Chatham Ridge Subdivision Phase II

Preliminary Plan

Portland, Connecticut

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

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Portland, 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

Planning and Zoning Commission
Portland, Connecticut

June 2005

Report #591

CT Environmental Review Team Program
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Acknowledgments

This report is an outgrowth of a request from the Portland Planning and Zoning Commission to the Connecticut River and Coastal Conservation District (CRCCD) 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, April 6, 2005.

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I would also like to thank Nancy Mueller, town planner, Deanna Rhodes, assistant planner and ZEO, Geoffrey Jacobson, consulting town engineer, Don Mitchell, Chatham health District, Peter Gardner, surveyor, John Atkinson, applicant, John Martucci, project engineer and Mike Schaefer, consulting soil scientist, for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were given preliminary plans, and some Team members received additional materials after the field review. Some Team members also 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 landowner/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 the review of this proposed subdivision.

If you require additional information please contact:

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1. Introduction

Introduction

The Portland Planning and Zoning Commission have requested Environmental Review Team (ERT) assistance in reviewing a preliminary plan for a proposed residential subdivision.

The project is Phase II of a residential subdivision located to the southeast of the intersection of Stewart Hill Road and Great Hill Road. This phase is approximately 40 acres in size and will include 20 single family house lots with on-site sewage disposal and water supply wells. A new loop road is to be created that will connect with the nine lots already approved as Phase I. The property abuts Meshomasic State Forest and Rattlesnake Brook.

The DEP Natural Diversity Data Base confirmed that a State threatened species, Eastern Timber Rattlesnake, has been documented in the vicinity of this project.

Objectives of the ERT Study

The town has requested the ERT to assist in a preliminary review of Phase II by providing comments and recommendations on the following concerns: erosion and sediment controls, watershed management, stormwater management, wetlands, water quality, sewage disposal, fisheries habitat, rattlesnake habitat, and archaeological and historic significance.

The ERT Process

Through the efforts of the Portland Planning and Zoning Commissions this environmental review and report was prepared for the Town of Portland.

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, April 6, 2005. 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.

Figure 1

N

Topographic/Location Map

Scale 1" = 2000'

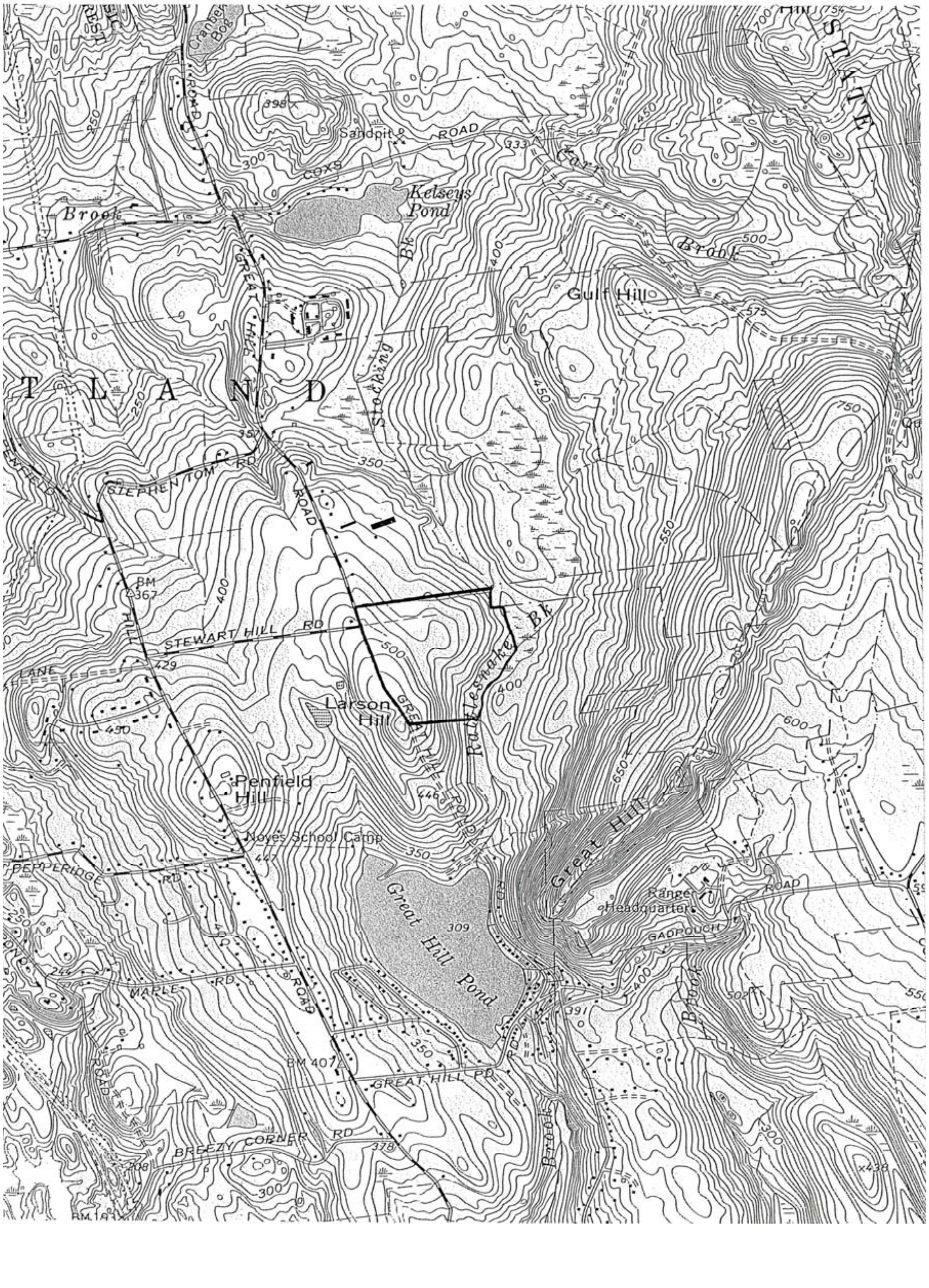
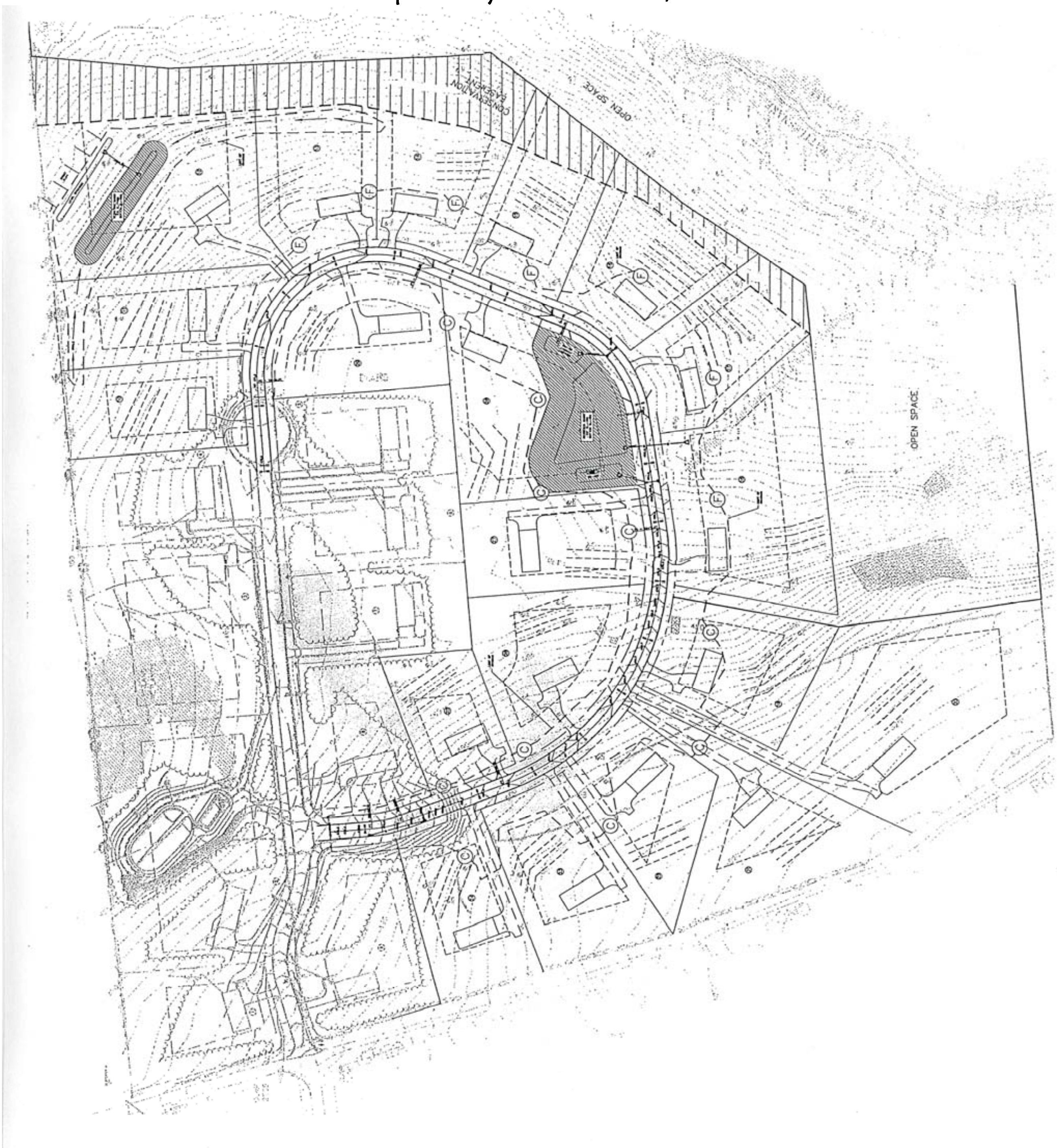


Figure 2

Overall Conceptual Layout – Dated 10/04



2. Topography and Geology

Topography

Chatham Ridge Subdivision is situated on the east facing slope of Larson Hill, an elongated drumlinoid-shaped hill. Larson Hill has a relief of about 150 feet and a maximum elevation of just greater than 530'. Topographic contours of Larson Hill are oval shaped with the long axis oriented north-northwest/south-southeast. Slopes on top of Larson Hill are gentle and rather smooth, but become moderate to steep on its south and east flanks.

Bedrock Geology

Larson Hill is underlain by Glastonbury Gneiss that is likely Ordovician in age (Rodgers, 1985) but remobilized in late Devonian time (Wintsch et al, 2003). It is on the overturned northwest limb of the Bolton Syncline, a structure that begins at Great Hill, just south of Larson Hill, and continues diagonally across the state of Connecticut toward West Stafford and into Massachusetts. Along the south facing and some of the east facing slopes of Larson Hill the Glastonbury Gneiss is exposed in extensive low outcrops. It is a fine- to medium-grained very weakly foliated granite- to granodiorite-gneiss. It is composed dominantly of sodium-feldspar, small amounts of quartz, biotite mica in elongate pods, and minor amounts of black hornblende-needles. The foliation is only apparent on careful examination of the rock with a hand-lens. Macroscopically the rock appears even grained and massive. Rare, small pegmatite veins cut the granite. They are up to a foot in width and contain sodium feldspar, quartz, and minor biotite mica.

Outcrops on and immediately adjacent to the parcel display well developed exfoliation fractures. Exfoliation fractures develop parallel or near parallel to the earth surface and form as a result of unloading (decrease in pressure) associated with erosional removal of the weight of former overlying rocks. The exfoliation fractures at the site are closely spaced at the surface creating slabs of rock several inches in thickness. The spacing of the fractures increases with increasing depth below the surface.

A quarry operation existed at the location sometime in the nineteenth century as evidenced by ubiquitous drill holes in the slabs. The drill holes do not have perfectly circular cross-sections. Rather some have slightly triangular cross-sections and some (mostly the smaller diameter holes) have pentagonal cross-sections. This is typical of hand held drill tools instead of power tools and suggests the quarry operation was early or mid- nineteenth century. The thinner exfoliation slabs of rock were cut into blocks that likely were used for construction. Some square cut blocks found left behind in the old workings add credence to that hypothesis. The quarrying did not extend more that a few feet below the original surface, possibly because at greater depths the exfoliation slabs were too thick to be practical.

Local tradition, expressed by town staff during the field review, states that the stones from the quarry were used to construct two arched overpasses for the former rail road of the "Airline Trail." One overpass takes the rail line over Great Pond Brook and the other takes the rail line over Middle Haddam Road just south of its intersection with Jobs Pond Road, both in Portland. The building-stones of the overpass on Middle Haddam Road were examined by the geologist Team member. The overpass is arched and forms a short tunnel that takes the road under the rail-line. The east abutments to the tunnel are constructed of arkosic sandstone ('brownstone') likely derived from the quarries along the Connecticut River in Portland. A reinforcing abutment was later built in front of the southeast abutment. It is made of blocks of coarse-grained granite gneiss containing potassium feldspars (pink) and having a poor foliation. The main part of the overpass and western abutments are constructed of blocks of moderately well foliated grayish granite gneiss containing cream colored feldspars (orthoclase?). Although the building stone from the overpass appears to be Glastonbury gneiss, it is not similar to that observed in the quarry operations at the proposed Chatham Estates Subdivision. It is likely that the building stones were obtained from another local quarry. The brook crossing overpass was on posted (No Trespassing) land and this Team member did not attempt to observe it. Interestingly, a retaining wall that was part of a culvert on Stewart Hill Road was constructed of stones almost identical to those observed in the quarries of Larson Hill.

Surficial Geology

Larson Hill has oval shaped contours that are elongate in a north-northwest/south-southeast direction. This suggests a drumlin shape and indeed it was mapped as a drumlin by Tharin (1973). It is covered by a thin veneer of glacial till that is less than 10' in most places. The till that was observed in test pits opened for collecting engineering information is composed of an upper portion that is "loose" and sandy or gravelly and a lower part that is "hardpan." This suggests that there may be till of two different ages: the hardpan is a compact older till and the loose till is that deposited during the last Ice Age. The northern-most slopes of Larson have thick till (Tharin, 1973; Stone *et al.,* 1992) that is in many places associated with older till (Stone *et al,* 1992)

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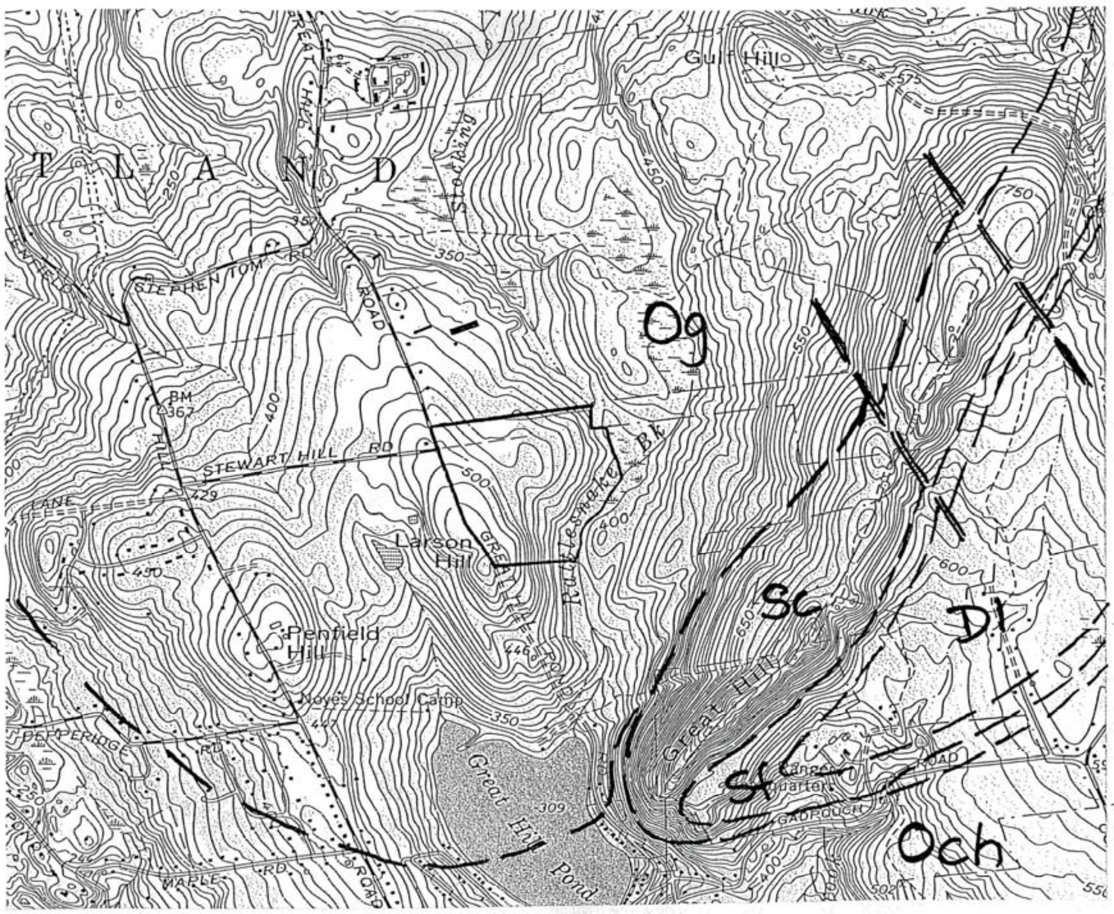
Figure 3

Geology Map

Scale 1" = 2000'



Explanation. Map after Eaton and Rosenfeld, 1972, and Chomiak, 1989.

Dl *Littleton Formation:* Silvery, medium-grained muscovite schist, staurolite and garnet bearing.

Sf *Fitch Formation*: Medium-grained muscovite schist with quartz and feldspar; locally with calcsilicate and calcite-bearing layers.

Sc *Clough Quartzite:* Medium- to coarse-grained, glassy, muscovitic and garnitiferous quartzite; schistose at top.

Og *Glastonbury Gneiss*: granodiorite intrusive on west side of Bolton Syncline; gray, medium grained; locally with pink microcline.

Och *Collins Hill Formation*: Muscovite-biotite schist and muscovite-quartz-feldspar gneiss. May be rusty weathering (Rodgers, 1985).

3. Connecticut River and Coastal Conservation District Review

District comments are advisory in nature, and are intended to assist municipal land use commissioners in the decision making process.

The following are general comments and recommendations regarding the proposed Chatham Ridge Phase II residential subdivision. Proposed activities include development of 20 single family residential lots served by on-site septic systems and water supply wells. A 24-foot wide loop road is proposed to connect to a subdivision road off of Great Hill Pond Road approved during Phase I of the project. Proposed stormwater management for the new section of road includes curbs, catch basins, sediment forebays, and a detention basin. Road runoff collected in the detention basin will discharge through a watercourse to the wetlands associated with Rattlesnake Brook to the south and east of the subject property. In addition a detention basin is shown behind Lots 10 and 11 to capture and detain runoff from Lots 10, 11, 12, and 13. This basin will discharge to a level spreader and then via overland flow to the wetlands north and east of the subject property.

Potential natural resource impacts of the proposed project may include sedimentation of on- or off-site water resources due to uncontrolled soil erosion during site development; post-construction degradation of downstream receiving areas by nonpoint source pollutants (e.g., road deicing materials, fertilizers, pesticides, and heat); and the hydrologic alteration or loss of stability of on- or off-site wetlands. These impacts can be minimized through careful site design, implementation of erosion prevention and sediment controls, and appropriate stormwater management.

Comments in this report are based on a review of:

- an Overall Conceptual Layout plan (5 sheets) dated October 8, 2004 prepared for Chatham Ridge Associates, LLC;
- a Plan Showing Property of Chatham Ridge Associates, LLC, Great Hill Pond Road, Portland, CT dated November 2001;
- a report titled Test Pits for Chatham Associates, property located at Great Hill Road and Stewart Hill Road, performed on 4 dates;
- a site visit conducted on April 6, 2005.

ERT Field Review 4/6/05

Current Site Conditions

The 40 acre site is mostly comprised of sloping to strongly sloping (10 to 20%) wooded uplands, with some gently sloping (3-5%) areas in the north western portion of the proposed development. The majority of Chatham Ridge Phase II drains eastwards towards Rattlesnake Brook, a tributary to Great Hill Pond.

Upland soils shown in the project area on the Soil Survey Maps for Middlesex County (USDA/Soil Conservation Service) are extremely stony fine sandy loams. Soils mapped in the project location are similar to those on the USDA/NRCS Statewide GIS soils coverage with the exception that Sutton fine sandy loams are shown on the GIS rather than Woodbridge fine sandy loams. This difference could be important since Sutton soils do not have the shallow hardpan layer found in Woodbridge soils. Results of the on-site soil testing (test pit data) however indicate a sandy hardpan layer exists throughout the site. This suggests that soils are more likely to be Woodbridge than Sutton. Regardless, caution should be taken when using either the soil survey maps or GIS coverage for site-level planning since at this scale soils in a single mapped unit can differ in slope, depth, drainage, and stoniness. Soil physical properties and potential development limitations of soils in the project area are summarized in Table 1.

Table 1. Summary of upland soils mapped in the proposed Phase II project area

	SOIL MAP UNIT		
	WzC	CcB	CdC
Soil Type	Woodbridge	Canton and Charlton	Canton and Charlton
Stoniness	Extremely	Very	Extremely
Slope (%)	3-15	3-8	3-15
Hydrologic Group	C – low infiltration & high runoff	B – high infiltration & low runoff	
Drainage	Moderately Well	Well	Well
Erosion Potential	Moderate[1]	Moderate	Moderate to Severe
Restrictions on Site Development Activities:			
Principal Limitations	Seasonally high water table at ±18 inches, low permeability substratum (hardpan layer), slow percolation rates, frost action, stoniness	Stoniness	Stoniness and slope
Buildings w/ or w/out Basements	Severe[2]	Moderate	Severe
Lawns and Gardens	Severe[2]	Moderate	Severe
Shallow Excavation	Severe[2]	Severe	Severe

[1]*steep slopes of excavations slump when saturated,* [2]*wet - may require artificial drainage*

Development potential of Woodbridge soils is limited. Limitations are primarily related to the underlying compact substratum, or hardpan layer, that is slow to very slowly permeable. In these soils once the surface and subsoil are saturated water will no longer infiltrate but will drain along natural topographic features into low lying drainageways and depressions. The site topography is such that the majority of surface runoff will be directed eastwardly to the wetlands associated with Rattlesnake Brook. While there is a good distance to the brook through wooded uplands (approximately 300 feet), slopes are in excess of 20% in some areas and runoff from disturbed areas could both carry sediments and become concentrated to impact downslope resources. The potential to impact downgradient resources is greatest where surface flows concentrate into the on-site intermittent watercourse that discharges to the Rattlesnake Brook.

The nature of fine sandy loam soils in combination with high runoff rates and volumes due to the slowly permeable hardpan layer in Woodbridge soils increases the potential for erosion during site development activities. Once in suspension the fine particles in these soils settle slowly, and can cause turbid discharges even if standard erosion and sediment controls (e.g., geotextile silt fence or sediment traps) are installed and maintained correctly. Therefore, additional care should be taken to ensure appropriate erosion and sedimentation control measures are provided both on the plans and on site during construction activities.

Recommendations

The site plans provided for review are conceptual and do not depict proposed clearing or grading limits, do not provide detailed information on the proposed stormwater management system beyond the potential location of two detention basins and associated outlets, and do not include soil erosion and sedimentation controls. Based on site topography and soil test pit results indicating ledge at varying depths between 20 and 50 inches, considerable grading (cuts and fills) and blasting may be required to construct the proposed residences, roadway, driveways, and stormwater infrastructure associated with the Phase II development. Development of more detailed site plans should consider the recommendations and guidance provided in both the 2002 CT Guidelines for Soil Erosion and Sedimentation and the 2004 CT Stormwater Quality Manual.

Natural Resources Protection

The most notable natural resource is Rattlesnake Brook and its associated wetlands to the east of the proposed development site. In addition the some of the proposed development site may serve as rattlesnake foraging habitat. Consideration should be given to preserving as much wooded upland as possible between the development and the brook especially considering the site is adjacent to the Meshomasic State Forest.

1. The total amount of clearing required to construct the individual lots, driveways, subdivision road and associated stormwater infrastructure should be kept to a minimum. This will help preserve the intact upland wooded habitat associated with Rattlesnake Brook, minimize the potential for erosion and sedimentation, and help

ensure the physical characteristics (hydrology and water quality) of the brook and intermittent watercourse are protected.

a) The need to construct the northern basin to detain runoff from four lots should be carefully considered. Construction of this basin and stormwater outlet structure will require clearing approximately ½ acre (25,000 square feet) of wooded uplands.

b) Clearing only the primary septic leaching fields and leaving the reserve areas vegetated should be considered in order to minimize the total disturbance on each lot.

c) Some septic system leaching fields are shown in areas with 20% slope and may require extensive grading to construct. Alternative less steep locations for these systems should be considered.

d) Proposed development activities on rear lots 20 and 21 should be relocated closer to the proposed subdivision road.

2. The total amount of grading required to construct the individual homes, septic systems, road, and stormwater infrastructure should be kept to a minimum since erosion from disturbed areas such as cut and fill slopes can be a major source of downgradient sedimentation. The plans as currently shown require an approximate 4-8 foot cut for the southern detention basin and a 2-6 foot cut for the northern basin. First floor elevations are not shown for the proposed houses or septic fields therefore it is not possible to determine the extent of cutting or filling that will be required.
3. The pre-development hydrology (runoff velocity and volume) of the on-site watercourse should be preserved. Discharges to this watercourse should not cause channel erosion and subsequent downgradient sedimentation.
4. All opportunities to minimize the amount of residential lawn, semi-impervious and impervious surfaces should be evaluated, including the extension of conservation easements to preserve and protect intact wooded uplands on individual lots.

Stormwater Management

A stormwater management program should be provided that will mitigate both runoff quantity and quality in order to protect downgradient resources from erosion, flooding, and nonpoint source pollution. Roads, lawns, and roofs can all be sources of nonpoint source pollution (sediments, nutrients, heat), and best management practices should be employed to limit their potential impact on natural resources.

1. Low impact and alternative site design practices as detailed in the 2004 CT Stormwater Quality Manual should be considered, for example disconnecting impervious surfaces.
2. Where subsurface conditions allow stormwater runoff should be infiltrated back into the soil. Discharges from roof leaders and ground water control measures (footing

drains) are generally free on nonpoint source pollutants and do not require the same level of treatment as road runoff.

3. A stormwater water quality treatment train approach using multiple practices (both **primary** and **secondary**) in parallel should be considered. Pretreatment practices should be included, for example deep sump catch basins, hydrodynamic separators, and stormwater basin forebays. The stormwater management plan should demonstrate that an adequate level of pollutant removal will be achieved, e.g.:
   a) A target pollutant removal of 80% total suspended solids.
   b) Treatment of the water quality volume (WQV) also called the first flush (1" of rainfall).
   c) Pre-treatment forebays sized for 10% of the WQV with an adequate depth to prevent resuspension of collected sediments during storm flows.
   d) All practices have an adequate capacity and drainage area to function properly.
4. Detailed plans for each of the proposed basins should be provided and include information on required construction, planting, monitoring, and maintenance. In particular if stormwater quality basins will be proposed the plan should include:
   a) Supervision of construction/planting of the basins by a qualified wetland scientist.
   b) Monitoring of groundwater levels prior to final grading and planting to ensure that hydrologic conditions will support proposed vegetation and pollution removal functions.
   c) A detailed list of proposed plantings for each basin.
   d) A schedule to inspect plant establishment and survivability, water levels, and slope stability (recommended twice per year for first five years).
   e) The name and number of the individual/organization responsible for the inspections.
   f) Optimal planting dates for the proposed plantings.
   g) Details on invasive species monitoring and removal.
   h) Requirements for maintaining the basins and the name/number of the individual or organization responsible for routine maintenance.
5. Water quality inlets, otherwise known as oil/particle separator, are a secondary treatment practice that achieves pollutant removal through gravity separation in a series of baffled chambers. A number of factors limit the treatment capacity of water quality inlets, including resuspension of trapped sediments, ability to treat only relatively small contributing drainage areas, and the necessity for frequent maintenance. Hydrodynamic separators (e.g. vortechnics or stormceptor units) have a higher level of pollutant removal capacity than water quality inlets, and should be considered when downstream receiving areas have high water quality and/or habitat value. If water quality inlets will be proposed the following should be considered:
   a) Efficacy increases when used in an **off line** configuration to treat peak flow associated with the WQV.
   b) The impervious cover of the contributing drainage area to each water quality inlet should generally be limited to 1 acre or less.

c) A permanent pool volume of 400 cubic feet per acre impervious area should be provided.
d) Maintenance is critical to the continued function of water quality inlets – monthly inspections and cleaning once a month to once every six months may be required depending on the season.

Erosion and Sedimentation Control

A soil erosion and sediment control plan was not provided on the plan sheets for review, therefore only general recommendations are included below. All efforts should be made to proactively minimize the potential for uncontrolled soil erosion, and to ensure that erosion does occur sediments are controlled before they impact natural resources. The E&S plan and narrative should note that all elements must conform to the 2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control (2002 Guidelines).

1. Activity limits and wetland boundaries should be flagged prior to beginning clearing, grubbing, or grading activities for the stormwater infrastructure, utilities, subdivision road, driveways or individual lots.
2. A construction phasing plan should be provided that limits the total amount of land disturbance on site at any given time.
3. As a precaution doubled sediment controls should be used at the toe of cut/fill slopes. For example, a second row of geotextile silt fence or the addition of hay bales, wood chips, or stone berms may be prudent especially where the contributing drainage area exceeds the recommended 1 acre.
4. Extra erosion control and sedimentation protection should be provided for disturbed areas draining to the on-site watercourse because it discharges to Rattlesnake Brook.
5. Proposed cut/fill slopes should be 3:1 or flatter. Flatter slopes are easier to stabilize and maintain and pose less of a risk of potential erosion and sedimentation to downstream receiving areas.
6. The use of temporary erosion control matting or blankets on all cut/fill slopes should be considered in order to provide more immediate stabilization.
7. Methods such as construction sequencing/timing to limit the duration of exposure, the application of temporary seeding or non-living soil protection within 7 days or once final grading is complete, and controlling stormwater runoff using temporary diversions and earth berms should be applied to all exposed areas.
8. Sediment barriers (geotextile silt fence or hay bales) should have perpendicular wings in areas that run across the slope in order to reduce runoff velocities. The sediment barrier details should note for slopes > 5:1 perpendicular wings placed every 100 ft; for 3:1 to 5:1 every 75 ft; and for 2:1 to 3:1 every 50 ft (per the 2002 Guidelines).
9. Temporary sediment traps or basins and diversion measure(s) to direct runoff to the proposed basin and trap should be specified in accordance with the 2002 Guidelines. Traps and/or basins should be located to minimize potential impact to wetlands, for example, where they can discharge to overland flow across natural soil and

vegetation. In addition, due to fine sandy nature of site soils a plan to ensure that fine suspended particulates if they become a problem will be captured and not discharged should be provided (e.g., through the use of flocculants if necessary).

10. Due to the potential for shallow depths to groundwater, controls for dewatering operations should be included on the detail sheet per the 2002 Guidelines (e.g., pump intake and outlet protection or pumping settling basins control measures).
11. Adequate controls to break erosive flows on the subdivision road and driveways should be provided. Some portions of the road and some of the driveways will most likely be steep enough to cause concentrated flows (5% or more). The use of appropriately spaced water bars that will slow the flow on the roughed in road and driveways should be considered as well as temporary diversions or temporary fill berms to direct surface flows away from the cuts/fill slopes until they are completely stabilized.
12. A planting plan should be provided for all areas of the site that will be disturbed. The use of native plant species should be encouraged throughout the site.

4. Wetland Review

The Mapped Wetlands Observations

The plans do not show much impact on the on-site wetlands. The dominant wetland features are the intermittent watercourse to the southeast and Rattlesnake Brook to the east. Rattlesnake Brook after leaving the vicinity of the site flows about 2,100 feet into Great Hill Pond. A vernal pool was located along the logging road behind proposed lots 16/17.

Vernal pool egg masses

Concerns

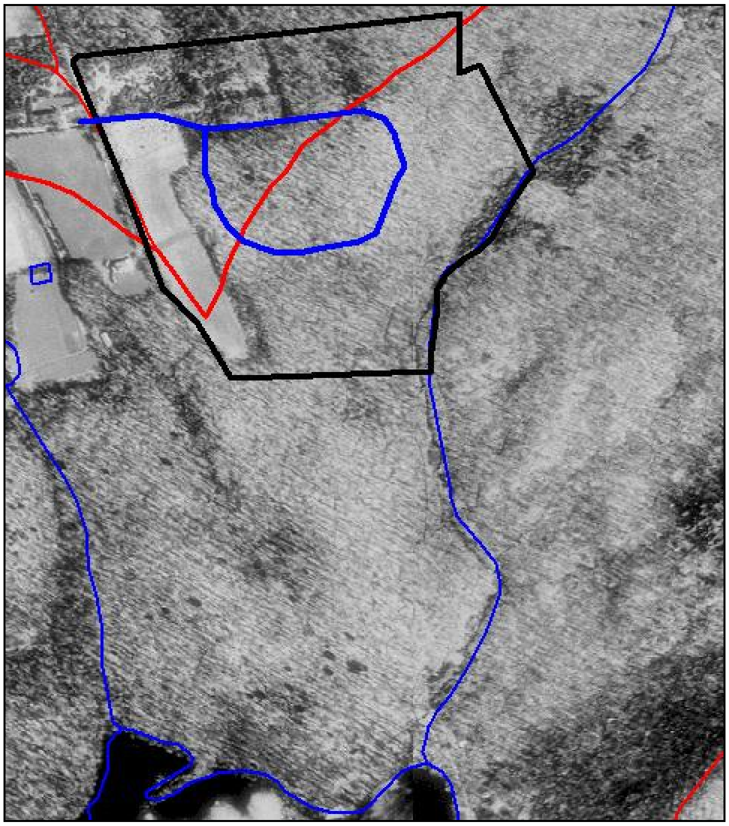
Intermittent Stream course

Just below the large white oak tree on Lot 18 a seep begins its surface flow. It passes downslope about 675 feet before emptying into Rattlesnake brook.

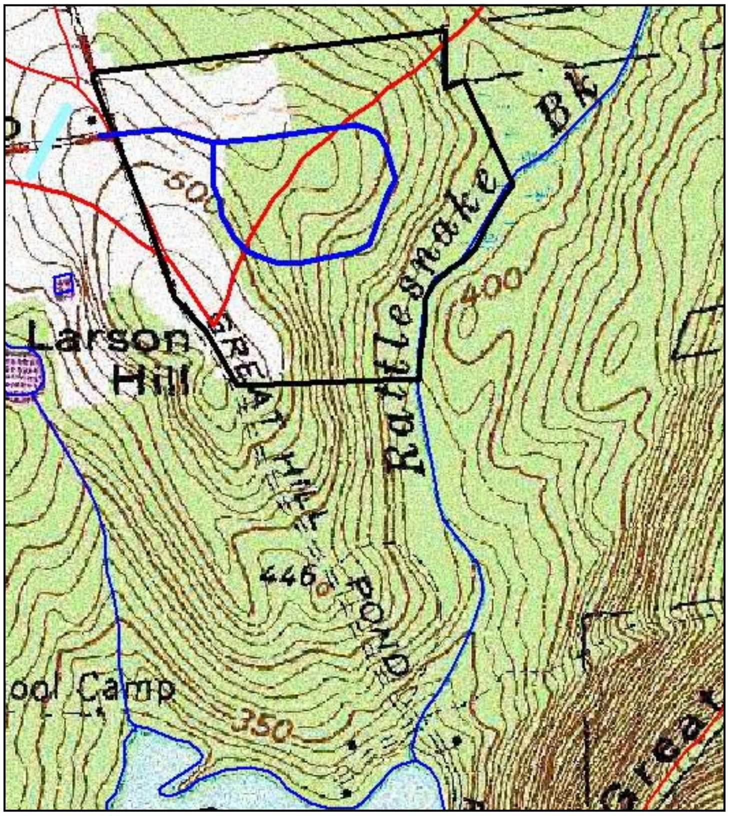
The main concern here is that the energy dissipating mechanism that will serve as the discharge point from the detention basin east of Lot 27 should be kept well away from the watercourse. The landscape here offers such a rough surface: boulders, rocks, fallen trees, and extensive leaf accumulation (lots of infiltration potential) that the surface itself can dissipate much energy once the outflow comes off the level spreader and before it hits the watercourse.

Drainage into Rattlesnake Brook

There is cause of concern as to the overall change in surface drainage. As can be seen on the topographic map and the aerial photograph below, the drainage divide crosses the parcel on a diagonal from the northeast to the southwest. This divides the parcel approximately 42% to the northwest and 58% to the southeast. The northeast section will drain generally north into the Stocking Brook drainage and southeast of the line will drain to Rattlesnake Brook. These percentages have been, for the most part, maintained in the system of catch basins and storm drains. On average, there are no structures within 300 to 500 feet of the Brook.



This 1990 aerial photograph shows the approximate parcel boundaries, water courses, proposed road way, and drainage divide.



This view of the USGS topographic map shows the same line work as on the previous page but with the topographic lines provided to show the relief of the parcel and surrounding landscape.

Vernal Pool

The Team did encounter one breeding vernal pool. It was located in the open space portion of the site several hundred feet from the nearest structure with a conservation easement between the structure and the pool. It is in the area behind proposed Lots 16/17 along the logging road. There were 28 egg masses counted, a combination of wood frog and blue spotted salamander.

Other Comments

- Deed restrictions need to be documented so homeowners understand the preservation efforts that will have gone into the protection of the resources on their parcels.

- Road width/impervious surface - There was discussion at the ERT meeting concerning reducing the road width from 28 feet to 26 feet, The Nonpoint Education for Municipal Officials (NEMO) website (http://nemo.uconn.edu/index.htm) From NEMO TECHNICAL PAPER NUMBER 1 states: "Research shows that for most local roads all that is needed is 20' or 24' road widths composed of two 10' or 12' travel lanes."

- Design 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." According to the Swift Report, "... as the street widens, accidents per mile per year increases exponentially, and that the safest residential street width is 24 feet." (This Team member can provide copies of the Swift Report for anyone interested.)

- The detention basin to the north of the entrance road, in Phase I will be planted with wetland plants and constructed to a depth that would allow for a year round wet substratum.

The Town should pursue discussion with Chatham Ridge Associates to offer the same treatment for the large basin east of Lot 27. Depending on the proposed basin bottom size, this may approach as much as one half acre (~22,000 square feet) of new wetland habitat.

- As the town continues to oversee the development of large parcels, it would benefit the wildlife, wetlands and water quality to create or maintain hydrologic and or wildlife corridors between parcels.

5. 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. Additionally, the quality of stormwater runoff (post construction) could be degraded by the presence of pollutants such as total suspended solids, nutrients, and pesticides.

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 to the maximum extent possible, by eliminating curbs, utilizing pervious pavement, installing vegetative swales, and employing level spreaders.
- 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.

The construction of Chatham Ridge Subdivision, Phase 2 ("site") will be regulated by the General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities ("the construction general permit"). In accordance with Sections 4(c) and 6(b)(6) of the construction general permit, respectively, a registration form must be filed and a Pollution Control Plan ("PCP") must be prepared and implemented. The following review comments are based upon the requirements of the construction general permit and review of the Overall Conceptual Layout Plans dated October 8, 2004 and the Preliminary Drainage Report dated April 26, 2005. A more detailed review was not possible as the wetlands delineation map, erosion and sediment control plans, grading and utility plans, and detail sheets were not available for review.

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. Please 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/ threatened species are present in the project area, please contact Dawn McKay of the DEP at 860-424-3592. The project will not be permitted under the construction general permit until compliance with these regulations/ statues is achieved.

The owner or developer must register the site with the Department of Environmental Protection ("DEP") thirty days prior to the commencement of construction activity. The Pollution Control Plan ("the PCP") must be prepared and kept on site during the entire life of the construction project for sites with soil disturbance between 5-10 acres. The PCP is required to be submitted to the DEP with the registration form for sites with soil disturbance greater than 10 acres.

The PCP must include a site map as described in Section 6(b)(6)(A) of the construction general permit and a copy of the erosion and sedimentation (E & S) control plan for the site. An E & S plan which has been approved by the Town of Portland in conjunction with the DEP Inland Water Resources Division (IWRD) and the local Soil and Water Conservation District may be included in the PCP. The PCP and site map must include specifics on controls that will be used during each phase of construction, pursuant to Section 6(b)(6)(B) of the construction general permit. Specific site maps and controls must be described in the PCP, as well as construction details for each control used. The construction general permit requires that "the plan shall ensure and demonstrate compliance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control." The Plan must be flexible to account for adjustment of controls as necessary to meet field conditions.

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 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 seeded. 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 PCP must demonstrate that the post-construction stormwater treatment system has been designed with a goal of 80% removal of total suspended solids, pursuant to Section 6(b)(6)(C)(iii)(1) of the construction general permit. Such measures may include, but are not limited to, stormwater detention basins, stormwater retention basins, swirl concentrator technology structures (such as

Vortechnics, Downstream Defender, Stormceptor, Stormtreat, or similar), 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 (Section 6(b)(6)(D)) requires inspections of all areas at least once every seven calendar days and after every storm of 0.1 inches or greater. 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.

The following are comments specific to review of the conceptual layout plan:

- During construction, a sediment trap and/ or a sediment basin with the ability to store 134 cubic yards of water storage per acre drained must be installed for drainage areas greater than 2 acres. For drainage areas where more than 5 acres is disturbed at any time, a sediment basin with an outlet engineered to remove sediment must be installed. Although the conceptual plan shows the installation of a detention basin to manage post-construction stormwater runoff, the installation of sediment traps/ basins for treating runoff during construction is not proposed.

- The DEP strongly recommends a buffer area exist between the detention/ sediment basin and wetlands areas. The presence of a buffer area is of particular importance during construction to prevent the discharge of fine soil particles which are not removed effectively by sedimentation. Should a basin(s) fail due to inadequate design, lack of maintenance, etc., the absence of a buffer area would result in the immediate contamination of the wetland areas with sediment. A discharge of sediment to a wetland or watercourse without a permit would be a violation of Section 22a-42a(c)(1) of the Connecticut General Statutes and may require remedial action.

- To prevent an adverse impact to nearby wetlands, watercourses, and Great Hill Pond, DEP recommends the utilization of a flocculation agent(s)[1] when the use of all other reasonable controls is not adequate to prevent pollution. Flocculation agents are typically most effective when installed in drainage swales, sediment basins, and catch basin sumps.

- The sediment forebays should be sized for 10% of the water quality volume with a 2:1 length to width ratio and designed in accordance with the guidelines specified in the 2004 CT Stormwater Quality Manual ("the Manual").

- In order to promote velocity reduction and solids settling, DEP recommends constructing the forebay berms with the appropriate size of riprap with a core of stone (DOT #3).

[1] The manufacturer must provide test data showing the flocculant is non-toxic (products such as the Floc-log or similar).

6. Concerns From A Watershed Perspective

These recommendations to the Town of Portland 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[2]. 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.

If the following recommendations overlap or conflict with those of other ERT members; please defer to the individual who has the greater expertise.

Introduction

This reviewer's comments on the proposed plans for the Chatham Ridge Subdivision Phase II 20-lot subdivision in Portland are somewhat general in that there was insufficient detail provided on the proposed final grading and stormwater drainage collection system. There are two major issues of concern: 1) the proposed development of lots 13 through 18 located on steep slopes on the southwest side of the subdivision, and 2) chief reliance on the detention basins to control stormwater runoff. A third, unavoidable problem is the location of the subdivision within the foraging area of the state endangered timber rattlesnake.

The timber rattlesnake is one of only two venomous snakes found in Connecticut and protected under the state's threatened and endangered species legislation, Connecticut General Statutes §26-311. Indiscriminate killing, illegal collection and

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

loss of habitat in the past has resulted in the severe decline of timber rattlesnake populations; eliminating them from many parts of their historic range. Timber rattlesnake habitat is deciduous forest (often second growth) in rugged terrain with steep ledges, rock slides and a nearby water supply. Their food source is primarily mice, other small mammals, like voles, shrews, chipmunks and squirrels, and occasionally birds. Disturbance by humans and lack of suitable den sites appear to be the major limiting factors for rattlesnakes in Connecticut. In areas of the state where timber rattlesnakes still exist, intensive land development can place humans in the species' migratory path. In residential areas, timber rattlesnakes may be discouraged from using yards by removing hiding places, such as keeping grass cut short and removing brush piles and stone walls. Usually, human presence is sufficient to drive off a snake. If a snake persists, the DEP's Wildlife Division should be contacted at 642-7239, or DEP Communications at 566-3333 to find volunteers in the area who are qualified to handle venomous snakes. **No attempt should be made to remove a timber rattlesnake by oneself as the species can become aggressive when handled.** The developer should include the DEP's Wildlife Division contact number with a warning of the possible presence of timber rattlesnake on the subdivision plans for the future homeowners' reference. (Please also refer to The Natural Diversity Data Base section of this report.)

The proposed 20-lot subdivision is an expansion of the recently approved 9-lot subdivision (Phase I). Although Phase II does address stormwater control and proposes a conservation easement to buffer the wetlands and water resources, greater effort can be made to reduce the cost and maintenance of the stormwater collection system while improving water quality and reducing water quantity. Additionally, an alternative subdivision configuration may minimize the potential for soil erosion and sedimentation during and post-construction as a consequence of developing the steep slopes to the south.

Water Quality Classification

The subject parcel falls between two natural drainage basins (watersheds). The north and northwest portions eventually drain to Carr Brook (subregional drainage basin number 4012), while the western and southern portions of the site drain to Rattlesnake Brook which empties into Great Hill Pond, and ultimately outlets to the Connecticut River main stem (drainage basin number 4000). For the purposes of this report, this reviewer is focusing only on that portion of the site that drains to the latter.

A watershed is the land area that drains to a common receiving water body such as a stream, lake or wetlands. It is an easily identifiable landscape unit that ties together terrestrial, aquatic, geologic, and atmospheric processes. Rattlesnake Brook has a surface water quality classification of A, as does Great Hill Pond. Class A surface waters are known or presumed to meet the criteria which support the following designated uses: 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 quality designation for the area is Class GA which has the following designated uses: existing private and potential public or private supplies of water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies.

As a consequence of the surface and ground waters associated with this site being designated as high quality, the 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.

Stormwater Runoff

Much of the information provided here comes from DEP's new guidance document, the 2004 Connecticut Stormwater Quality Manual[3]. It discusses in detail the "what's", "why's", "how's", and "where's" of stormwater management. As development occurs, impervious area increases and new sources of stormwater pollutants are introduced, accumulating pollutants between storm events. As it rains and snowmelt rolls over the ground surface, it picks up pollutants and contaminants (even thermal effects), which may then subsequently be collected by a stormwater conveyance system 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, decrease the amount of precipitation that percolates through the ground to recharge aquifers, thus allowing for their slow release as base flow in streams during low flow periods. By contrast, in undeveloped areas, natural processes such as infiltration, interception, depression 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 water body to handle such flows, thereby causing flooding, erosion and sedimentation, and physically altering the aquatic habitat. Examples of such stormwater impacts include:

- Increased runoff volume (as a result of less infiltration)
- Increased peak discharges (relating to the timing and magnitude of the runoff occurring from a specific storm event) and velocity
- Reduced groundwater recharge
    - reduced stream baseflow
- Increased frequency of bankfull and overbank floods
    - channel scour, widening, and downcutting of the receiving stream

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

  - streambank erosion and increased sediment loads
  - loss of pool/riffle structure within streams (important habitat areas)
- Destruction of freshwater wetlands, riparian buffers and springs, and burying of stream substrate
  - settling of suspended sediments carried or eroded by stormwater discharges can destroy benthic habitat, thus impacting the food chain
- 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 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 can adversely affect the aquatic ecosystem
  - impacts to the aquatic biota due to stress caused by the increased temperature of stormwater runoff

The Chatham Ridge Subdivision Phase II has a stormwater drainage collection system designed to detain runoff to minimize hydrologic impacts to Rattlesnake Brook and subsequently, Great Hill Pond. This reviewer's concern is that the proposed stormwater management plan may not be as effective at renovating water quality, and may be overlooking opportunities to allow for infiltration (groundwater recharge).

Stormwater Management

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. It is generally recommended that reducing and treating runoff from all developed sites and reducing the amount of impervious surfaces, where feasible, is the best way to manage stormwater runoff. 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.

The new 2004 Connecticut Stormwater Quality Manual describes both primary treatment practices, which provide demonstrated, acceptable levels of water quality treatment, and secondary treatment practices which 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.

This Manual 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. For instance, many municipalities' subdivision ordinances discourage or prohibit the use of open vegetated channels for roadside drainage due to concerns over inadequate drainage, maintenance issues, pavement stability, and nuisance insects (if water is allowed to stand for longer than 7 to 10 days). Instead of barring this practice, the local citizens and public works officials should be educated not to expect stormwater runoff to disappear quickly after a rainfall event. For more information on how to control stormwater, the new 2004 Connecticut Stormwater Quality Manual is now available on DEP's website at:
http://www.dep.state.ct.us/wtr/stormwater/strmwtrman.htm.

Depending on where the proposed site is situated in the watershed, stormwater detention may or may not be necessary to protect downstream receiving waters from flooding or streambank erosion as a result of coinciding or cumulative peak flows from a stormwater event. When considering the use of detention measures, the following concept can be applied:

- In the lower 1/3 of the watershed: little or no detention
- In the middle 1/3: limited detention
- In the upper 1/3: longer detention

For the proposed Chatham Ridge Subdivision Phase II, the majority of development will occur within the subregional watershed associated with the mainstem of the Connecticut River. Based on the proximity of the proposed subdivision located upstream of a sizable dammed impoundment (Great Hill Pond), and the fact that the drainage area ultimately discharges to the state's largest river, it seems unlikely that runoff from the proposed development would have a significant effect. However, due to the high water quality of Rattlesnake Brook and Great Hill Pond, it is prudent to consider on-site stormwater management to ensure that the volume of stormwater runoff does not overwhelm the natural drainage system.

In order to determine the ability of Great Hill Pond to provide the necessary detention without adversely affecting the pond or Rattlesnake Brook, the developer's engineer should model routing the additional stormwater runoff without the proposed detention basins, through the outlet of Great Hill Pond and evaluate stream velocity, the potential for stream erosion, storage capacity of the pond, and the resultant maximum water surface elevation of the pond, as well as time to peak flow; and compare this to a model run with the proposed detention basins. If the proposed stormwater detention basins offer little or no significant benefit, perhaps a smaller detention basin design would be acceptable.

Stormwater Quality

Percolated through the ground, stormwater is filtered by the soil, stored, and gradually released to surface waters via the hydraulic connection through the stream/lake bed. This slow rate of release benefits the riverine system by moderating fluctuations in the water surface elevation of the stream, as well as stream temperatures. However, infiltration is not always practical or preferable. 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 upgradient and at least 25 feet downgradient from building foundations).

The developer has proposed two detention basins for Phase II; the larger will collect the runoff from an 8.5-acre area, and the smaller from a 4-acre area. The remaining southern portion of the site (18 acres) will drain to an intermittent watercourse. In addition to using catch basin sumps along the roadway, the larger basin has a sediment forebay at each of the two inlets, while the inflow to the smaller basin travels along a drainage swale before discharging to the basin. Although these stormwater basins are designed to control stormwater runoff and reduce peak flows, they offer limited water quality benefits. 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. Specific recommendations include:

- Maximizing overland sheet flow
- Increasing and lengthening drainage flow paths
- Lengthening and flattening site and lot slopes (although may conflict with goal of minimizing grading and disturbance)
- Maximizing use of vegetated swales

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. In the proposed subdivision layout, some rooftop runoff will also be directed to the detention basins. Given the type of soils present on site and the current proposed subdivision layout, there are several lots that may be able to discharge roof runoff directly to the ground, provided that the discharge is located at least 50 feet away from the septic system, if upgradient, and 25 feet away if passing by. The Canton and Charlton soils complex (CcB) may be suitable for this, but the actual permeability of these areas should be measured before final designs are implemented. [*Note - the soils map shown on plan sheet 6 of 15 of the plans entitled, "Chatham Ridge Subdivision Phase I", identifies Woodbridge soils, however, according to the most recent, updated soil survey information by the USDA Natural Resources Conservation Service, these have been replaced by the Sutton series.] 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. For more information about infiltration practices and drywells, consult Chapters 4 and 11 of the 2004 Stormwater Quality Manual.

As for the proposed stormwater detention basins, "wet" versus "dry" systems provide increased water quality benefits in addition to hydraulic control. Chapter 8 of the 2004 Stormwater Quality Manual indicates that stormwater ponds, specifically micropool extended detention ponds and wet extended detention ponds, would be the best choices for providing water quantity and water quality benefits for this situation. Stormwater ponds are vegetated ponds with sediment forebays that retain a permanent pool of water and are constructed to provide both treatment and attenuation of stormwater flows. Treatment is primarily achieved by the sedimentation process where suspended particles and pollutants settle to the bottom of the pond. Stormwater ponds can also potentially reduce soluble pollutants in stormwater discharges by adsorption to sediment, bacterial decomposition, and the biological processes of aquatic and fringe wetland vegetation (although anoxic conditions may actually cause pollutants to be released). The key to maximizing the pollutant removal effectiveness of stormwater ponds is maintaining a permanent pool. To achieve this, wet ponds typically require a large contributing watershed with either an impermeable liner or an elevated water table without a liner. The pool typically operates on the instantaneously mixed reservoir principle where incoming water mixes with the existing pool and undergoes treatment through sedimentation and the other processes. When the existing pool is at or near the pond outlet or when the primary flow path through the pond is highly linear, the pond may act as a plug flow system in which incoming water displaces the permanent pool, which is then discharged from the pond. The value provided by this process is that a portion of the “new,” polluted runoff is retained as the “old,” treated water is discharged from the pond, thereby allowing extended treatment of the water quality volume. When properly designed, the permanent pool reduces the velocity of incoming water to prevent resuspension of particles and promote settling of newly introduced suspended solids. The energy dissipating and treatment properties of the permanent pool are enhanced by aquatic vegetation, which is an essential part of the stormwater pond design. In contrast, dry detention ponds, or dry extended detention ponds that have no permanent pool, are not considered an acceptable option for treating the water quality volume due to the potential for resuspension of accumulated sediment by incoming storm flows during the early portion of a storm event when the pond is empty.

Wet ponds typically consist of two general components - a forebay and a permanent wet pool. The forebay provides pretreatment by capturing coarse sediment particles in order to minimize the need to remove the sediments from the primary wet pool. The wet pool serves as the primary treatment mechanism and where much of the retention capacity exists. Wet ponds can be sized for a wide range of watershed sizes, if adequate space exists. For example, a variation on the conventional wet pond, sometimes referred to as a “pocket pond”, is intended to serve relatively small drainage areas (between one and five acres). Because of these smaller drainage areas and the resulting lower hydraulic loads of pocket ponds, outlet structures can be simplified and often do not have safety features such as emergency spillways and low level drains. Micropool extended detention basins are primarily used for peak runoff control and utilize a smaller permanent pool than conventional wet ponds. While micropool extended detention ponds are not as efficient as wet ponds for the removal of pollutants, they should be considered when a large open pool might be undesirable or unacceptable. Undesirable conditions could include thermal impacts to receiving streams from a large open pool, safety concerns in residential areas, or where maintaining a large open pool of water would be difficult due to a limited drainage area or deep groundwater. Micropool extended detention ponds are also efficient as a stormwater retrofit to improve the treatment performance of existing detention basins. Wet Extended Detention Ponds are very similar to wet ponds with the exception that their design is more focused on attenuating peak runoff flows. As a result, more storage volume is committed to managing peak flows as opposed to maximizing the wet pool depth. The configuration of the outfall structure may also differ from typical wet pond designs to provide additional storage volume above the level of the permanent pool. For additional construction details, limitations, and factors for consideration of wet ponds, see Chapter 11 of the Manual.

Layout Design

The proposed subdivision's conventional layout maximizes the number of residential lots which increases the amount of impervious surface and consequently, increases the amount of stormwater runoff and promotes expansive lawn maintenance applications of fertilizers and pesticides. As an alternative, a "cluster" subdivision or "low impact development" design can typically accommodate the same number of homes on smaller lots while providing large, communal open space that may then be used as a playground, park, or walking/hiking trail, etc., resulting in less stormwater runoff, reduced roadway and stormwater basin maintenance, minimal lawn maintenance, preservation of wildlife habitat and open space, as well as retaining groundwater infiltration, thereby further reducing the impacts associated with stormwater runoff.

Stormwater detention allows settling of fine sediments as well as infiltration, as does *filtration* through grassed swales and stone berms. Catch basins with sumps are a first line of defense in stormwater drainage collection systems, but will not likely trap a significant fraction of sediment. Therefore, it is recommended, wherever possible, that road curbing be eliminated and drainage directed to sheet flow over grassy surfaces and ultimately into vegetated drainage swales utilizing the permeable soils on site to promote infiltration, and reducing the amount of stormwater runoff that requires treatment; thereby replenishing groundwater supplies and reducing the cost of road construction and maintenance, including seasonal street sweeping, catch basin cleaning, and maintenance for the stormwater basin. Other strategies to reduce imperviousness include: reducing roadway widths, minimizing sidewalk coverage, reducing front yard setbacks to minimize driveway length and area, designing cul-de-sacs with a pervious center, and promoting pervious driveways. 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://www.canr.uconn.edu/ces/nemo/.

The Town of Portland has already reduced the roadway width to 24', but this could be pared down even further to 18' to 20', depending on the roadway layout. It is not necessary to have sidewalks on both sides of the street, or even at all, unless there is an attraction nearby such as a school, playing fields, or park. However, if selected, sidewalk widths should be reduced and they should be separated from the street with a vegetated area; grading the sidewalks away from rather than towards the road to reduce impervious area, increase on-site infiltration, and decrease stormwater runoff. As an alternative layout, perhaps Phase II could extend the existing cul-de-sac at the termination of Phase I to the east, and bend around to the south, terminating in another cul-de-sac (provided this does not conflict with the maximum allowable length of a roadway having only one outlet under the Town of Portland's Planning & Zoning subdivision regulations). At the western end of Phase II, the "loop" road could terminate in a cul-de-sac as well, essentially forming a sideways "F" coming off Great Pond Hill Road instead of the proposed "P" configuration. This plan design alternative may also decrease development along the steep slopes on the south side of the parcel, thereby minimizing the risk of erosion and sedimentation.

Additionally, it may not be necessary to completely pave the interior of the cul-de-sacs. Where impervious surface reduction is difficult, 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 and reduce pavement. Emergency vehicles and snow removal equipment turning radii have been adequately addressed in other communities with modified cul-de-sacs designed with a depressed and pervious (unpaved) center. 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).

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.

Alternatively, if one house lot is removed from the inner circle of the loop road and lots 26, 27 and 28 are combined into two lots, that may allow the southern half of the roadway to be shifted northward, thereby minimizing the amount of fill required to construct lots 22, 21, 19, 18, 17, and 16, and subsequently, reduce the risk of erosion and sedimentation.

Buffers

The developer has proposed a conservation easement which will serve as a buffer to protect the existing open space and wetlands and watercourse to the east. 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. 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 riparian corridor is the area immediately adjacent to a watercourse that typically contains wetlands and acts as a buffer to the watercourse. In addition to the benefits described above, riparian buffers help moderate the temperature of stormwater runoff before it enters the watercourse, thereby reducing thermal impacts on aquatic wildlife. 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.

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 zone along perennial streams, and a 50-foot buffer zone along intermittent streams[4] measured from the outer edge of any riparian wetlands. DEP Fisheries further recommends that this buffer zone remain in a naturally vegetated and undisturbed condition. In this instance, the Chatham Ridge Subdivision Phase II proposes a conservation easement adjacent to current dedicated open space with language that allows for only passive, non-invasive use; providing buffer protection to the wetlands and Rattlesnake Brook. However, because the future homeowners may not recall or note the conservation easement shown on the subdivision plans or within the land deeds, it is suggested that signage be posted long the residential edge of the proposed conservation easement.

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

Soil Erosion and Sediment Control

The 2002 revision of the Connecticut Guidelines for Soil Erosion and Sediment Control[5] contains detailed technical guidance on specific erosion and sediment control practices and recommended procedures for developing an effective soil erosion and sediment control plan.

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 by the Connecticut Guidelines for Soil Erosion and Sediment Control, but the Soil and Water Conservation District or the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service) may have more current information on the various seed mixes and mulches that are now available. Note: avoid seed mixes containing Reed Canary grass, an invasive species. Temporary sedimentation basins and other stormwater control structures (i.e. siltation fence and staked hay or straw bales) should be inspected and maintained weekly, and within 24 hours of receiving a 0.1" or greater rainfall event. Note that proposed stormwater basins should not be used as temporary sedimentation basins during construction.

Summary of Recommendations

- Note the presence of the timber rattlesnake and DEP contact information on the subdivision plans.
- Promote groundwater infiltration to reduce stormwater runoff.
- Modify stormwater detention basins to "wet ponds" for water quality renovation.
- Evaluate alternative design layouts to reduce imperviousness, and to avoid/minimize construction on steep slopes.

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[5] The Connecticut Council on Soil and Water Conservation. January 1985 (Revised January 1988). Connecticut Guidelines for Soil Erosion and Sediment Control.

7. Great Hill Pond

Great Hill Pond is a 76 acre water body with a maximum depth of 9 feet and a mean depth of 5.5 feet. Based on the plans provided to the ERT, approximately 30 acres of the Chatham Ridge Phase II subdivision lies within the watershed of Great Hill Pond. The watershed, also called drainage basin, is the area of land that drains to a given water body. The Great Hill Pond watershed is 1,283 acres. Land use within the watershed can influence the water quality of a lake. Lakes with relatively undeveloped watersheds will have less sources of pollution than a comparable size lake and watershed that is developed. Land uses that require fertilizers such as lawns or agriculture activities, and land uses that create impervious surfaces such as roads and houses, will contribute pollutants such as nutrients and sediments. Nutrients promote aquatic plant and algal growth, and sediments fill in a water body creating shallow areas. Methods used to limit impacts from these land uses can help reduce the loading of these pollutants to a lake. However, an undeveloped watershed is still superior for protecting water quality than management practices that limit nutrient and sediment loading from an existing or proposed development.

It is important to understand the current level of fertility of a lake or pond so that changes in water quality can be assessed. The system used to classify the fertility of a water body is a trophic classification system. The trophic classification describes the water body's ability to support vegetation and can be used to determine whether a lake is becoming increasingly fertile. Parameters such as phosphorus and nitrogen concentrations, water clarity, and chlorophyll *a* (a pigment found in algae) are measured during the spring and summer and used to determine a lake's trophic classification. Lakes classified as oligotrophic are low in nutrients and thus clear with little plant growth. Oligotrophic lakes are very desirable for most freshwater recreation activities. On the other end of the trophic classification system are eutrophic lakes. Eutrophic lakes have high nutrient concentrations and support nuisance weed and algae growth. Great Hill Pond was classified as early mesotrophic by DEP in 1995. An early mesotrophic classification means that Great Hill Pond's level of fertility is between oligotrophic and eutrophic, but closer to oligotrophic.

In order to prevent Great Hill Pond from becoming more fertile, land use managers need to consider nutrient loading as part of the decision making process. Two concerns that relate to the Chatham Ridge Phase II subdivision are stormwater runoff during construction and after the subdivision is completed. The plans provided to the ERT did not include erosion and sedimentation control plans and stormwater drainage infrastructure plans. Normally, review of these plans is a major component of an ERT when assessing impacts to water resources. Reviews of both plans are essential to assure that stormwater runoff both during and post construction is managed in a way that will not impact the water quality of Rattlesnake Brook or Great Hill Pond. If the Town of Portland land use commissions would like DEP to review these plans before final local approval of the subdivision is granted, please contact the Bureau of Water Management at (860) 424-3716. Please provide adequate time for this review.

The plans that have been provided to the ERT did include the proposed layout of the subdivision. Of the 20 houses proposed for Phase II, part or all of 17 of the proposed homes are within the Great Hill Pond watershed. Current plans indicate that there is an easement on lot 12 –17 on the side closest to Rattlesnake Brook. The exact restrictions that will be placed on the area covered by the easement have not been provided to the ERT. The easement will be in favor of the Town of Portland. The intent of the easement is to increase the buffer of undisturbed land between the Phase II subdivision and Rattlesnake Brook. Rattlesnake Brook will be further protected by the open space allotted to the Middlesex Land Trust. The easement and open space areas will provide a protected area of approximately 200 feet between the developed area and the wetlands along Rattlesnake Brook. A review of the restrictions that will be placed on the easement area of lots 12 –17 and a review of the existing of proposed management plan for the open space area is warranted to assure that Rattlesnake Brook and Great Hill Pond will be adequately protected.

In addition to the concerns related to the Phase II subdivision, the Town of Portland and the Great Hill Pond residents should continue discussions on how to further protect Great Hill Pond. Future proposed developments will have similar issues as the current Phase II subdivision and possibly greater if closer to Great Hill Pond. Ideally these discussions can take place as the Town of Portland updates its Plan of Conservation and Development (the Plan). The Plan could identify Great Hill Pond as a high water quality pond with access for the general public through undeveloped DEP managed shoreline properties. The Plan can recognize that proposed land use activities within the Great Hill Pond watershed that increase stormwater runoff and thus increase nutrient loading can exacerbate weed and algae growth. The Plan can also discuss how open space preservation within the Great Hill Pond watershed will have the added benefit of protecting the pond's water quality.

The residents living around Great Hill Pond may want to form an organization to assist the Town in assuring that Great Hill Pond is considered in the Plan and work to develop awareness about the pond. Many lake communities have developed lake associations that function as advocates for their lake, disseminate educational materials, and conduct water quality monitoring programs. The Great Hill Pond community may wish to discuss with DEP the possibility of receiving a grant through the Connecticut Federation of Lakes to develop such a lake association. These small grants should become available in early 2006.

If the developer, Great Hill Pond residents, or the Town of Portland would like further information on lake management and water quality monitoring, please contact DEP Lakes Management Program at (860) 424-3716.

8. Subsurface Sewage Disposal Review

The "Conceptual Layout" site plans for Phase II of the Chatham Ridge Subdivision prepared by Dieter and Gardner date October 8, 2004 were reviewed. The focus of this review concentrated on the proposed subsurface sewage disposal systems for the homes. In general, it was determined that there is insufficient soil test documentation to establish if there is suitable soil on the proposed lots to support on-site septic systems. Some of the lots had unsuitable soil conditions in the proposed leaching system areas. The following comments are based on this review:

1. Public Health Code (PHC) Section 19-13-B103a (a)(3) defines areas that are unsuitable for subsurface sewage disposal systems. Unsuitable conditions include areas where ledge rock is less than four feet below grade. No lot with unsuitable soil in the primary or reserve area should be created. Many of the lots tested had unsuitable soils conditions based on the depth to ledge rock. These include but are not limited to Lots #12, 15, 16, 17, 18, 19 and 22.

2. Additional soil testing is required and must be conducted in accordance with PHC requirements. Approximately 70 percent of the lots had either no testing on the lot or no testing in the proposed leaching system areas. The following lots require more testing: #10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 27 and 28. As noted in comment #1, unsuitable areas must be avoided. Soil testing is needed in and down gradient of all leaching areas. Probes to identify shallow ledge rocks depths are useful and non-obtrusive.

3. The ERT pre-review packet indicated the subdivision is to utilize on-site wells. No wells are shown on the conceptual plans. All wells must be sited in accordance with PHC Section 19-13-B51d. The protective radius around

each well is preferred to remain on the lot on which the building served is located in order to provide optimum protection.

4. Septic system design criteria and soil test documentation must be added to the plans. This includes all deep test pit and percolation test data. Documentation on system design/layout (# of bedrooms, MLSS calculations, etc.) must be included.

5. Septic systems must be laid out to ensure sufficient naturally occurring soil is available in and down grade (25 – 50 feet) of the leaching systems. Several of the lots have down gradient cuts below the leaching system due to detention basins (Lots #12 and 28) or roadways (Lot #24). Several of the leaching systems (Lots #21 and 22) are located up gradient of houses. This will not only require pump systems but also is a concern relative to down gradient drains, and cuts for grading around the structure. Lots requiring pump systems must be identified. The leaching system for Lot #27 does not follow contours.

In conclusion, the conceptual plans are inadequate due to lack of supporting soil test data, or location of septic systems in "unsuitable" areas. Additional testing must be coordinated with the Chatham Health District. Final plans must be reviewed by the Chatham Health District to ensure all lots provide suitable/adequate areas for subsurface sewage disposal facilities.

The DOH Environmental Engineering program is available to comment on the final plans.

9. Fisheries Resources

Fisheries Resources

Rattlesnake Brook, a small 1st order watercourse that empties into Great Hill Pond is located just east of the Chatham Ridge Subdivision Phase II property. The watercourse adjacent to the subdivision is of low to moderate gradient, averaging approximately 10 feet in width. Most instream mesohabitats are in the form of alternating riffle and pools intermixed with pocket waters. In addition to boulder substrates, streambed substrates are comprised of large cobbles, small gravels and native coarse sands. The stream is well shaded with a closed overhead canopy. Surface water quality of this watercourse is classified by the Connecticut Department of Environmental Protection as Class A. Designated uses of Class A waters are as follows: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other purpose.

Watercourses of this size are generally thought by the public as too small to support fish; however, fisheries biologists and stream ecologists recognize these watercourses and their habitats as very sensitive and critical to the production and survival of fish species such as native brook trout. In addition, they also function to protect and maintain the water quality of recipient waterbodies downstream in the watershed. In this case, Great Hill Pond. A visual qualitative survey of the Rattlesnake Brook fish population was conducted for a stream length of approximately 500 feet. Native brook trout fish were not observed in this stream; however, the lack of visual evidence does not mean this section of stream does not support native brook trout, since the only conclusive way to determine fish presence/absence is with electrofishing equipment. Several year classes of blacknose dace, another fish species native to Connecticut, were observed throughout this watercourse. Blacknose dace, a member of the minnow family reach sexual maturity in 1 year and spawn in shallow riffle areas during the spring. They reach lengths of 2-3 inches.

Great Hill Pond is a very shallow 76-acre impoundment fed by Rattlesnake Brook and an unnamed tributary to the north. The pond does not stratify due to its limited depth (Jacobs and O'Donnell, 2002). Although not sampled by the DEP Inland Fisheries Division, the pond is expected to support a warmwater fish community comprised of largemouth bass, chain pickerel, yellow perch, black crappie, sunfish, bullheads and white catfish.

Potential Resource Impacts

The residential design footprint for the most part has mitigated for most potential impacts to fisheries resources by providing a sufficient (greater than 100' in width) undisturbed vegetated riparian buffer zone adjacent to Rattlesnake Brook and the creation of a conservation easement on the backside of the building lots adjacent to the brook.

As with any residential development, there is always a potential for erosion and stream sedimentation to occur during construction because of disturbed soils. Given that building lots are located on steep slopes that drain towards Rattlesnake Brook, there is increased risk of erosion and sedimentation if best management practices are not implemented. In addition, the intermittent unnamed watercourse can act as a "direct conduit" for harmful sediment to enter Rattlesnake Brook and eventually Great Hill Pond. The negative impacts of sediment runoff have been well documented by researchers. Sediment will reduce populations of aquatic insects and fish by eliminating physical habitat while suspended sediments will reduce dissolved oxygen levels (Cordone and Kelley 1961). Suspended sediments may prevent successful nest development of trout (Bell 1986). As reported by Meehan (1991), sediment deposition can severely impact spawning substrate abundance and quality. Reductions in egg survival are caused by smothering, insufficient oxygen supply and lack of proper removal of catabolic products (Bell 1986). Meehan (1991) indicated that erosion and sedimentation of instream habitat could alter channel morphology by increasing the stream width-depth ratio, incidence and severity of stream bank erosion, channel braiding, and reduce pool volume and frequency.

It is understood that the stormwater detention basin has been designed to contain a 50-year storm event based upon Town of Portland regulations. Stormwater from the basin will outlet into an intermittent unnamed tributary that drains directly into Rattlesnake Brook. Thermal loading to waterbodies from stormwaters can be a serious concern with residential development during the summer. Impervious areas act as a heat collector, with heat being imparted to stormwaters as they pass over impervious surfaces such as roadways and rooftops. In addition, stormwater temperatures can be elevated from solar radiation as they are collected and stored in large, oversized detention basins.

Recommendations/Comments

The following recommendations and comments are provided to minimize impacts to fisheries resources:

Erosion and Sediment Control Plan

It is recommended to develop an aggressive and effective erosion and sediment control plan that utilizes guidance as described in the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*. Proper installation and maintenance of erosion/sediment controls is critical to environmental well being. Extra care should be taken to minimize sediment runoff into the intermittent stream that is tributary to Rattlesnake Brook. This includes utilizing such mitigative measures as filter fabric barrier fences, staked hay bales, and sediment basins. Land disturbance and clearing should be kept to a minimum and completed in phases. All disturbed areas should be restabilized as soon as possible. Exposed, unvegetated areas should be protected from storm events. The applicant and the local wetland enforcement officer should be responsible for checking this development on a periodic basis to ensure that all soil erosion and sediment controls are being maintained.

Stormwater Management

It is recommended that the applicant design the detention basin utilizing latest technology as described in the *DEP 2004 Connecticut Stormwater Quality Manual*. The large, wet detention basin will serve to detain and hold stormwaters in storage. To reduce potential thermal impacts to Rattlesnake Brook, it may be worthwhile to reduce the size of the detention basin and investigate the use of infiltration systems (trenches, basins) in which stormwaters could be allowed to infiltrate back into the ground.

Lawn Chemicals/Fertilizer

Property owners should consider having the soil in lawns tested to identify which nutrients are sufficiently abundant and which nutrients are not. This information tells you which nutrients you need and don't need to place on your lawn. Whenever possible, landowners should be encouraged to use fertilizers with little or no phosphorus. The use of low or non-phosphorous fertilizers can provide nutrients while avoiding threats to water quality, especially since drainage in this subwatershed enters Great Hill Pond.

Literature Cited

Bell, M.C. 1986. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers. Fish Passage Development and Evaluation Program. North Pacific Division, Portland, OR. 290 pp.

Cordone, A. J., and D. W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Fish and Game 47:189-228.

Jacobs, R. P. and E.B. O'Donnell. 2002. A Fisheries Guide to Lakes and Ponds of Connecticut. Connecticut Department of Environmental Protection. DEP Bulletin 35. 354 pp.

Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD. 751 pp.

10. The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, this property is within the foraging range of State Endangered *Crotalus horridus* (timber rattlesnake). The previous correspondence from the DEP-NDDB, as well as from Julie Victoria (DEP-Wildlife) regarding this project is included in the Appendix. In her March 16, 2004 letter, Ms. Victoria recommends that a survey of the property be completed and that future landowners be notified of the existence of rattlesnakes in the area.

Rattlesnakes are actively foraging in Connecticut between April 1 and October 31 and this project site is within the summer foraging habitat for timber rattlesnakes. Populations of this reptile have declined dramatically in recent years, and the timber rattlesnake is currently protected by state laws which prohibit the taking or killing of this reptile. Please be advised that 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 Wildlife Division recommends that a herpetologist familiar with the habitat requirements of the timber rattlesnake conduct surveys. 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 does not maintain a list of herpetologists in the state. A DEP 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. It is recommended that future landowners be notified of the existence of rattlesnakes in the area. Please be advised that encounters may be common during the active period. Future landowners should be advised and prepared to observe a venomous reptile that it is illegal to kill.

The Wildlife Division has not made an on-site inspection of the project area nor been provided with details or a timetable of the work to be done. Again, please be advised that 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. It is recommended that any work be done during the snakes' dormant period, October - March, that workers be notified of the existence of rattlesnakes in the area, and that they be apprised of the state regulations protecting this endangered species. It is requested that any observations of rattlesnakes while workers are in the area be reported to the Wildlife Division so that Julie Victoria can determine habitat use patterns and dispersal. Consultation with the Wildlife Division should not be substituted for site-specific surveys that may be required for environmental assessments. If you have any additional questions, please contact Julie Victoria (860-642-7239).

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.

Please 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.

11. Archaeological and Historical Review

A review of the state of Connecticut's archaeological site files and maps shows two prehistoric Native American archaeological sites and one historic 18th century Euro-American site located in the immediate proximity of the project area. These sites are associated with the terraces adjacent to Rattlesnake Brook and represent the seasonal camps of hunters-gatherers utilizing the natural resources of the area. In addition, the project area is situated on a high ridge overlooking the brook. These areas of high prominence and where relatively lessened slope exists suggest a high sensitivity for prehistoric archaeological sites. In addition, cultural resources in the area may be represented in below-ground features associated with the town's farming history, and should be considered prior to any construction activity.

The Office of State Archaeology recommends an archaeological reconnaissance survey for the project area. This survey should identify, evaluate and manage all cultural resources which may be effected by the proposed undertaking and, and provide recommendations for preservation of any significant cultural resources which might exist within the project boundaries. This survey should be conducted in accordance with the State Historic Preservation Office's *Environmental Review Primer for Connecticut's Archaeological Resources.*

ABOUT THE TEAM

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

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

PURPOSE OF THE TEAM

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

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

REQUESTING A REVIEW

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

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.