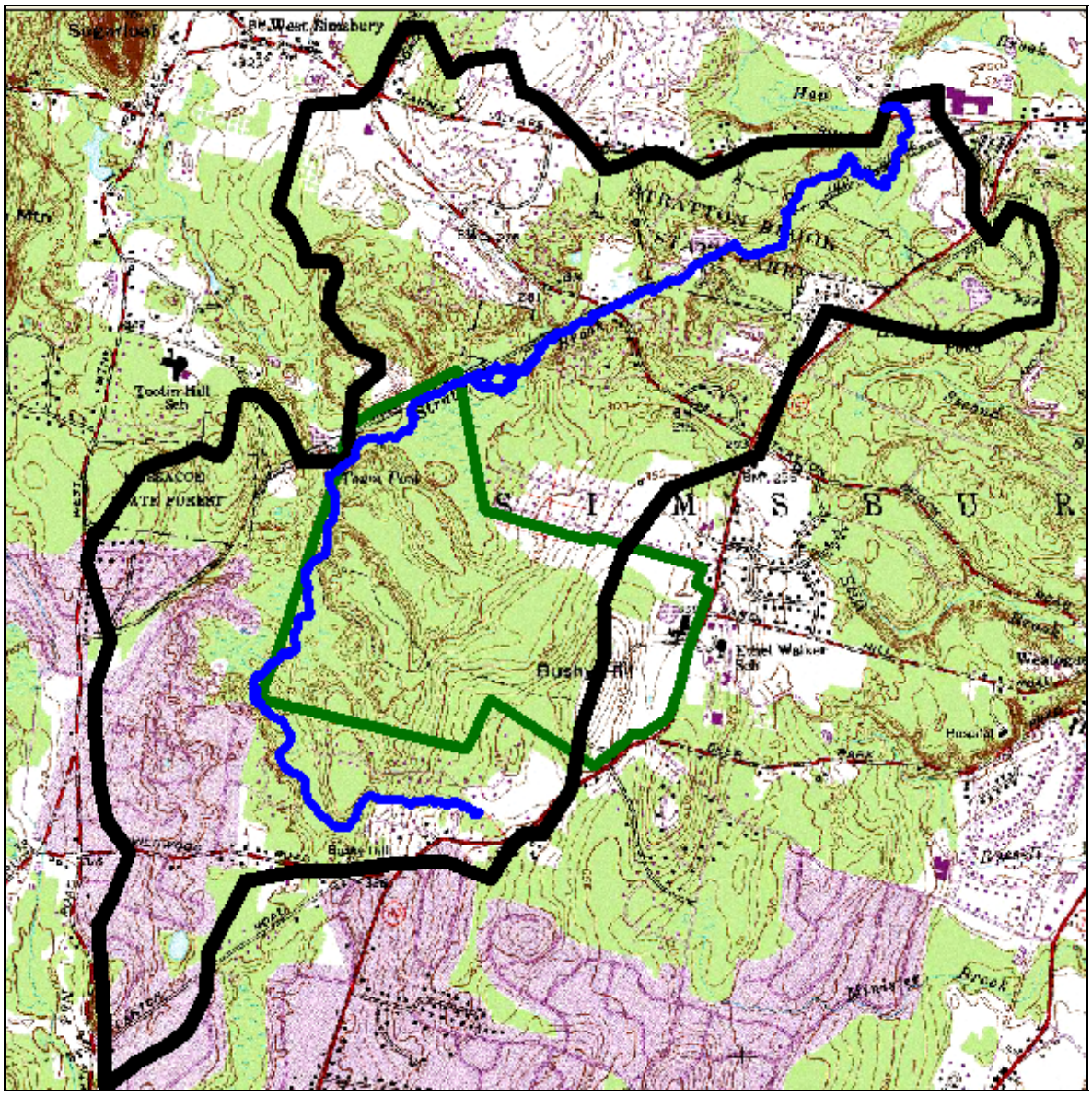
Overview

The highest point on the property has been mapped by the U.S. Geological Survey 7.5 minute Avon topographic map at approximately 450 feet above mean sea level (MSL). This elevation occurs on the roughly north-south trending drumloidal feature, named Bushy Hill on the map below. This hill is also the drainage divide. The western most 371 acres drain west into Stratton Brook. Most of the eastern 82 acres drain to the Still Brook drainage, which has its headwaters at the 1.3 acre pond just west of the main Ethel Walker barn.

Elevations are uniformly lower along the west boundary of the property. The lowest point being about 245 feet above MSL in the northwest corner. That drop of 205 feet over a distance of 4,244 linear feet yields an average slope of about five percent.

The property is surrounded to the north, east, south and southwest by low density residential development. Only to the northwest is there undeveloped land. This is due to state and municipal ownership. A series of old forest roads and riding trails criss-cross the property. These provide interior access for the many neighbors who use the road network for recreation and exercise.

The proposed lots will be served by on-site sewage disposal systems and public water.



This image shows the outline of the Stratton Brook watershed in black, Stratton Brook in blue and the outline of the subdivision in green. On the east side of the Ethel Walker property the black the drainage divide line passes over Bushy Hill. The land to the west of Bushy Hill drains to Stratton Brook, while east of the line drains predominantly into Still Brook.

Stratton Brook

The watershed for Stratton Brook measures ± 2,012 acres. It is depicted above as a black line. The 371 acres of this parcel that drain into Stratton Brook constitute 18 per cent, or nearly one fifth, of the watershed. It is the largest undeveloped parcel in the drainage. The land use within the drainage, taken from the 2004 aerial photographs, shows this (very approximate) land use breakdown:

986 acres low density residential 49%
371 acres Ethel Walker School parcel 18%
344 acres of privately held woodland 17%
211 acres municipal property including open space 10%
55 acres active farmland 3%
17 acres commercial 1%
28 acres Miscellaneous 2%

After construction these numbers will change to approximately:

1146 acres low density residential 57%
344 acres of privately held woodland 17%
218 acres Ethel Walker School open space parcel 11%
211 acres municipal property including open space 10%
55 acres active farmland 3%
17 acres commercial 1%
28 acres Miscellaneous 2%

In his paper entitled: *Determining Impervious Surfaces for Watershed Modeling Applications,* 2004, Sandy Prisloe addressed the percent of imperviousness for a variety of land uses. (Impervious surfaces are generally thought of as roads, driveways, roof tops, sidewalks, etc.) Though quite variable by town, it can generally be stated that an expected impervious percentage of building lots in the 1.5 acre size range with a single family dwelling will be from 7 to 10 percent. A spot check of the subdivision to the immediate south of this parcel showed 14 to 17 percent impervious. Thus, if this proposal gets built as proposed and the watershed has approximately 1,146 acres of rural residential, using a rough figure of 12 percent impervious, that would yield 138 acres of impervious surface, or roughly seven percent of the total watershed. These same 2004 aerial photographs show a total of ~17.5 miles of roadway in the watershed. At 28 feet in width this adds another 59 acres to that total. Combined, the 138 acres of residential imperviousness and the 59 acres of road surface will equal ~10 percent impervious cover in the watershed.

Wetlands

The most noticeable wetland system on the property is Stratton Brook which flows generally south to north along the property's western boundary. Most of the mapped wetland soils on the parcel are found in conjunction with the Stratton Brook and its drainage, although as described in the MMI report, several breeding vernal pools are also present on the landscape. The town has a 100 foot review area bordering wetlands. This is extended when slopes are added to the equation.

Comments

Quantity of Lots

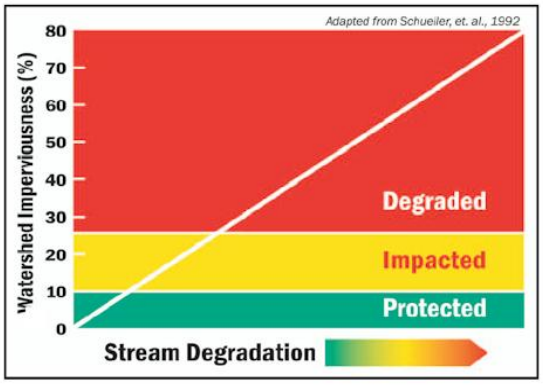
Of the 103 proposed lots, 44 of them (43%) have some property in the 100 foot wetland review area. In some cases this is of little consequence, as on proposed lots 28 and 29, 46, and 48.

But on other lots a high percentage of the acreage is in the wetland review/setback area, especially the thirteen lots: 1, 2, 13, 14, 21, 53, 54, 57, 58, 59, 86, 92, and 93, which account for more than one eighth of those proposed. That the lots are being forced to intrude quite far into the review area speaks to the fact that there are too many lots proposed. The reduction of lots by the applicant will ease these large incursions into the wetland review areas, allow for the wetland protection these areas deserve and demonstrate the good land stewardship of the applicant.

Water Quality

Stratton Brook flows through a well vegetated and forested riparian corridor. This buffer provides the function of shade as it impacts water temperature, and provides both wildlife habitat and woody debris for the stream and flood plain. In addition, high quality groundwater is fed into the stream from its sand and gravel aquifer. The quality of the in-stream habitats allows Stratton Brook to support a population of native brook trout and wild brown trout. It is important that to protect this resource there be no construction within 200 feet. This distance will provide an excellent riparian corridor for the stream to maintain the characteristics it has in pre-construction. The applicant has done well to protect this resource in this manner.

A rule of thumb for monitoring water quality in any given drainage area is that water quality decreases as impervious surface in the watershed increases. Often referred to are the numbers/ranges seen in the following graphic:



This graph is taken from NEMO Fact Sheet Number 3 entitled: Impacts of Development on Waterways. *This Fact sheet and graphic are available on line at:*

http://nemo.uconn.edu./publications/fact_sheets/

The graph above depicts the water quality of a stream as being generally well protected when the imperviousness in the watershed is 0-10 percent of the total land cover. The numbers show that from that 10 percent to about 26 percent imperviousness, impacts compromise the water quality. After ~26 per cent definite water quality degradation is taking place. As with many studies, the numbers are not absolute for every scenario, but the concept is sound.

As we saw in the figures above, that if the proposal is built as submitted the imperviousness in the watershed will be 10 per cent at a minimum.

Currently the DEP maps the surface water quality of Stratton Brook as level "A". This is on a rating scale of "AA" being the best, "A" being next, then "B" , "C", and finally "D". The full text of the DEP's *Water Quality Standards and Criteria* can be found on the web at: http://www.dep.state.ct.us/wtr/wq/wqs.pdf The town should strive to maintain this water quality (along with the health and integrity of the wetland systems) long term within the basin. This can be accomplished by minimizing impervious surface in the watershed.

Impervious Surfaces

Issue - Road Width

The plan as proposed calls for the introduction of ±14,000 linear feet of 26-28 foot wide road way. At 26 feet wide, the amount of impervious surface added to this parcel amounts to approximately 8.4 acres. At 28 feet in width the new roadways will add nine acres of impervious surface. Added to this number is the surface area of roof tops, driveways and sidewalks. In effect, the builder creates a water runoff and sediment collection system to service the needs of the newly built subdivision, and then turns over the maintenance of it to the town in perpetuity.

Historically/typically, runoff from impervious surfaces is channeled into roadways, then directed by the curbs downhill to pass into storm drains. The storm drains in turn outlet into, or just upslope of, wetlands. Minimizing impervious surface is one way to decrease this runoff, and thus decrease the impacts to the wetland systems.

One of the most straightforward ways to reduce impervious surfaces is to decrease the width of the road. A reduction in road width from 28 feet to 24 feet would decrease impervious surface by more than one and a quarter acres. Although discussion of road width at the ERT meeting was leaning towards the 26 foot design, that being reduced from the 28 foot width, in the regard of

impervious surface and safety of the residents, this reviewer has included language favoring reduction to 24 feet.

In the city of Longmont, Colorado approximately 20,000 police accident reports were reviewed and compared against five criteria that would signify the probability that street design contributed to accidents. The analysis showed that a typical 36 foot wide residential street has 1.21 a/m/y (accidents/mile-year) as opposed to 0.32 for a 24 foot wide street, the street with the least a/m/y. This is about a 400 percent increase in accident rates. The analysis illustrates that as street width increases, accidents per mile per year increases exponentially, and that the safest residential street width is 24 feet (curb face).

The Connecticut Nonpoint Education for Municipal Official's (NEMO) embraces the same thinking in their Technical Paper Number One. It may be viewed on their website (http://nemo.uconn.edu) . Quoting in part:

"Designing Roads for Speed - As design speed declines, road widths narrow. Research shows that long, wide, straight roads produce higher traffic speeds and higher accident counts, particularly fatal accidents. Local residential roads should be designed to provide safe access to home sites and not as mini raceways. Research shows that narrow streets are the safest. For example, a study by Swift Associates and the City of Longmont, Colorado looked at 20,000 automobile accidents over an eight-year period and found, "The most significant casual relationships to injury and accident were found to be street width and street curvature . . . and that the safest residential street width is 24 feet." (Copies of the Swift Report can be provided for those interested.)

A road width of 24 feet over the length of this project can provide the mutual benefit of minimizing impervious surface and offering a safer traffic environment.

Issue - Roof Runoff

Very often the downspouts from the roof of a home lead water directly to an impervious surface such as a driveway. It then flows into the street and down slope. Collectively, the total surface area of 103 house roofs can be substantial, adding acres of impervious surface. To reduce runoff and to most closely mimic the water path of preconstruction flow, two options are available. The first is to have the downspouts discharge directly into the ground. This eliminates runoff and will aid in the on-site groundwater recharge on each house lot. Second is the construction of rain gardens which also provide the water with an opportunity to recharge or infiltrate into the groundwater.

The images above depict three different rain gardens. The top picture depicts the rain garden close to the downspout. The lower pictures show two rain gardens receiving piped roof runoff which enables the garden to be further away from the house. (Top photo courtesy of NEMO, others North Carolina State University.)

Issue - Road Sand

As the number and width of road surface miles per basin increases, so does the amount of road sand applied during the winter months. Some things to keep in mind:

Connecticut has a no-tolerance level for snow and ice on its roads. As a result, large quantities of road sand are applied every winter to keep the travel ways safe. The DEP estimates that on average in urban settings more than 40,000 pounds of sand (20 1/4 tons) is applied per road mile every year. Of that total,

approximately 30-50% is collected in the spring through street sweeping. Thus, ~12 tons of sand are left on every road mile every year.

Because of the nature of the Connecticut's hill and valley topography, roads are often in close proximity to wetlands and watercourses. This aspect of the landscape makes it highly likely that over time most of the uncollected sand will move downslope into the wetlands and watercourses. These sediments can destroy aquatic habitat and fill in water bodies. The impacts of sand deposition (typically in combination with elevated salt levels and increased water temperature [thermal pollution]) on spawning streams and wetlands with close proximity to roads is well documented. Road sand itself can be a major pollutant source by carrying nutrients, oil, and metals with it to the rivers, streams, and lakes.

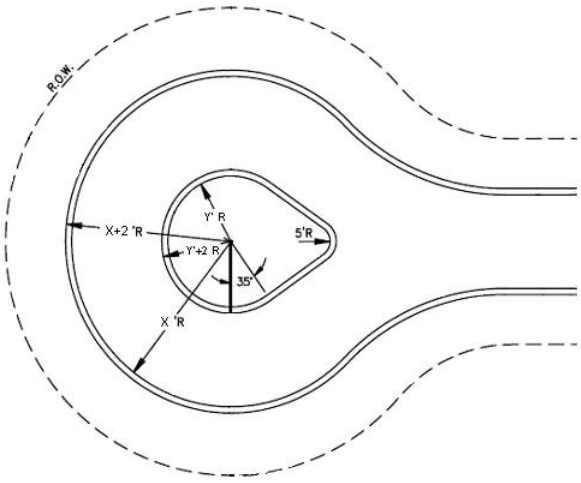
In the springtime, after the danger of icing, if the road sands are swept/collected later than sooner, the impacts are worse. This is because the constant grinding of automobile tires reduces sand particle size. These finer particles are held in suspension longer and thus carried further downstream.

Using these numbers, approximately 53.5 tons of sand will be applied to the proposed ~14,000 feet of road every winter. Of this total perhaps 40 percent will be collected. This leaves ~ 32 tons or 64,000 pounds of sand on the roads of this subdivision *every year*, slowly moving downslope.

As a result of the potential long term impacts from road sand towns are urged to sweep the roads as soon as possible in the spring and maintain their catch-basin clean out schedule. Many municipalities, unwilling or unable to take on the maintenance of new systems' maintenance call for a homeowner's association to be formed. The association then assumes a plan with an agreed upon schedule of maintenance intervals with the town. Reasonably, the town wetland or public works sector keeps the status of the proposed maintenance.

Issue - Cul-de-sac

As discussed at the team meeting, only the largest of the five cul-de-sacs will be large enough to offer a further reduction of impervious surface. The reduction may be had by vegetating the inner circle of the Cul-de-sac. These circles can be tapered to a low point at their center to further contain/reduce runoff. In addition, cul-de-sacs with vegetated circles are generally regarded as more aesthetically appealing than those that are fully paved.



This drawing of a cul-de-sac exemplifies the vegetated inner circle concept. The radius varies with the road width. Cul-de-sacs that are tapered downward to the middle can be designed to treat and infiltrate runoff. The applicant applies the landscaping which then is owned and maintained by the homeowner's association.

Vernal Pools

Issue: Proximity of Lots

The largest integral part of the vernal pool ecosystem is the upland area which neighbors the pool. This typically extends away from the pool uphill or upslope to drier soil types. The slopes often vary from gentle to steep. It is in these slopey areas that amphibians spend over 90% of their adult lives. They travel up hill to the well drained soils to burrow. In places, some usable slopes can approach 45 or more degrees. The drainage areas for these pools are typically located on till-based soils and measure 2-3 to 5-6 acres. Thus, local impacts can be dramatic and damaging to the vernal pool ecology, especially since vernal pools are fed primarily by surface water runoff and precipitation.

There is extensive information in print about vernal pools. Much of it points to the fact that the reduction of more than a certain percentage of critical adjacent upland habitat will have telling impacts on the pool's breeding ecology.

Dr. Michael Klemens suggests in his book, co-authored with Dr. Aram J.K. Calhoun, entitled: "*Best Development Practices – Conserving Pool Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States*" that there be no development in the 100 foot buffer around the vernal pool and no more than 25% in the critical terrestrial habitat, that is, the distance from 100 feet to 750 feet away from the pool. Indeed, the upland use by various vernal pool amphibians can range from 386 feet from the pool for spotted salamanders to 1,550 feet from the pool for juvenile wood frogs (3,835 feet for

adults). (Dr. Klemens'document may be obtained from the DEP Store: http://www.dep.state.ct.us .)

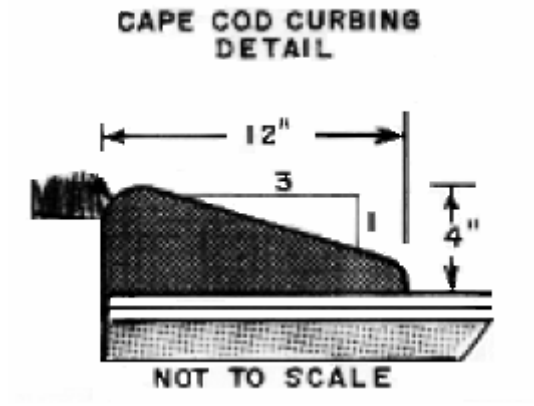
A greater understanding of the amphibian's land-based needs may be obtained by mapping each pool's contributing watershed and associated upland needs.

Miscellaneous

Use of Curbing

Curbs often function as a means of channeling water to storm drains. To minimize the flow to the storm water system, where possible, the applicant should be encouraged to use no curbs (typically in low gradient areas). This allows runoff to more easily infiltrate in non-point locations. It also serves to take the pressure off of the stormwater system and allows the land to more naturally renovate the runoff, ultimately protecting the wetland resources.

In addition, the road ways in the vicinity of the vernal pools frequently cut across amphibian migration paths. Vertical curbing does not allow for the passage across the road way of small amphibians. The curb walls are cliff-like to them and form an insurmountable presence. Cape Cod curbing however, because of its gentle profile does allow for the migration from the pool to the upland and back because of its lower over all height and low gradient slope.



This drawing shows Cape Cod curbing in profile. Typically made of extruded asphalt, it is easy to see the advantage for wildlife passage.

Aquatic Habitats and Resources

Site Description

The Ethel Walker School Subdivision is proposed for a 453 acre forested parcel on the Ethel Walker School located westerly along Route 167 in Simsbury. With the exception of several vernal pools and two intermittent streams, the portion of the parcel proposed for development does not contain any perennial waterbodies (ponds or streams). However, a 3,000±-foot reach of Stratton Brook *(DEP Drainage Basin #: 4318)* flows south to north along the western boundary of the parcel.

Aquatic Habitats

Stratton Brook is physically characteristic of a coldwater stream found in Connecticut. Within the bounds of the proposed Ethel Walker School Subdivision, the brook is of moderate to low gradient; a significant portion meanders through a broad wetland. Stratton Brook is contained in a channel approximately 15 to 20 feet in bankfull width. Normal flow depth within the brook is 18 inches to 2 feet. The brooks' substrate is composed of cobble, gravel, coarse sand, and sand-silt fines. Dense growths of conifers, hardwoods and woody shrubs predominate as riparian vegetation. Physical in-stream habitat is provided primarily by water depth in pools, undercut banks and fallen or overhanging vegetation. The Department of Environmental Protection classifies the Stratton Brook reach on the Ethel Walker School Subdivision parcel as *Class A* surface waters. Designated uses for surface water of this classification are potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other legitimate uses.

Aquatic Resources

The Inland Fisheries Division has conducted fish surveys of Stratton Brook immediately downstream (north) of the Ethel Walker School Subdivision parcel. The brook reach surveyed was found to contain a fish populations composed of brook trout, blacknose dace, and tessellated darter. The Stratton Brook reach on the parcel is anticipated to support a similar fish assemblage.

Impacts

Plot plans for the proposed Ethel Walker School Subdivision indicate a vegetated riparian buffer in excess of 200 feet will be maintained along Stratton Brook. The preservation of a vegetated buffer of this width is critical to the "health" of the Stratton Brook ecosystem. Roots of trees, shrubs, and grasses bind the brook bank soils and provide a resistance to the erosive forces of flowing water. Stems and leaves of brook bank vegetation provide shade that prevents high water temperatures. Leaves, stems, and other plant parts that fall into the brook provide food for aquatic insects. Large woody debris that fall into the brook enhance physical habitat. Abundant riparian vegetation softens rainfall and enables the riparian area to serve as a reservoir storing surplus runoff for a gradual release to the brook during low flow periods of summer and early fall. The riparian area is a natural filter that removes nutrients, sediments, and other non-point source pollutants from overland runoff.

In addition to the preservation of riparian habitat, other design features of the Ethel Walker School Subdivision (e.g. lot layout, stormwater management system) should adequately protect the habitats and living resources of Stratton Brook from adverse impacts.

Recommendations

Areas within the riparian buffer along Stratton Brook altered by prior land use should be reestablished to a condition similar to that found in undisturbed riparian habitat. Vegetation selected for reestablishment in the riparian buffer shall be native and non-invasive.

Wildlife Resources

Proposed site development plans, a site walk, and aerial photos were used to evaluate existing wildlife habitat on the property. The proposed development site is approximately 450 acres, bordered by residential neighborhoods. The site is mostly forested with wetlands in the northwest and southwest portions, including, according to Trout Unlimited, a trout-breeding stream. Wetlands include vernal pools and floodplain swamp. The proposed development is for 103 buildings and a new road network, utilizing 106 acres. Two hundred and eighteen acres will be dedicated to open space and 75 acres, including open meadows, will continue to serve the Ethel Walker Equestrian Center. The development plan calls for two wetland crossings over intermittent streams.

Existing Wildlife Habitats

Upland Forested Area

Housing units are proposed for the over 300 acres of forested areas west of the meadows. Forested areas are valuable to wildlife, providing cover, food, nesting and roosting places and denning sites. Mast produced by oaks provides excellent forage for a wide variety of mammals and birds including white-tailed deer, southern flying squirrel, eastern chipmunk, white-footed mouse, and eastern wild turkey. Trees, both living and dead, also serve as a home for a variety of insects, which, in turn, are eaten by many species of birds, including woodpeckers, warblers and nuthatches. Other wildlife species capable of using this habitat type include white-breasted nuthatch, American redstart, barred owl, broad-winged hawk, redback salamander and northern ringneck snake. As Connecticut's landscape becomes more and more fragmented, forest habitats of this large size, with a well-developed understory of diverse shrubs, saplings, and herbaceous growth are increasingly rare.

Wetlands

Wetlands found on the property include vernal pools scattered in the northern (observed) and southern halves of the site and the Stratton Brook wetland complex near the western border (as reported in the draft *Existing Conditions Analysis and Wetland Impact Assessment* submitted by Milone and MacBroom, Inc.). In addition, there is evidence of multiple intermittent streams found on the site.

Vernal Pools

Vernal pools are small, temporary bodies of standing fresh water that are typically filled in spring and dry out most years. They do not contain any fish populations and are generally found in confined basins with no inlet or outlet. These pools are critical to the survival of many species of reptiles and amphibians, such as the gray tree frog and the spotted salamander, that use vernal pools for breeding and spend the balance of their time in forested uplands. According to the *Existing Conditions Analysis and Wetland Impact Assessment* provided by Milone and MacBroom, Inc., seven vernal pools have been identified on the property. Their report states that three of the four southernmost pools (VP-1, VP-2, and VP-3) had low numbers of both wood frog and spotted salamander egg masses (25 or less wood frog and two or less spotted salamander per pool) and that the pools had dried up by June or July; egg masses had disappeared or no larval amphibians were found. The fourth of the southern pools (VP-4) was more productive, with 44 wood frog egg masses, 10 spotted salamander egg masses, and wood frog tadpoles found in May. Although these southern pools had limited or no productivity, amphibians did attempt to make use of them, and they have the potential for higher productivity levels in years with more rain. The three northern vernal pools (VP-5, VP-6, and VP-7) were much more productive, with over 50 spotted salamander egg masses and over 100 wood frog egg masses per pool. These northern vernal pools are certainly valuable for amphibian productivity and even pools with limited productivity of more common species are important for the overall conservation of reptiles and amphibians in our state.

Stratton Brook Wetland

This area contains both high quality marshland and shrub-scrub wetland created by a beaver impoundment, and a flowing brook and associated riparian area. Beaver impoundments can provide habitat for a wide variety of animals. For example, standing trees killed by flooding can provide nesting habitat for great blue herons as well as cavity-nesting birds such as wood ducks and hooded mergansers. According to the report submitted by Milone and MacBroom, species observed in the marsh area included swamp sparrow, common yellowthroat, yellow warbler, wood duck, tree swallow, belted kingfisher and great blue heron. The brook flows through heavily shaded forested areas. Per Milone and MacBroom, species observed in this habitat include Louisiana waterthrush, black-throated green warbler, pine warbler, hermit thrush, Eastern wood pewee, and wild turkey. Other wildlife likely utilizing wetland habitat for

food and cover are raccoons, star-nosed moles, pickerel frogs, spring peepers and eastern garter snakes.

Open Fields

There are approximately 75 acres of fields on the property, some of which are utilized by the Equestrian Center for pasturing and training/jumping. Open fields are valuable to a large number of species; they are heavily utilized by many invertebrates, which, in turned are preyed upon by insect-eating birds and small mammals, which are then preyed upon by raptors and larger mammals such as red fox and coyote. Other species that make use of open fields include herbivores such as cottontails and reptiles such as garter snakes. Open fields such as these are in significant decline in Connecticut due to development and the decline of farming in Connecticut.

Wildlife Corridors

This large, undeveloped parcel now serves to connect or to provide a wildlife corridor between the large undeveloped traprock ridge area to the west and the undeveloped floodplain area associated with the Farmington River to the east. Because the proposed development site is connected to the east and west to other sizeable and valuable wildlife habitat patches, its value as wildlife habitat is increased. Additionally, the lack of large tracts of habitat in highly developed areas such as Simsbury further magnifies the wildlife value of those tracts still remaining. The development of a large, good-to-excellent quality habitat patch that also connects two other large undeveloped tracts will negatively impact the majority of the wildlife species in the area.

Impacts

This site currently provides good to excellent wildlife habitat due to its large size, diversity of habitats (including upland forest, vernal pools, riparian areas and open fields), and connectivity to other large areas of undeveloped land. Development of this site with single-family homes will negatively affect the existing wildlife habitat; these changes will be significant, extensive and lasting. Although plans call for approximately 275 acres to be left as open space, this will be of limited value because of the small, fragmented nature of the parcels. Outright habitat loss in the forested area will significantly change the species composition in the upland area because many species require specific habitat

conditions (including habitat size) and are unable to adapt to a suburban environment. Species diversity, both plant and animal, in the forested area is likely to decrease and the composition will shift to those species typically associated with suburban habitat (for example, American robin and blue jay are likely to become the more common bird species).

Wetland species that require large parcels of upland habitat in addition to wetland breeding pools are likely to decline in two ways: First, outright loss of habitat will make the area unsuitable for those species that require minimum forested acreages above the amount that will remain; second, because juveniles need to migrate from the vernal pools in which they develop to the upland habitat they utilize as adults, the addition of roadways and other hazards will certainly negatively impact populations. Calhoun and Klemens (2002) recommend that the upland areas around breeding pools up to a distance of 750 feet be considered critical upland habitat, that at least 75% of that zone be kept undisturbed and that a partially closed-canopy stand be maintained. The plans call for widening the existing road near VP-7 for emergency vehicle access. This has the potential to result in a decline in the productivity of this pool. The loss of this site as a whole as corridor habitat will negatively impact species with life history characteristics requiring multiple habitat types (for example, breeding vs. foraging habitat). Beaver-human conflict in the form of flooding is also a potential in the western portion of the property.

Reducing impacts

Given the number of single-family housing units proposed as well as the layout, reducing impacts to wildlife will be virtually impossible under the current proposal. At the very least, the development plans should maintain adequate buffer zones around the wetlands (including vernal pools, particularly the northernmost three). According to the best science available, a buffer of at least 750 feet from the wetlands into the uplands is needed to somewhat reduce the impacts to reptile and amphibian species using the upland forest area in conjunction with the wetland. The proposed open space amount would be much more valuable if it was contiguous and connected with less developed areas (along the western and northwestern portions of the property) and would also allow a portion of the parcel to continue functioning as a wildlife corridor. Concentrating the lots along the south-central portion of the property, eliminating the northern-most and western-most lots, and concentrating the open space in one piece connecting the northeastern and northwestern portions of the property would allow the site to retain some of its value for wildlife.

Summary

The proposed project will almost totally replace the existing forest with residential housing, resulting in a direct loss of habitat. Development in the forested area (including the wetlands) will affect the number and composition of species found. Even for the wetland areas with no development planned, there are still potential impacts to the reptile and amphibian species that use the wetlands in conjunction with the adjacent uplands. Most reptile and amphibian species are not very mobile and cannot easily seek out suitable habitat elsewhere once disturbance has occurred. Species that currently use this area for migration will no longer be able to do so. Given the scope and layout of the proposed development, the impacts to wildlife should be expected to be significant.

References

Calhoun, A. J. K. and M.W. Klemens. 2002. Best Development Practices: Conserving Pool Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States. MCA Technical Paper No. 5, WCS, Bronx NY, 57 pp.

Forest Vegetation Review

The study area comprises of 453 acres of which 373 acres are forested, 76 acres are open, and 4 acres are open swamp. The open portion of the property consists of fields, hedgerows, roads, and structures. The forested portion of the property can be divided into the following forest cover types, Mixed Softwood (230 acres), Mixed Hardwood (42 acres), and Forested Wetland (99 acres). See Forest Cover Type Map.

The property has a westerly aspect. Elevations on the property range from 220 feet in the northwest corner to 430 feet in the southeast. The topography is level to rolling with slopes ranging from 4 to 20 percent. The soils found on the property vary from excessively well-drained gravelly sandy loams to poorly drained silty loams and muck. In the forested portion of the property there is an estimated 99 acres of soils that are classified as inland wetlands. These soils are disbursed through out the site. The property has good access from Bushy Hill Road in the east. The operability of the property is good due to the extensive road system, the well-drained soils and the topography. The exception to this would be in the area of the wetland soils.

The property has sustained several timber harvests in the last 10 or more years. The most recent occurred in 2002 where a sawtimber thinning took place on 122 acres in the central portion of the property. The forest remaining from this harvest is comprised of small to medium sawtimber sized trees of white pine, black oak, red oak, white oak, and hemlock. A scattering of large diameter trees of white pine and oaks where left in the harvest area.

Forest Cover Type Description

Type 1 – White Pine/Hemlock Sawtimber: This type occupies the largest area of the forested portion of the property (230 acres). White pine is the predominate tree in the main canopy. Hemlock is present in varying amounts. Mixed hardwood species found in this type are black oak, white oak, red oak, scarlet oak, red maple, and black birch. The understory is comprised of seedlings and saplings of white pine, hemlock, red maple, and black birch. Shrub species present are huckleberry and highbush blueberry. The sawtimber thinning in 2002 took place in this type.

Type 2 – Mixed Oak Sawtimber: This type occupies 42 acres of the forested portion of the study area. Black oak, red oak, scarlet oak, and white oaks are the predominant species in the main canopy. Black birch, red maple, white pine, and

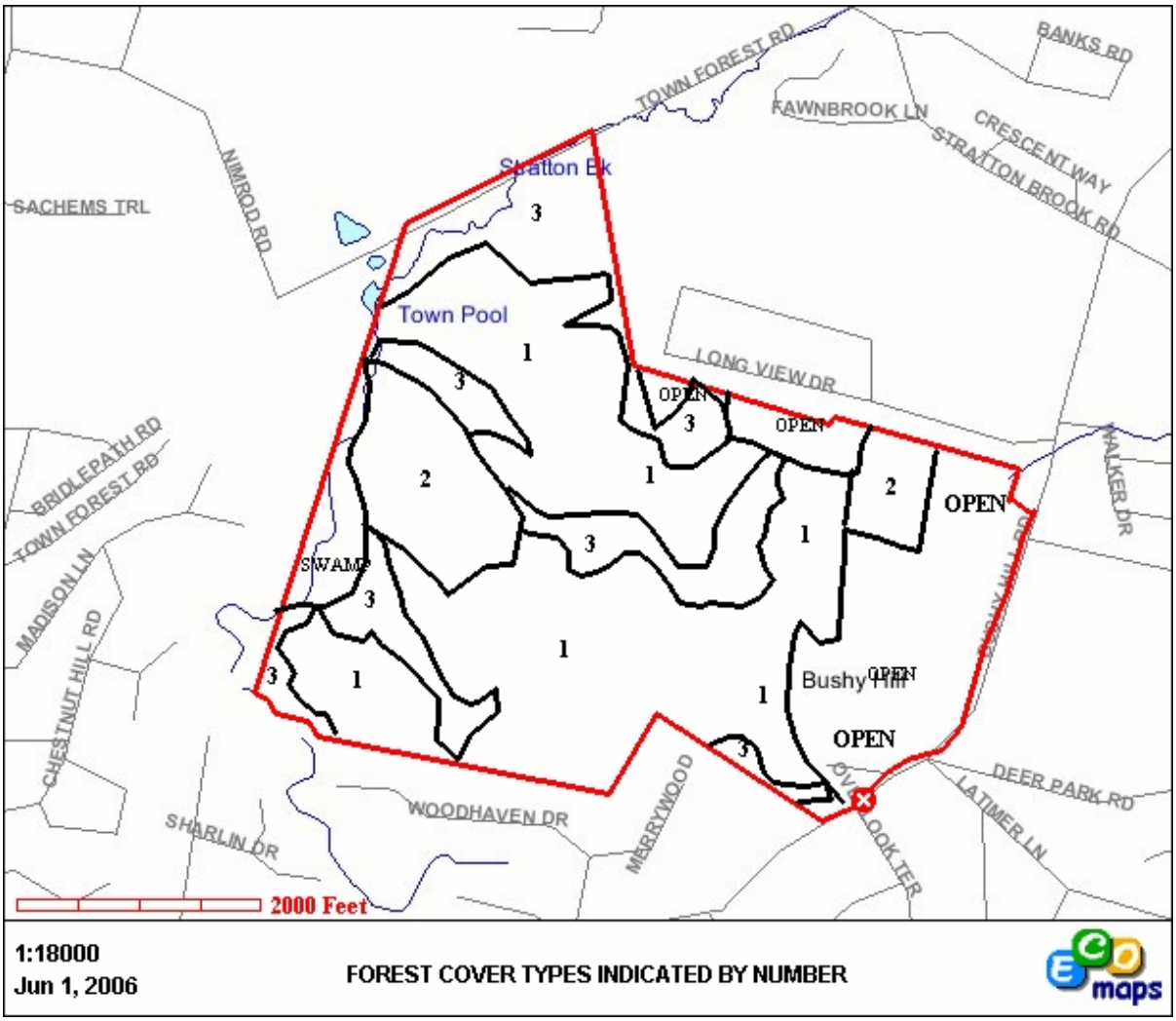
hemlock are present in lesser amounts. The understory contains seedlings and saplings of black birch, white pine and mixed oaks. Shrubs present are huckleberry and blueberry.

Type 3 – Forested Wetland: This type occupies 99 acres of the forested portion of the study area. Red maple, swamp white oak, white ash, elm, pin oak, hemlock, and white pine are found in the main canopy. Shrub species present are highbush blueberry, and spicebush.

Management Considerations

The development as planned will occupy the better-drained soils and will eliminate forest Types 1 and 2. Type 3 will be impacted by the increase in storm water runoff and the increase in windthrow due to removal of trees in the surrounding forest types. Trees within the development area remaining after site clearing may be subject to windthrow and damage during the construction process. The development will eliminate a working forest and fragment an existing greenway.

The developer should contract the services of a licensed arborist to evaluate, which trees should be retained as yard trees and design measures to ensure the trees survival after the construction process.



Legend

- Town Lines
- State
- Town
- Coastline
- Railroads
- Airports
- GDT Roads (Zip Geocode)
- Named Rivers and Streams
- Water
- Shore
- Named Rivers
- Named Lakes

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information there are records for State Special Concern *Terrapene c. Carolina* (eastern box turtle) from the vicinity of this property.

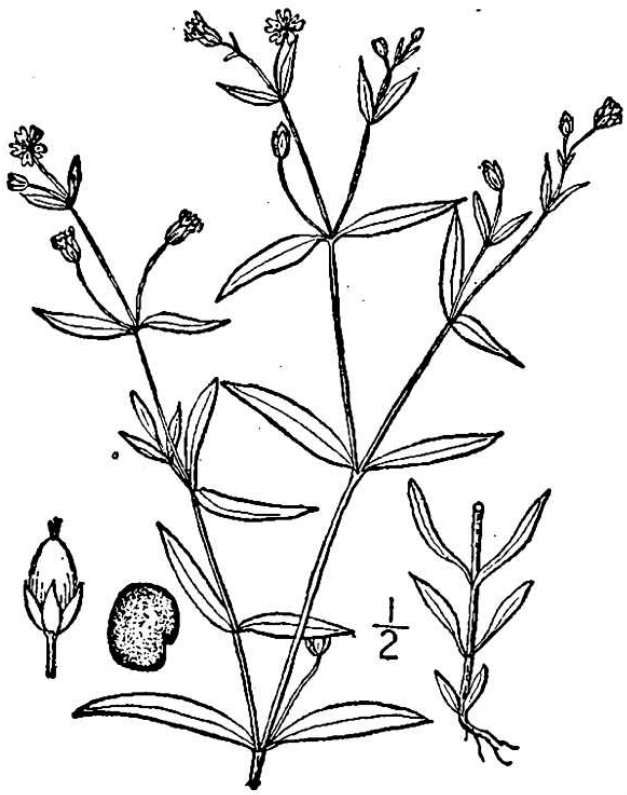
Eastern box turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds, the adults are completely terrestrial but the young may be semi-aquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year.

If Eastern box turtle habitat exists on the proposed site, the Wildlife Division recommends that a herpetologist familiar with the habitat requirements of this species conduct surveys between April and September to see if they are present. A report summarizing the results of such surveys should include habitat descriptions, reptile species list and a statement/resume giving the herpetologist' qualifications. The DEP doesn't maintain a list of qualified herpetologists. A DEP Wildlife Division permit may be required by the herpetologist to conduct survey work; you should ask if your herpetologist has one. The results of this investigation can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

Please be advised that this section of the Wildlife Division has not made a field inspection of the project nor have they seen detailed timetables for work to be done. Should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested.

The information on the box turtle was collected during surveys that were conducted in the town of Simsbury as part of a Farmington Valley Biodiversity Project. The Farmington Valley Biodiversity Project is a unique regional initiative done in cooperation with the towns of Suffield, Granby, East Granby, Canton, Simsbury, Avon and Farmington, the Farmington River Watershed Association, The Metropolitan Conservation Alliance and the Department of Environmental Protection. The purpose of the project was to conduct biological surveys within the Farmington Valley area and provide this information to the communities so that it could be used for local land use planning and open space activities.

We also have a record of a state listed plant species from the proposed project site. *Stellaria borealis* (northern stitchwort) is listed as State Special Concern (R.C.S.A. Sec 26-306). This species was documented in 2002 growing in the west central portion of the project site. The habitat is an acidic hemlock basin swamp with some white pine. It is recommended that the site design consider protection of this area if possible. We work to conserve State Special Concern Species with the goal of preventing them from becoming threatened or endangered. If you have any questions contact Nancy Murray (DEP-Wildlife; 860-424-3589 or nancy.murray@po.state.ct.us).



Natural Diversity Data Base information includes all information regarding critical biological 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 substitutes 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.

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.

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Archaeological and Historical Review

At the request of Landquest, LLC (consultant for the applicant) of West Harford, Dr. Marc L. Banks was contracted to conduct an archaeological reconnaissance survey of the westerly portion of the Ethel Walker School Subdivision property. Walkovers and surficial inspections of the project area suggested that portions of the properly were archaeological y sensitive. These potential areas were further surveyed by subsurface field testing. Dr. Banks' report "Archaeological Reconnaissance Survey of the Ethel Walker School Parcel," is on file with the Office of State Archaeology.

Several extant 20th century structures, a small building and two pump houses, were located within the project area. No evidence of earlier structures was encountered during the survey. A stone wall, possibly earlier that the structures, is located north of the fields above the horse barns. The survey yielded the remains of a charcoal kiln dating between 1740 and 1840. Charcoal kilns are found throughout Connecticut's uplands, particularly in the northwest hills.

During subsurface survey 347 test pits were dug along 13 transects within the project area. A total of 227 stone tools were recovered from six site areas defined. These sites represent localized hunting and gathering camps and hunting stands when stone tools were manufactured and retouched by Native Americans during prehistoric time periods.

Fortunately, the archaeological sites of significance that have been discovered are in areas of open space and outside the impact area of the proposed development. As a result, based on current plans, no further archaeological investigation is warranted. This review recommendation is conditional upon the avoidance of the prehistoric archaeological sites by all construction-related activities. The Office of State Archaeology and the State Historic Preservation Office wish to emphasize that should proposed plans change prior to final approval of the subdivision, and areas of significant site location cannot be avoided, then they request a further review opportunity.

Department of Public Health
Drinking Water Section Review

Introduction

The Department of Public Health Drinking Water Section (DWS) under the authority of Connecticut General Statute 25-32f offers comments and recommendations regarding sources of supply. The project proposal is a 103 lot residential subdivision (average lot size is around one acre) on over 400 acres of Class I Water Company Land. Class I Water Company Land is defined in the Regulations of Connecticut State Agencies (RCSA) Section 25-37c-1(c) as being either "(4) within two hundred feet of ground water wells; (or) (5) an identified direct recharge area or outcrop of aquifer now in use or available for future use". This project proposes development in areas that meet both of these definitions, as it affects two public water systems, and is located within a Level B Aquifer Protection Area.

Public Water Systems Affected

This project would affect two Community Public Water Systems, Ethel Walker School and Aquarion Water Company of Connecticut -Simsbury System. Ethel Walker School (CT1280051) is a Community Water System that is served by a gravel packed well. This public water system is considered a class 1 treatment plant and serves approximately 200 resident students and faculty, as well as other students and staff who commute.

The proposed project includes development (housing and roads) upgradient and within 200 feet of Ethel Walker's well making this Class I Water Company Land. This development would constitute a reduction of undeveloped land in the source water area of the this well, which could permanently adversely affect its susceptibility rating in the Source Water Assessment (SWP) Report completed in 2003 by the Department of Public Health (see Appendix B). The SWP reports assessed existing and potential contamination of Connecticut's drinking water sources, and offered specific recommendations and actions that could help protect these crucial and finite resources. Since these reports found a direct link with land development and degraded source protection, any increase in development in a source water area poses a risk to degrading the source and its associated water quality. Undeveloped land provides protection to drinking water quality through natural filtration. The specific issues are discussed in the Potential Impacts section of this review.

Aquarion's Simsbury System (CT1280021) is a Community Water System that serves over 13,000 people. Approximately 90% of the proposed development is within the DEP Level B Aquifer Protection Area (APA) for Aquarion's Stratton Brook Well field making this large parcel Class I Water Company Land. This aquifer is comprised largely of water bearing sand and gravel deposits, and the following map gives the location of the Level B aquifer boundary. Development is proposed upgradient and within 200 feet of the Stratton Brook, a tributary that leads directly to the Stratton Brook Well field. This development would entail a large reduction in undeveloped land in the APA, which could permanently adversely affect the susceptibility rating of Aquarion's source.

Potential Impacts

This development conflicts with State Policy from the *2004-2009 Conservation and Development Policies Plan for Connecticut* (State C&D Plan), which recommends that intensive development be guided away from existing and potential water supply watersheds and aquifers. The plan mentions requiring minimum lot sizes of two acres of "buildable" area (excludes wetlands). The average lot size of this application is approximately one acre, which is denser than the state plan recommends. The plan also recognizes the importance of Class I lands and does not support development of this land that could degrade water quality.

High density residential development has the potential for cumulative adverse impacts to drinking water quality. One of the largest concerns is the reduction in undeveloped land which provides source protection through filtration. Some of the other factors that adversely impact water quality are the creation of impervious surfaces from lots and roads, storm drainage, winter road maintenance materials (especially with the steep slopes, large amounts of salt and/or sand needed to maintain safe driving conditions), and all associated home chemical activities such as lawn products (herbicides, pesticides, fertilizers) and vehicle products including their use and storage. Maintenance of storm water management and other features is often a long term challenge as it carries an ongoing financial and time commitment. These collaborative impacts are the factors that increase the overall susceptibility of these wells to contamination. The State C & D plan recognizes that increases in impervious surface, stormwater management issues and chemical use associated with this type of development all increase non-point pollution which should be avoided in public water supply areas.

In addition, it appears from the application that there are proposed storm water discharges within 100 feet of a wetland or watercourse that would require a permit from the DPH pursuant to RCSA Section 19-13-B32(i) which states: The design of storm water drainage facilities shall be such as to minimize soil erosion

and maximize absorption of pollutants by the soil. Storm water drain pipes, except for crossing culverts, shall terminate at least one hundred feet from the established watercourse unless such termination is impractical, the discharge arrangement is so constructed as to dissipate the flow energy in a way that will minimize the possibility of soil erosion, and the commissioner of health finds that a discharge at a lesser distance is advantageous to stream quality. Special protections shall be taken to protect stream quality during construction.

Over time, all the above listed activities may degrade water quality which can lead to increased operation and maintenance costs for monitoring and treatment for the public water systems, which in turn results in higher prices for the water consumers. Degraded source quality can also constitute an increased health risk, as treatment is not always 100% effective and there are substances that community water systems are not required to test for, monitor, or treat. As the ERT report states, this parcel "is the primary recharge zone for the Stratton Brook Aquifer that provides roughly 60% of the source water for the Aquarion Water Company's system in town." This means development of this parcel could affect all of Aquarion of Simsbury's customers. The State C& D Plan recognizes the cumulative effects of incremental growth on source water areas and recommends guiding intensive development away from these areas.

Residential development is considered less intensive than many other development types. However, since there is still the potential for source water threats, the C& D plan and the DPH recommend formulating individual and regional drinking water source protection plans. A Drinking Water Quality Management Plan or DWQMP should be developed to oversee all activities, from construction and all long term issues, as well as address and manage any water quality issues. Best Management Practices (BMPs) for construction and for the protection of public drinking water systems with groundwater sources (may be found following this section) should be adhered to, and a well formulated DWQMP should address these point and non-point pollution issues. The residents of this area should be partners in the oversight of this plan and Aquarion and Ethel Walker School should be included in these initiatives.

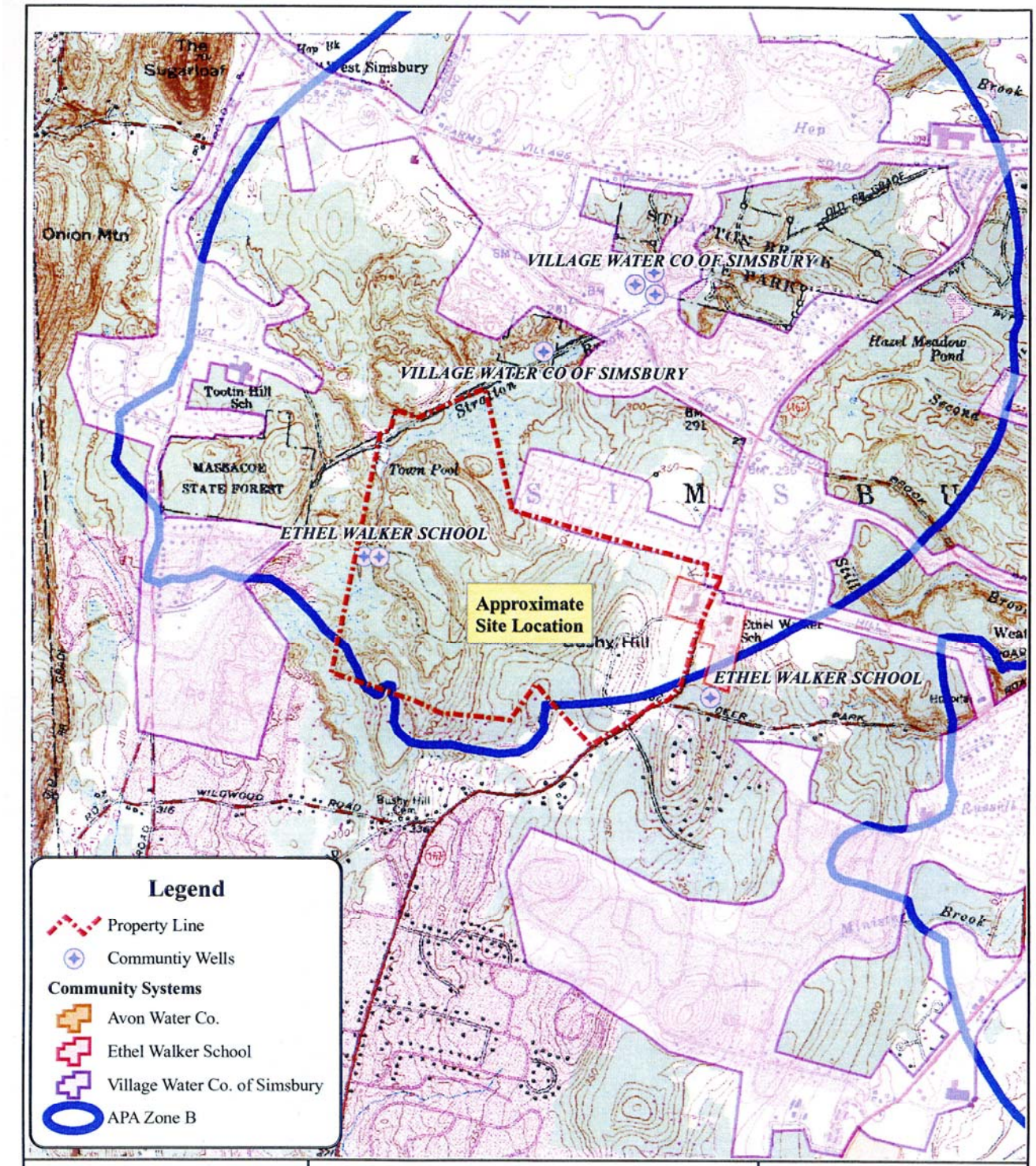
Public Health Laws

The parcel identified for development meets the definition of Water Company Lands in the RCSA Agencies Section 25-37c-2(a). Connecticut General Statute Section 25-32(b) states that "No water company shall sell, lease, assign or otherwise dispose of or change the use …without a written permit." The Department of Public Health has sent two letters to Ethel Walker School (6/17/05 & 12/27/05) declaring this information and as of this report have still not received any response or application from the school.

In addition, storm water discharges within 100 feet of a wetland or watercourse require a permit under RCSA Section 19-13 B32 (i).

Conclusion

In addition to the required applications mentioned in the previous section, the DPH finds developments are best located outside of Source Water Areas. The current proposal conflicts with the State C&D plan. However, residential development tends to be less intensive of a land use than other developments if the minimum two acre zoning is used and a stringent drinking water quality management plan was developed and adhered to.



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ETHEL WALKER SCHOOL
SITE FEASIBILITY STUDY

LOCATION: Simsbury, Connecticut

MMI#: 2041-18-00
MXD: H:site.mxd
SOURCE: DEP Bulletin 37

Water Service & Level B APA Zone

DATE: 7/20/04
SCALE: 1:24,000

SHEET: Figure 1

General Construction Best Management Practices
For Sites Within A Public Drinking Water Supply Area

- **Emergency Response Plan**. A response plan should be written for actions to be taken for the containment of accidental fuel or chemical spills that may occur during construction. Spill response equipment should be available on-site at all times along with personnel trained in the proper use of such equipment. A person or persons should be designated by the contractor for emergency response coordination on a 24/7 basis.
- **Vehicles and Machinery.** Designate one area for auto parking, vehicle refueling and routine equipment maintenance. The designated area should be well away from exposed surfaces or storm drains. Methods and locations of refueling, servicing, and storage of vehicles and machinery should be addressed and included as notes on the final site plans. Minor servicing and refueling of machinery should be completed on a fueling pad with containment. All major equipment repairs must be made off site. Onsite fuel storage should be discouraged.
- **General Site Conditions.** Keep pollutants off exposed surfaces. The burying of stumps or construction debris must not be allowed on the job site. Sediment fences and hay bales must be strategically placed, inspected and maintained to prevent sedimentation and erosion. Temporary storm water ponds and basins must be routinely inspected and maintained. If unexpected conditions occur, additional fences and hay bales should be available for use as needed to prevent runoff. Protect exposed stockpiles of soil to prevent runoff. Use as little water as possible for dust control. Clean up leaks, drips and other spills immediately to prevent or minimize soil contamination. Never hose down "dirty" pavement or surfaces where materials have spilled. Use dry cleanup methods whenever possible.
- **Hazardous Materials Storage.** Paints, paint products and other hazardous materials should be removed from the site during non-work hours or otherwise stored in a secure area to prevent vandalism. Place covered trashcans and recycling receptacles around the site. Cover and maintain dumpsters, check frequently for leaks, and never clean a dumpster by hosing it down on site.
- **Sanitation.** Make sure portable toilets are in good working order. Check frequently for leaks.
- **Notification.** If the project is approved, notification of the start date should be sent to the Public Water Systems as soon as it has been determined. Public Water System personnel should be granted site access to review compliance with site best management practices.

> The Public Water Systems *and this office must be notified immediately of any chemical/fuel spill at the construction site, along with the Department of Environmental Protection's Oil and Chemical Spill Response Unit*. Emergency telephone numbers and a statement identifying the construction site as a sensitive public water supply area should be posted where they are readily visible to contractors and other on-site personnel. A note should be added to the construction documents stating the sensitivity of the area.

Source Water Assessment Report and Best Management Practices for the Protection of Public Drinking Water Systems with Groundwater Sources may be found in Appendix B.

Planning Considerations

From a municipal planning perspective, the proposed subdivision at the Ethel Walker School presents several environmental, economic and social costs to the community. The expected increase in tax revenue from 103 large, expensive homes will off-set the municipal service costs of the proposal and the proposal to phase the development will help to temper its impact on the municipal budget. The proposal is within an R-40 zone, but has a housing density of well under one unit per acre, even discounting wetlands. Nonetheless, increased school enrollments, public safety and infrastructure maintenance costs, and increased traffic will result and are considerations for the Town. The increase in traffic on Bushy Hill Road, which would provide the only access to the proposed subdivision, would follow on the heels of increases resulting from the nearby large age-restricted housing development currently under construction. State and local officials need to carefully consider the cumulative traffic increase, the proximity of the proposed access road to the Ethel Walker and Cobb Schools, and subsequent safety concerns. Other local costs associated with the proposal include the loss of a significant open space that provides recreational opportunities for not only Ethel Walker students, but also Simsbury and regional residents, and habitat for wildlife. The site is one of the largest undeveloped parcels remaining in a community that has proven its desire to protect open spaces through its land and easement acquisitions.

From a broader planning perspective, the proposed subdivision poses further concerns because of its inconsistency with state and regional plans. The fragmentation of this significant forest into 103 single-family lots would be a loss to the natural resources and people not only in Simsbury but also throughout the region and state. The western half of the site is designated a Conservation Area in the 2005 State Plan of Conservation and Development, while the entire site is identified as an Aquifer Protection Zone. According to the Plan, Conservation Areas "contribute to the State's need for food, wood, water and minerals, or are important for sustaining native flora and fauna and the landscapes essential to scenic and recreational enjoyment." The Ethel Walker site is located on an important water resource, as the aquifer it recharges serves the water needs of about 60% of Simsbury residents. The site consists of a significant forest that has been managed for timber and recreational use. Finally, the parcel helps to maintain an undeveloped link between the traprock ridges in western Simsbury and the Farmington River Valley for use by wildlife.

The State Plan of Conservation and Development states that development within Conservation Areas may occur if it is designed in a way that is compatible with

the resources present in the Area. The proposed subdivision is designed to treat and maintain wastewater on-site in accordance with current best practices to protect the aquifer. While the proposal would conserve a large amount of open space, the subdivision would nonetheless negatively impact the forest, wildlife and recreational resources located there by fragmenting an intact forest. The subdivision would physically and legally divide a sizable tract of single-owner forest, which in and of itself is an increasingly rare resource in Connecticut. This division of ownership and interests makes it difficult to manage forest resources. Furthermore, the site's proximity to municipal and state forested open space increases its current value as part of an undeveloped corridor. Fragmentation would not only disrupt that corridor, but also change the site's ecology, creating more forest edges and thereby influencing the flora and fauna that persist and thrive there.

In addition, land uses under low-density residential development, can have greater ecological footprints than physical footprints. Homeowners can further alter the environment through landscaping practices (species choice, use of chemical pesticides and fertilizers, erosion, etc.). Property owner activities are especially of concern with this proposal, as many individual lots would contain significant slopes. In addition, noise, light and other emissions from homeowners have impacts on resources beyond lot boundaries.

Finally, the site's existing trail network is currently used for non-motorized passive recreation. While the developer proposes to incorporate some of the trails into the subdivision, the presence of houses will change the nature of the trail system and deter some current users. This is especially a concern with the proposed development, as the houses will not be visible from Bushy Hill Road and will have only one access point, lending an air of privacy or a feeling of a gated community. This represents a loss to not only Simsbury residents, but other potential and current trail users as well.

The proposal also conflicts with certain aspects of the Capitol Region's Plan of Conservation and Development. In that Plan, the site is partially designated "environmentally sensitive" and "development constrained land suitable for protection" primarily because of the existing wetlands and slopes. The specific goals and objectives with which this proposal is inconsistent include:

- Growing and developing in harmony with natural resources – allow increased development where there is existing infrastructure, reduce allowed development intensity in areas where infrastructure is not available and is not planned to be available, and encourage clustered housing;

- Improve and maintain water quality – evaluate and manage natural resources on a watershed basis;
- Support protection of more open space in the region – retain existing open space through public and non-profit acquisition;
- Guide growth to regional centers and areas of established infrastructure – encourage residential, commercial and industrial development in areas where adequate infrastructure is available.

Reliance on on-site septic in an aquifer protection area, while allowable under current standards, may not be the best use of the site in the long-term, especially when weighed against the value of the parcel under its current land use and cover.

Appendices

A. Appendix A – Soils Information
B. Appendix B – Source Water Assessment Report
Best Management Practices for the Protection of Public Drinking Water Systems with Groundwater Sources

Call the ERT Office for Appendix Information at:
(860) 345-3977