

**Lakeview North and  
Lakeview West  
Subdivisions  
North Stonington, Connecticut**



**Eastern Connecticut  
Environmental Review Team  
Report**

**Eastern Connecticut  
Resource Conservation and Development Area, Inc.**

**Lakeview North and  
Lakeview West  
Subdivisions  
North Stonington, Connecticut**



**Environmental Review Team Report**

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

**for the  
Inland Wetlands Commission  
North Stonington, Connecticut**

**August 2003**

**Report No. 579**

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## Acknowledgments

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

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

The field review took place on Wednesday, June 4, 2003.

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I would also like to thank Ron Lewis, inland wetland commission chair, John Bean, inland wetland commission member, Ann Nalwalk, planning and zoning commission chair, Craig Grimord, town planner and ZEO, Mark Coen, applicant, Peter Gardner, land surveyor for the applicant, and Greg Smith, Eastern CT conservation district, for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were given plans and additional information. Some Team members made separate or additional visits to the project 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 the landowner/applicant. This report identifies the existing resource base and evaluates its significance to potential and existing development, and also suggests considerations that should be of concern to the town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

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

If you require additional information please contact:

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## Introduction

### Introduction

The North Stonington Inland Wetlands Commission has requested assistance from the Eastern Connecticut Environmental Review Team in conducting a review of two proposed residential subdivisions.

Lakeview Subdivision West is an ±80.77 acre parcel located on the east side of CT Route 201 (a.k.a. Cossaduck Hill Road) and the south side of Billings Lake Road in the northern section of North Stonington. Eleven single family house lots are proposed with on-site sewage disposal and water supply wells. The lots range in size from 2.28 acres to 20.57 acres. Access will be from existing town and private roads.

Lakeview Subdivision North is a ±69.69 acre parcel located on the north side of Billings Road. Six single family house lots are proposed with individual on-site sewage disposal systems and water supply wells. Access is from Billings Road and a gravel drive. Fifteen (15.9) acres of open space is being proposed which will abut State of Connecticut land.

No improvements to Billings Road are proposed and the applicant has said that subdivision homeowners would not have beach rights on Billings Lake.

### Objectives of the ERT Study

The Town of North Stonington has requested assistance in evaluating these subdivisions. Major concerns include: impacts to the lake, wetlands and aquifer, water quality, soils and erosion and sediment control, stormwater management, open space suitability and historical and archaeological significance.

## **The ERT Process**

Through the efforts of the planning and zoning commission this environmental review and report was prepared for the Town of North Stonington.

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 town and applicant.

The review process consisted of four phases:

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

The data collection phase involved both literature and field research. The field review was conducted on Wednesday, June 4, 2003. Some Team members made separate or additional site visits. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

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



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### Location Map

Scale 1" = 2000'



## Topography and Geology

Lakeview Subdivision West is sited on moderate to gentle sloping terrain, most of which drains toward the west. Lakeview Subdivision North consists of moderate to steeply sloping land, most of which drains toward the north and west. Only a small portion of either proposed subdivision is part of the Billings Lake drainage basin (watershed; see Fig. 1). An area of approximately 7-8 acres of Lakeview West is located within the Billings Lake drainage basin (most of proposed lots 10 and 11 and part of lots 8 and 2). In addition approximately 1-2 acres of lots 1-5 drain into the Anderson Lake watershed. A small portion (~ one acre more or less) of Lakeview Subdivision North (lots 5 and 6 immediately adjacent to Lake Billings Road) is part of the Billings Lake drainage basin.

Till-covered bedrock underlies all of Lakeview North and the highlands of Lakeview West. The till is thin in most areas and numerous bedrock (ledge) outcrops occur. The bedrock in the immediate area of the subdivision consists of light-grey granitic gneiss that contains large crystals of pinkish microcline feldspar. The gneiss is approximately one billion years, pre-Cambrian, in age (Dixon and Felmlee, 1986). Outcrops of similar-aged metamorphosed volcanic rocks have been mapped on the other side Billings Lake by Feininger (1965a, b). The granitic gneiss and meta-volcanic rocks are part of what is referred to as Avalon Terrane. Rocks of the Avalon Terrane have greater affinities with rocks currently found in the Baltic Region of Europe than with typical rocks of North America such as are exposed farther west in Connecticut (see ch. 8 in Bell, 1985, for a non-technical description of Connecticut geology). Rocks of North America and Avalon are juxtaposed in eastern Connecticut along the Lake Char Fault (inactive) that thrust North American rocks eastward over Avalonian rocks. The geologic activity involved with the juxtaposition of these terranes produced a huge mountain range (since eroded) and caused either the metamorphism or remetamorphism of the rocks of both terranes. The Lake Char Fault extends

north-south through Connecticut along the Quinnebaug River valley. The eastern portion of what is actually a fault zone cuts the bedrock beneath the lower portion of the west-facing upland slope in lots 1 and 2 of Lakeview West subdivision (see Fig. 2 of this report; Goldsmith, 1985). The Lake Char Fault bends abruptly just southwest of Billings Lake and extends westward to about the Connecticut River as the Honey Hill Fault (Rogers, 1985; Bell, 1985).

Stratified sand and gravel underlies the lowland area of Lakeview West Subdivision (Stone, 1978; see Fig. 3 of this report). Sand and gravel were deposited approximately 14,000 years ago, against and beneath stagnant (melting) leftover blocks of ice by glacial meltwater streams during the global warming at the end of the last ice age. They are unconsolidated and are both porous and permeable. The sand and gravel is an important resource because, in addition to its potential use as construction material, it is a valuable, shallow-aquifer. The stratified deposit extends several kilometers north of the subdivisions and streams, both northward flowing and westward flowing, that drain both subdivisions eventually cross and may infiltrate into the aquifer.

Because only a small portion of the subdivision is located within the watershed boundaries of Billings Lake and Anderson Lake, adverse impact to the water quality of either lake seems unlikely. Likewise, the potential impact to the protected aquifer by so few new-residential dwellings seems remote. If future potential development of the lake watersheds or the aquifer recharge area are of similar low density (high acreage) minimal impact to the quality of water should result.

### References Cited

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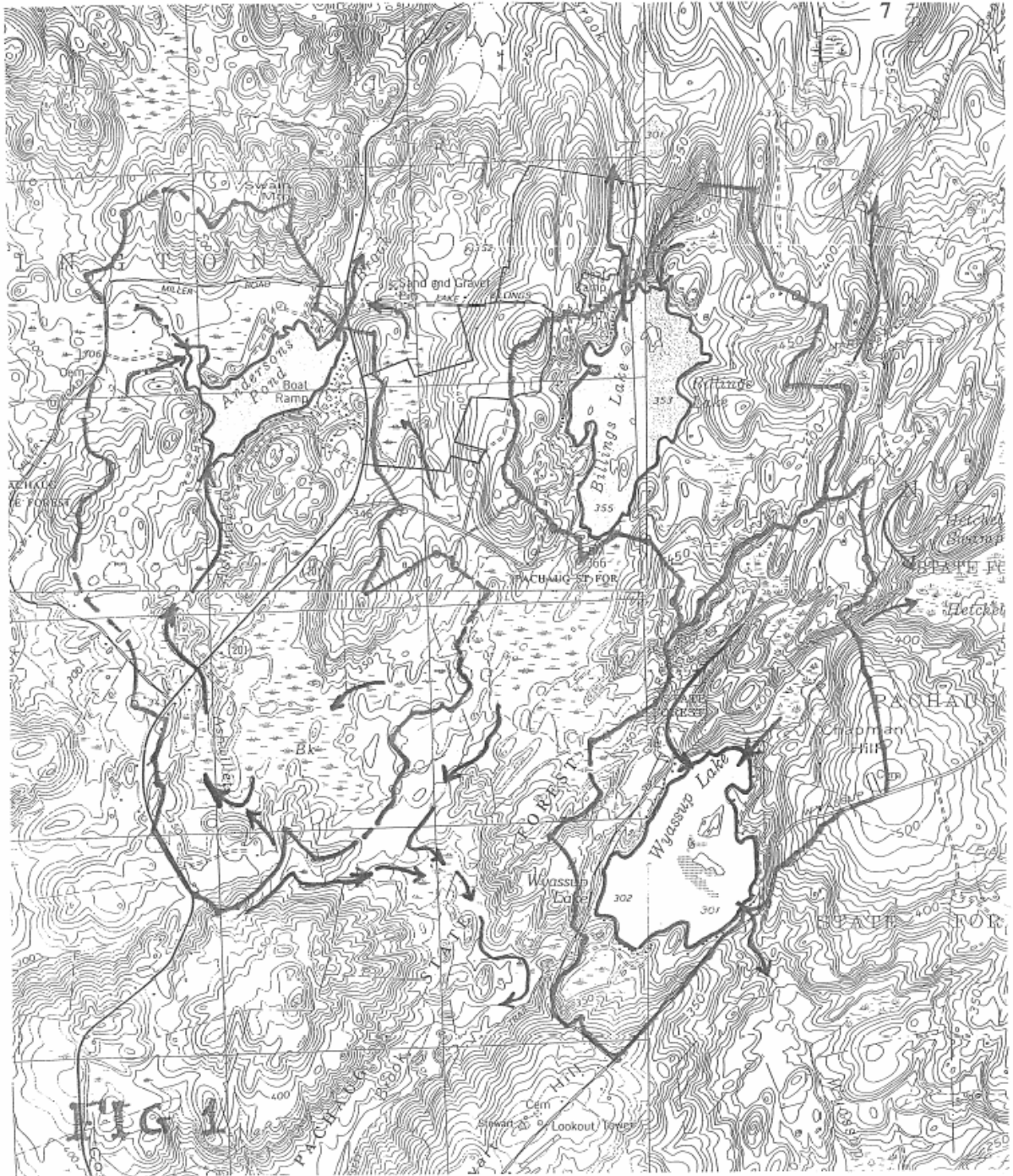


FIGURE 1. Drainage basin (watershed) delineation and water drainage patterns (arrows)

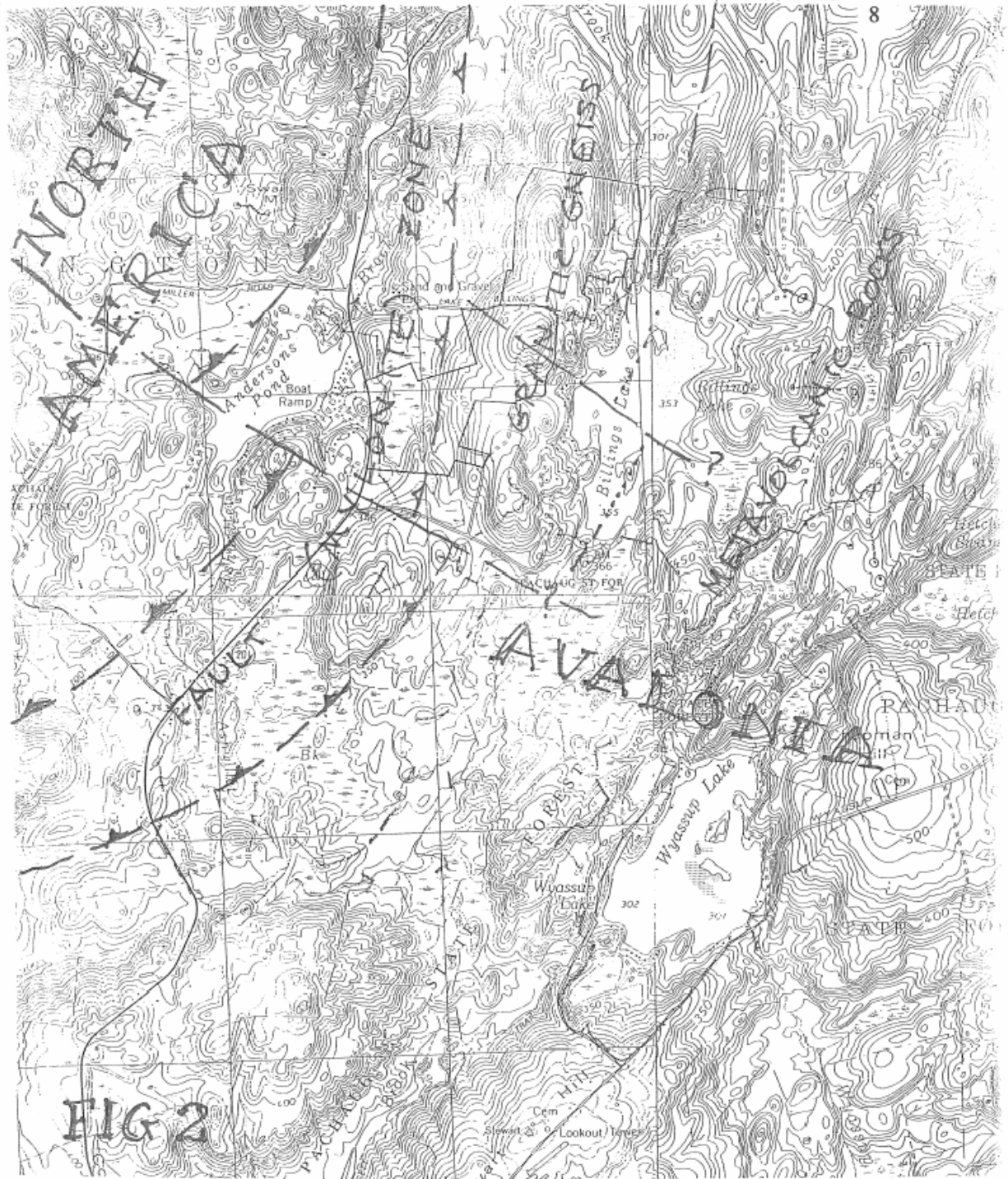


FIGURE 2. Generalized bedrock geology (after Dixon and Felmlee, 1986, Feininger, 1965a, b, Goldsmith, 1985, and Rogers, 1985)



FIGURE 3. Area underlain by stratified sand and gravel aquifer (after Stone, 1978).

## Conservation District Review

The Eastern Connecticut Conservation District (ECCD) attended the ERT site walk and has reviewed the plans for the subject project. Overall, the plans are not complete enough to provide thorough recommendations within the District's fields of expertise. In their comments below, they have recommended specific additional information that the Commissions will need in order to make a decision on these proposals. This report is based on the preliminary plans submitted, and is not to be interpreted as a complete report.

The comments correspond to the Commissions' concerns as given to the ERT.

### Planning and Zoning Commission's List of Concerns

#### Lake view West

- **Drainage from roads if improved to accept anticipated traffic:**

Certainly drainage and polluted drainage will increase with increased traffic. If the roads are paved in the future, runoff will increase further. Extensive analysis will be required to provide specific information as to how much the drainage will increase and what pollutants will be increased.

- **Are there logical places for Open Space?:**

It is the District's opinion that the applicant has proposed a logical location for the open space.



- **Are non-building easements recommended?:**

ECCD's focus is natural resource conservation, and limiting construction helps conserve natural resources. From that standpoint, they recommend that non-building easements be recorded for all areas not needed for the construction to be proposed by the applicant. (They say, "to be proposed" because the house, driveway, and septic locations shown on the plans are conceptual, not actual.)

#### Lakeview North

- **Effect of increased use of roads:**

Same as first bullet above.

#### Inland Wetland's List of Concerns

- **Environmental impacts to Billings Lake due to development in the area:**

Increases in development could have a detrimental effect on natural resources in the area, including Billings Lake. Extensive analysis will be required to provide specific information.

- **Impacts of development on Upland Review Area:**

ECCD may be able to provide some comments on this issue, but they will require more information, such as the extent of the upland review area and the actual locations of the land disturbances. They have listed the additional information required to review the proposed subdivisions under general recommendations (see below). Additional analysis may also be required, depending on the Commissions' level of need.

- **Impacts of development on wetlands and watercourses:**

ECCD may be able to provide some comments on this issue, but they will require more information, which they have listed below under general recommendations. Additional analysis may also be required, depending on the Commissions' level of need.

- **Specific areas of concern for the future:**

There are, of course, many areas of concern, but the District has listed several that are a high priority from a natural resource conservation perspective.

- a) Removal of trees and ground cover that facilitate infiltration and filtration of stormwater, and moderate temperatures
- b) Erosion - Disturbance of land, and/or inadequate erosion control measures; Consideration of soils information (highly erodeable, etc.); Steepness of any slope being disturbed.
- c) Stormwater management - Regarding stormwater leaving the area of disturbance, ideally post-development should be the same as pre-development with regard to:
  - 1) amount
  - 2) quality
  - 3) location(s)? to include concentration of flow
  - 4) velocity
- d) Disturbance of wetlands and/or watercourses - clearing, filling, redirection, etc.
- e) Pollution resulting from septic systems
- f) Negative impacts to the aquifer resulting from additional wells
- g) Disturbance of habitat, primarily with regard to vernal pools and endangered species
- h) Pollution by humans utilizing the developed area (e.g.: direct dumping of debris, chemicals, petroleum products, etc.)

### **General Recommendations:**

The District was unable to do a complete review because not all the information required has been submitted yet, and they found certain aspects of the drawings difficult to interpret. It is their opinion that the review process is greatly facilitated when the applicant makes the drawings as clear as possible. In order for us to do a complete review, the drawings need to clearly show:

- 1 . Specific (not conceptual) locations of proposed houses, driveways, septic systems, land disturbance, etc.
2. The boundaries of the open space
3. Erosion and sedimentation controls
4. Stormwater controls
5. Sheet numbers and match lines (On the drawing they received, they found it difficult to orient match lines and sheets to the overall site drawing)
6. The Commissions have the responsibility to consider impacts on wetlands and watercourses and other natural resources, and also the cumulative effects of development. To enable the Commissions to do their evaluation, the applicant should provide at least one separate sheet showing the entire site and the land surrounding the site, depicting lot boundaries, proposed and existing houses, driveways, roads, septic systems, wells, and other structures; topography, wetlands and water courses, vernal pools, vegetation, etc., and the limits of North Stonington's Upland Review Area (if such limitations have been established).

### **Comments on Soils**

The plans showing Lakeview Subdivision West and Lakeview Subdivision North (Revised: April 2, 2003) have been reviewed with regards to soils. On

first review, the District was concerned about possible impacts to the lake, wetlands, and aquifer, and stormwater drainage to roads. However, information gained at the site visit and their review of the soils information have addressed those concerns, with the following caveat: If the homes and septic systems are constructed where indicated on the plans, there should be no concerns about damage to the adjacent wetland as delineated by R. Richard Snarski, given the low density of homes. However, some of the test pit percolation tests would raise concerns if the house/septic locations and other conditions (e.g. slopes) were different. Therefore, if there are future proposals to construct homes and/or septic systems in locations other than those indicated on the plans, it is recommended that an additional review be conducted by a qualified evaluator.

## Watershed Resources and Site Development Considerations

### Surface Water Resources

The two proposed subdivisions, Lakeview North and Lakeview West, are located within a single sub-regional watershed known as the Billings Brook basin. A watershed is the entire surface area that drains to a particular water body. The Billings Brook basin is identified in a statewide drainage basin coding system as basin number 3605. This is a sub-regional basin draining about 2.3 square miles, and discharges into the larger Pachaug regional watershed north of these development proposals, in the town of Griswold. Surface watercourses on the site include Ashwillet Brook and Billings Brook. The two development sites are in close proximity to Billings Lake and/or to Anderson (Blue) Lake. There are wetland systems with small intermittent streams feeding Ashwillet Brook on the site. This is a first-order stream, originating from headwater wetlands and from groundwater.

The State Water Quality Classifications classify surface and ground waters in the state by existing water quality conditions, a classification goal, and its designated uses and the State Water Quality Standards. The Standards and Classifications are designated to manage water quality to protect health, the environment, and legitimate uses of water resources. The complete State of Connecticut Water Quality Standards and Criteria document is available on the CT DEP web site at <http://dep.state.ct.us/wtr/wqsinfo.htm>.

The entire site's known streams and water bodies are each classified as "A" surface water quality. Class A waters overall have excellent water quality and are designated for use as fishable/swimable (suitable for recreational use, fish and

wildlife habitat), as well as agricultural and industrial water supply, and potential drinking water supply.

Billings Lake and Anderson Lake each have a trophic classification known as oligotrophic, which in essence means they are nutrient-limited waterbodies. They tend to have rather high water clarity, and can be susceptible to unmanaged nutrient loading from the contributing watershed.

A review of the state Leachate and Wastewater Discharge Sources Inventory (1998), that supports the Water Quality Classifications, resulted in no known locations that would impair the class "A" surface water quality goal. This reviewer did not find any additional areas of potential pollution threats to surface water quality during the June 4, 2003 site visit.

As part of the federal Clean Water Action Plan, the CT DEP and the USDA-Natural Resources Conservation Service conducted a Unified Watershed Assessment for all CT waterbodies in 1998. Based on existing documents and other available water resources information, the overall health of the Billings Brook sub-regional watershed appears to be good. It should be a goal of the state, regional and local watershed stakeholders to protect the overall health of this sub-regional watershed. As stated previously, the watershed is nested within the larger Pachaug River regional basin (#36). Land use development proposals, especially in the upper headwaters, within the Pachaug River basin should be carefully reviewed for incorporation of best management practices (BMPs) to protect downstream water quality.

### **Groundwater/Aquifer Resources**

The State Water Quality Classifications, indicate groundwaters on the site are classified "GA." Class GA groundwaters have designated uses as existing private and potential public or private drinking water supplies, and as base flow to

adjacent surface water bodies. Water quality is generally good and at a minimum should be suitable for drinking or other domestic use without treatment. Domestic sewage discharges can be considered consistent with this standard. All the surrounding land appears to be served by on-site private or small community wells. Review of state waste sources inventory and the on-site review did not find any known potential pollution threats. Wastewater discharges to the ground in GA areas are limited to approved treated domestic sewage. The site development plans indicate that much of the Lakeview West proposal is within a local Aquifer Protection Overlay Area. This reviewer was not able to determine from the site development plans or site walk about the implications of use of this resource-planning tool with the proposed development. There is no state agency designation for an aquifer protection area within either of these two development proposals.

### **Basic Concepts of Watershed Protection**

*"A plan should be made to lay lightly into the land. "*

Benjamin Howland, Former Director, National Parks Service

Headwater streams such as Ashwillet and Billings Brooks are typically short in length and drain relatively small areas, but are important because they comprise the majority of the 8,400 stream and river miles in Connecticut. What happens in the local landscape is directly translated to headwater streams and major receiving waters are affected in turn. As rural areas of North Stonington suburbanize, streams handle increasing amounts of runoff that degrades headwater streams as well as major tributaries. Specific resource protection concerns for Ashwillet and Billings Brooks include contributions to stream base flow, and to cold temperature levels.

Focusing on the headwater stream level is important in watershed management for several reasons:

- Headwater streams are exceptionally vulnerable to watershed changes;
- Headwater streams are visible at the same geographic scale as development;
- The public intuitively understands streams and strongly supports their protection; and
- Headwater streams are good indicators of watershed quality.

The watersheds and sub-watersheds that drain to these streams are easily identifiable landscape units that tie together terrestrial, aquatic, geologic, and atmospheric processes. Thus, they are the most appropriate geographic unit to protect water resources.

### **Potential Water Quality Issues**

As stated in another section of this report, nitrogen and phosphorus are the nutrients of concern to water quality. Both can be found in high concentrations in polluted runoff. Nutrients are associated with runoff from poorly managed forested lands, urban runoff from lawns and pet wastes, as well as from leachate from on-site septic systems. These pollution sources all exist within the Billings Brook sub-regional watershed. It is somewhat unclear from the supplied site development plans on where and how the proposed lots lay on the topography, and thus hydrological network, of the local landscape. It appears that most of the proposed lots in Lakeview West would drain to Ashwillet Brook, discharging to Billings Brook. Unchecked nutrient pollutant management can lead to some downstream impacts to both Billings and Anderson (Blue) Lakes, as well as to impoundments within the Pachaug River system and eventually the Quinebaug River system below Jewett City. The CT 2002 Water Quality Report to Congress, often referred to as the 305(b) report, assessed Billings Lake for meeting its designated uses for Class A. Although no identified impairment to such uses was determined, a Threatened designation was given for Overall Use Support, Primary Contact (Recreational) and Secondary Contact (Recreational). Listed



causes for concern include noxious aquatic growth and exotic weeds - both which could be enhanced with unchecked nutrient (and sediment) loading into Billings Lake from construction and post-construction land activities.

Sediment is another pollutant of concern for Ashwillet Brook, and to a lesser extent for Billings Brook. Excessive sedimentation from sources such as unchecked erosion sites along unpaved roads and unmanaged road sanding operations can lead to degradation of stream bottom habitat. That can lead to impairment of the downstream fisheries in the adjacent streams and lakes.

Stream water temperature changes stress aquatic organisms that are often fine-tuned to specific water chemistry and temperature regimes. Ashwillet Brook, like most small stream systems in Connecticut, has a channel less than 15 feet in width, with (near) continuous foliage canopy that limits sunlight. Maintaining or enhancing natural(ized) streambank vegetation will shade the water, limiting temperature changes and supporting high dissolved-oxygen levels. The Thames River Basin Partnership, through the Eastern Connecticut Conservation Service office in Norwich, has public outreach information on vegetative buffer areas for streams that can be useful for residents, both moving into this development and within existing surrounding areas of Anderson and Billings Lakes.

### **Proposed Land Use**

Regional land use data are inadequately described in this site plan. These data are especially important because of the relationship between land use and site development runoff pollution. Any resultant pollution management must be based on the specific site and regional land use conditions for the Billings Brook sub-regional watershed. The Town commissions should consider requesting additional information to meet this decision-making need. The site's watershed boundaries, or drainage basin divides, should be clearly delineated on revised site plans. The Town should consider requesting the applicant to supply the

regional land use patterns on either an expanded Locational Map or similar overview map in the site plan sequence of maps and assessments.

Another need for descriptive land use data is with the Town's long term resource planning and management of open space areas within this site and how they correspond to adjacent parcels.

It appears that the proposed land uses and densities will be able to be supported on-site. Generally residential lots sizes of 1-2 acres or greater is a reasonable density given that general land conditions are good or buildable areas exist within the lot layout. Although the proposed lots are generally greater than this range, buildable areas within some lots will be difficult to construct on. This is evident by the site walk indications of extensive wetlands and ledge outcroppings in both development areas, as well as the developer's comments that engineered septic systems will be necessary for virtually all proposed lots. Given this, the following comments are offered in response to inquiries from the Town:

- 1) The State Water Quality Standards for a Class A watercourses and waterbodies neither promote "zero impact", nor preclude adjacent residential development, as long as the development does not result in degradation of the waterbody classification.
- 2) It should be a resource protection goal of the Town of North Stonington to strive for natural stream flow and temperature conditions.

Several commission members commented during the site visit about the current procedure that usually precludes a local sanitarian from witnessing the deep hole tests on proposed lots. From my understanding, State Department of Public Health (DPH) staff is often/usually called in to fill that void in the local approval process. Every subsurface sewage disposal system (a.k.a. septic system)

installation requires a site investigation to gather necessary soil information (including deep test pit data, percolation tests, etc.) The Town should consider addressing this local situation and find the resources to fund and train a local health sanitarian to witness the test sites. DEP may be providing some support to this across the state in the coming year - the DEP Nonpoint Source Pollution Management Program is reviewing a current proposal submitted by DPH staff and UConn staff to provide septic investigation training for local health department staff. Benefits of the training will include fewer septic system failures caused by flawed site investigations, better treatment and renovation of domestic sewage, and protection of groundwater supplies.

### **Stormwater Management**

Non point source pollution (NPS) occurs when water runs across the land mosaic, and picks up pollutants and deposits them in surface waters and groundwater. NPS has now become the nation's leading source of water quality degradation. Everyone is a NPS contributor in our everyday lives. The focus of NPS management is to educate ourselves about the inputs and apply NPS management principles to activities such as new site development proposals.

Stormwater from cumulative urbanization can be a significant non-point source of pollution. Management of both the quantity and quality of runoff should be considered to protect receiving waters, such as Ashwillet Brook.

**Although no direct impact is proposed within 100 feet of Ashwillet Brook, properly designed, installed and maintained stormwater controls are critical to ensure a healthy and productive stream corridor.**

No new roads or significant road improvements are proposed with this development site plan. That aspect will significantly reduce the potential impacts to water quality from increased impervious surfaces, such as paved roads and

cul-de-sacs. There are numerous driveways proposed, including some rather lengthy ones. Driveway standards and paving materials that are supportive of minimizing runoff and maximizing on-site infiltration should be considered. One opportunity for the Town and the applicant to pursue alternative driveway construction is with a program administered by the University of Connecticut, called the Non-Point Education or Municipal Officials (NEMO) Program. It's overarching mission is to educate municipal land use decision makers about the connection between land use and water quality, and provide them with technical information on how to reduce the environmental impacts of new development. This reviewer encourages the town of North Stonington and the applicant to review alternative driveway plans and designs, construction and post construction elements of NEMO techniques. You can view the information on NEMO's web site at: <http://www.nemo.uconn.edu> .

Typical residential use will have minimal and relatively more dispersed pollution sources, such as household waste and lawn maintenance, which is best handled through education. The Town of North Stonington should consider providing homeowners with information on residential Best Management Practices, much of which is readily available from the UConn-Cooperative Extension System's Home-A-Syst program. The DEP recently developed a brochure (*8 Tips For Cleaner Water*) to give people a quick introduction to how our everyday activities impact water quality, and provide eight tips that people can use at home that can lead to cleaner water.

The site plan does not provide an analysis of downstream impacts to the Ashwillet/Billings Brook streamside, or riparian, corridor by this development proposal. This development, if approved, will not be isolated within this watershed. Several commission members raised concerns during the site visit of development impacts to wetlands and watercourses. It is reasonable for the Town to understand any anticipated downstream impacts to private and public lands, transportation infrastructure and water resources. The Town Inland

Wetlands Commission should utilize its Upland Review Area regulation to require the applicant to explain how any impacts from the development proposal are consistent with the State Inland Wetlands and Watercourses Act. If the applicant can successfully document to the satisfaction of the Inland Wetlands Commission that the proposed activities are fully consistent with the purposes and provisions of the State Inland Wetlands and Watercourses Act, then the applicant is entitled to receive a permit. The determining factors that the Commission must weigh in making its decision on the application should be available on a Commission checklist, as prescribed in section 22a-41 of the Connecticut General Statutes.

### **Watershed Resources Protection and Alternative Development Options**

Watershed protection is a technique to provide long-term water quality benefits. Specific to non point source (NPS) pollution controls, site plan reviews are an integral component of a watershed protection program. During site development, efforts should be made to protect, to the extent practical, the natural integrity of watersheds and natural drainage systems. Two additional components of a watershed protection program for the Town to consider include: 1) avoiding conversion of areas susceptible to erosion and sediment loss; and 2) preserve areas that provide important water quality benefits and/or are necessary to maintain stream corridors and aquatic biota.

North Stonington Inland Wetlands Commission members raised several concerns during the site walk about proposed development impacts on the wetland and watercourse resources in and adjacent to the development sites. Inquiries were made for suggested options available to the town toward wetland/watercourse resource protection. **The DEP Watershed Management Program supports wetland buffer protection areas to retain viable watershed health**, as is currently in place for much of the Ashwillet/Billings Brook watershed.

The DEP supports and recommends the use of buffers to protect wetlands and watercourses from environmental impacts. Buffers 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. The importance of forested streamside buffers has been well documented in the scientific literature. In addition to the benefits described above, these riparian buffers also help moderate the temperature of stormwater runoff before it enters the watercourse, thereby reducing thermal impacts on aquatic wildlife. Maintaining or enhancing naturalized streambank vegetation on all watercourses will shade the water, limiting temperature changes and supporting higher dissolved-oxygen levels. Consider providing native plantings to enhance or extend the buffer zones around all wetlands and watercourses and/or adopting a no-mow zone to allow these areas to re-vegetate naturally.

The site development plan does not indicate a wetland or watercourse area buffer demarcation, though it does indicate a 100' boundary line from delineated wetlands. This is contradictory to the natural resource-based planning process, which is an increasingly important planning process for the region's rural communities. Furthermore, there was no description of the Ashwillet/Billings Brook sub-regional watershed beyond the immediate project site. The town should consider requiring the applicant to provide a fuller description of this local watershed so the town can better assess the impacts of this proposed development on adjacent land parcels and within the larger watershed landscape.

### **Upland Review Area Guidance**

Another topic of concern from Inland Wetlands Commission members focused on development impacts to the upland review area. Unfortunately, this

reviewer did not learn whether such an upland review area regulation has been established for North Stonington, and if so, whether it is based on a fixed, a variable, or a multiple variable model regulation. A guess is that a fixed 100' upland review area designation is being applied to these two proposals. The following then is some information that Inland Wetland commissioners can use for background information, or to supplement their existing upland review regulation process. The term "upland review" is promoted by DEP to describe the non-wetland or non-watercourse area in which certain types of activities, as defined by your municipal regulations, are regulated activities. This term best conveys the regulatory scheme under the state Inland Wetlands statutes wherein a wetland agency reviews regulated activities case-by-case and approves or disapproves them on their merits.

It is the Department's policy to encourage municipal inland wetland agencies to review proposed activities located in upland areas surrounding wetlands and watercourses wherever such activities are likely to impact or affect wetlands or watercourses.

The Department produced a document, *Guidelines: Upland Review Area Regulations, Connecticut's Inland Wetlands and Watercourses Act*, (June, 1997), which is available at Inland Wetland Commissioner Training workshops conducted annually by the Department's Wetland Management Program staff. The DEP believes that a 100 foot-wide upland review area is sufficient for reviewing most construction activities in areas surrounding wetlands or watercourses because most of the activities that are likely to impact or affect these resources will be located in that area. The Department emphasizes that other municipal authorities and mechanisms involving planning, zoning and subdivision decisions and plans of conservation and development, play a role in addressing the broader watershed issues.

It is important for the Commission to understand the various functions of upland areas that surround wetlands and watercourses and serve to protect these resources. Functions may include:

- Control Non-point Source Pollution
- Protect Aquatic Habitat
- Control Temperature
- Provide Food For Aquatic Life
- Insulate Fish and Wildlife From Human Activities
- Provide a Corridor Linking Wetlands and Watercourses

Since the functions will vary depending on the specific project site(s), each permit application must be reviewed on its individual merits.

Equally varying are the types of regulated activities in the designated upland review area and their potential wetland or watercourse impacts. Site-specific examples for the Town commissions to consider for these development proposals include the following:

- Clearing, grubbing and grading necessary for house lots
- Paving driveways
- Excavating house foundations
- Filling
- Constructing
- Depositing material
- Removing material
- Discharging storm water



### Determining Open Space Designation

It is unclear to this reviewer how and why the applicant chose the proposed open space area and what the applicant proposes for the dedication of open space. The applicant had not identified what the purposes of the proposed open space areas are for, and how they were determined (with reference to the town's recently revised Plan of Conservation and Development and town subdivision regulations). To provide for a more effective review of this site development plan, the applicant should discuss whether the town of North Stonington has expressed an interest in receiving the type and location of the open space depicted on the site plan. This can be clearly spelled out in a supplemental document to the site plan, along with a note in the site plan that references such a document.

As an example for consideration, there are several proposed lots that, if approved as is, would fragment ownership in the large wetland complex of Lakeview West. A supporting objective for consideration would be providing for long-term resource protection and management of desirable open space areas. An action strategy would be providing for natural(ized) linkages between land, wetlands, and water resources that can yield accumulated, synergistic benefits as a viable cluster (which can be realized under single owner/management), rather than risk resource fragmentation through isolated management or misuse of individual components over the long term (from multiple owner/managers).

The Ashwillet/Billings Brook watershed currently contains a low percentage of permanently protected and connected open space areas. It is noted that a state-owned boat launch is located at Billings Lake and at Anderson (Blue) Lake. The area does include various parcels within the Pachaug State Forest Management Unit. Much of this watershed is zoned to allow for similar land development as the current Lakeview North and Lakeview West subdivision proposals. The Town of North Stonington can protect and support long-term watershed health

by incorporating the inland wetlands and watercourses into committed open space protection areas.

Does the proposed open space dedication go to the Town of North Stonington? If so, is the proposed area(s) consistent with the prioritized areas of either recreation, conservation, and/or preservation as established in the Town's Plan of Conservation and Development? The town commissions should consider having the developer provide supportive information for the proposed open space type, location and any connectivity with other open space lands, as well as whether the Town selectmen are supportive of receiving such a proposal.

The town should consider the incorporation of the majority of the wetlands and the Ashwillet Brook corridor into a single ownership (e.g. town) for long-term resource protection and management. An alternative, though less favorable proposal, is to retain these wetland/watercourse resources with private ownership within the final approved lots, along with the execution of permanent conservation (restriction) easements on these areas.

Conservation easements are restrictions placed on property that legally restricts the present and future use of the land. For resource protection purposes, the easement holder is usually not the owner of the property and is able to control property rights that a landowner could use that might result in adverse impacts to resources on the property. In effect, the property owner gives up development rights within the (environment) while retaining the ownership of the property .

If either alternative is accepted, it is further recommended that the town consider developing a boundary marker and monitoring plan for these now protected areas. Field marked open space boundaries along road and lot lines will provide the town staff, the site contractor, and all sub-contractors with a clear understanding of where these areas exist, thus minimizing unintentional impacts during construction. The Town could extend this educational outreach

campaign by placing a letter in each lot file. The letter would identify to the new lot owners (and subsequent owners) the conservation easements and the desire by the town to protect the wetland and stream belt corridor through the development.

### **Additional Recommendations**

- With respect to these two development proposals, and in light of several commission member concerns for cumulative impacts of future development in the same area of town, the Town should consider the requirement of the applicant for a wildlife habitat assessment within the area of these two large parcels (totaling 150+ acres). This residential development proposal is located within a largely rural area of North Stonington. Ashwillet/Billings Brooks and the associated wetlands and floodplain probably provide a significant spine to a long-term wildlife corridor connection in the region (between the Pachaug State Forest parcels, the two lakes and then North across the town line into Griswold and the Pachaug River system). Networks of stream belts are a logical framework on which to develop open space systems in North Stonington and throughout much of Connecticut. Appropriately designated open space(s) within this development, and for consideration with future development proposals, can help insure that wildlife can effectively move in and through these residential subdivisions.
- During the site walk, a question was posed about the use of a local scenic road ordinance to conserve rural character of the area, and aid in water resources protection. An ordinance concerning the designation of scenic roads, established by the Town of North Stonington in 1987, allows the Planning and Zoning Commission to consider nominations of notable town roads.

Town roads should be free of intensive commercial areas and of intensive vehicular traffic AND meet at least one of the following criteria:

1. It is unpaved
2. It is bordered by mature trees or stone walls
3. The traveled portion is no more than 20 feet in width
4. It offers scenic views
5. It blends naturally into the terrain, or
6. It parallels or crosses over brooks, streams, lakes or ponds.

The Planning and Zoning Commission may want to consider proposing such a scenic road designation to the landowner/developer for incorporation into a revised site development plan and application. Additional lands fronting Billings Lake Road should be considered, much of which was reported as owned by the same landowner involved with the Lakeview North and West subdivision proposals.

## Water Quality Considerations

The ideal land use to protect water quality is undeveloped and undisturbed. Developed property can generate pollutants such as nitrogen and phosphorus and promote soil erosion. These pollutants collectively promote lake eutrophication. Eutrophication is the process that takes place when a lake or pond degrades from a waterbody with clear water and little plant growth, to a waterbody with weeds and algae. Road sands and eroded soils that deposit into a waterbody during storm events creates habitat for nuisance rooted aquatic plants while phosphorus, which promotes algae growth, is often attached to these soil particles. Although rooted plants and algae are natural components of the lake ecosystem and some lakes are naturally eutrophic, accelerating the eutrophication process beyond its natural level is detrimental to the lake and detracts from a lake's value as a recreational resource.

The drainage basin, also known as the watershed, is the area of land in which water drains to a particular waterbody. In the case of the Lakeview Subdivision West and Lakeview Subdivision North, water drains to three waterbodies; Billings Lake, Blue Lake (a.k.a. Anderson Pond), and Ashwillet Brook. However, the majority of both subdivisions drain to Ashwillet Brook, downstream of Blue Lake. The exact area that drains to each of the lakes and Ashwillet Brook is difficult to determine with the drawings provided by the developer. It is recommended that the North Stonington Inland Wetlands and Watercourses Commission request that the developer provide a map showing the watershed boundaries overlaid with the subdivision. This type of map will help the commission gain a better understanding of the potential impacts to each of the three waterbodies/watercourses.

Controlling the runoff before discharging into a watercourse both before and after construction is one of the single most important ways to protect these watercourses. The direction and amount of stormwater that will drain from the proposed driveways of these two subdivisions should be evaluated to determine the potential impacts to water quality. Runoff from the driveways will drain to state and local roads and ultimately to the three watercourses. The subdivisions propose a total of 10 new driveways along Billings Road. The potential increased runoff from these driveways and all other proposed driveways should be calculated to determine whether the existing stormwater drainage infrastructures are capable of controlling not only flooding, but also sediment that may be generated from gravel driveways or winter sanding. The town's engineer should review any hydrologic and hydraulic calculations provided by the developer. North Stonington should contact DOT to discuss potential problems with Route 201.

Another concern is the driveway for lot 11.01 in the Lakeview Subdivision West. This driveway is approximately 2,800 feet long and crosses through lot 11.02. The potential for drainage problems increases with the greater distance water travels. If this driveway develops a drainage problem, either property owner may claim the other is responsible. It is difficult to determine whether this driveway has the potential to create an erosion problem to adjacent properties or watercourses. Wetlands not within the subdivision have not been mapped and this drive travels a great distance along the border of the subdivision.

Other problems in addition to soil erosion can develop when common driveways are used to provide access to land that might not otherwise be subdividable. North Stonington may want to review its subdivision regulations to determine if common driveways are in the best interest of the town and future property owners of these lots.

Future development in the Billings Lake area may involve creating new roads to provide access to land that is currently inaccessible. A review of the current road standards may be needed to assure that they are protective of water quality. Often towns have been concerned with moving water off roads as quickly as possible with little regard to protecting water quality. More current practices often include drainage that directs roadway runoff to structures that allow settling of solids and skimming of floatable pollutants before discharging to watercourses. If road standards are not currently protective of water quality, North Stonington may want to review and upgrade as needed its road standards before additional subdivisions are proposed for the Billings Lake area.

## Subsurface Sewage Disposal Review

Although the DOH-Environmental Engineering Program was unable to participate in the ERT field review of the Lakeview Subdivisions, Robert Scully (PE, Supervising Sanitary Engineer, DOH, Environmental Engineering Program) was able to conduct a cursory review of the subdivision plans in regard to on-site subsurface sewage disposal facilities. Dieter, Gardner and Mereen, Inc. prepared the plans, which are dated February 2003, last revised April 2, 2003. The primary area of concern is with the soil test information as presented on the plans. This program has the following comments:

- **Soil Test Data:** The plans indicate Gary J. Winalski, PE, compiled the soil test results. The plans are not sealed by a professional engineer. The local health department did not witness any of the soil tests, nor did any other third party, therefore, the accuracy of the results is unknown. The test pit profiles are vague and incomplete. The results do not include typically described soil characteristics such as compaction and color. The soil horizon below the topsoil is simply noted to be "subsoil" with no mention of soil grain size. Other pertinent observations, such as root levels, are not provided. The actual dates of the December 2002 and the February 2003 testing were not provided. This program received a copy of a July 7, 2003 correspondence from Patrick Lafayette to the Town Planner, Craig Grimond. The letter indicates that several purportedly dug test holes could not be located. The letter recommended additional test holes be conducted and witnessed. This would be appropriate.

The percolation test data is incomplete. Hole depth and presoak information is not provided and in many instances the hole locations are not identified. Inadequate presoaking can result in reported percolation rates that are faster than they really are. Each lot had only 1 (one) percolation test rather than the



recommended minimum of 2 (two), one in each of the primary and reserve areas.

Some of the proposed on-site sewage disposal systems are in areas mapped by the soil survey as Woodbridge-Paxton-Montauk map unit. The test pit profiles do not describe a compact substratum (hardpan) which typically is associated with this map unit. Some of the test holes record shallow maximum groundwater levels in these areas which would be expected in such soils. None of the test holes descriptions contain unsuitable soil conditions as defined in PHC Section 19-1 3-B 103e (a)(3), however, as previously noted the local health department did not witness the soil tests. If the local health department participated in the soil testing and found that the maximum groundwater levels are in doubt, they could have required an investigation pursuant to PHC Section 19-13-B I 03d(e). This section provides for water level monitoring during the designated wet season.

- **Basis of Design/System Layout:** The plans do not contain complete information on the basis of design. The plans should stipulate the number of bedrooms and design percolation rates the sewage systems have been laid out for. It appears the 55' (length) by 21' (width) boxed out primary and reserve leaching areas were laid out to accommodate three standard leaching trenches which would provide the minimum required effective leaching area needed for a 3 bedroom house with a design percolation rate of 1-10 minutes per inch. It should be noted that several of the lots (4.04, 11.09, 11.01) have percolation rates slower than 10 minutes per inch which would necessitate larger designated areas.

Leaching system layouts should also reflect the minimum leaching system spread (MLSS) criteria contained in the Technical Standards. Substantial system spreads can be anticipated on some of the lots due to high groundwater. MLSS calculations should appear on the plans.

- **Miscellaneous Concerns:** Although the majority of the lots are relatively large and ample, suitable areas appear to be available for the sewage disposal systems, there are several lots that warrant particular scrutiny. Lot 4.05 has shallow groundwater and the primary leaching system layout is problematic. This layout would not meet MLSS criteria. Lot 4.06 has ledge outcrops in close proximity to the proposed leaching areas, however no soil testing was conducted off the ends of the system to establish depth to ledge. At least one lot (lot 11.02) would require a pump system to utilize the designated leaching areas. Lots requiring pump systems or engineered septic system designs should be designated.

In closing, this program recommends the North Stonington Health Department take necessary steps in order to assure the accuracy of soil test data generated by professional engineers during subdivision development. If local health department staff is not available to witness the actual testing, then arrangements for third party oversight is recommended. The lack of thoroughness on the test holes description in the subject subdivision under scores the need for accuracy assurances.

## The Natural Diversity Data Base

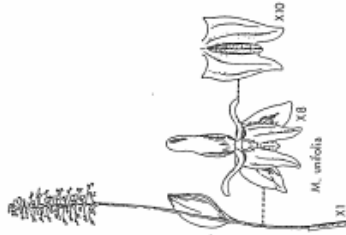
The natural diversity Data Base maps and files concerning the project areas have been reviewed. According to our information, there is an extant population of Green adder's mouth (*Malaxis unifolia*, State Endangered) observed on a wetland edge in "wet sphagnum" in the immediate vicinity of the proposed subdivision. The wetlands on this property should be carefully inventoried to determine whether this plant exists on site and to determine what impacts, if any, that the proposed subdivision may have on this plant.

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 contact Ken Metzler (860-424-3585) if you have further questions regarding this information. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

**Green adder's-mouth**  
*Malaxis unifolia* Michx.  
 Family: Orchidaceae

**Description:** Green adder's-mouth is a fibrous-rooted, glabrous (hairless), rather inconspicuous member of the Orchid family. It rises from a bulbous corm (vertical underground stem) to a height of 6 to 60 cm (2.4-23.6 in.). In most cases, however, it is 30 cm (1 ft.) or less in height. As the specific epithet (*unifolia*) suggests, it has only a single leaf. This solitary, bright green leaf sheathes the stem for about half its length before opening into an oval to elliptical blade approximately 2.5 to 7.5 cm (1 to 3 in.) long. The numerous—roughly 20 to 80—tiny, green flowers are grouped in a terminal raceme, which elongates and straightens as it matures. The flowers become more crowded toward the top, giving the raceme a flattened (or umbelliform) appearance. Floral bracts, leaf-like plant parts associated with flowers, are minute, 1-3 mm (.04-.12 in.) long and triangular. Each slender flower has three sepals, and three petals—two lateral petals and a lip (the lowermost petals of orchids). The lateral petals are thread-like and recurved (bending backwards). The sepals are somewhat broader (about 1 mm or .04 in. wide), with the uppermost erect and the two lower ones spreading or recurved. The lip is broader still and tridentate at its tip, with the central tooth the smallest. Green adder's-mouth fruit is an ellipsoid capsule, approximately 3-6 mm (.12-.24 in.) in length.



Gleason, H.A. *The New Britton and Brown Illustrated Flora of the Northeastern U.S. & Adjacent Canada*. NY Botanical Garden, 1952.

**Similar Species:** White adder's-mouth (*Malaxis brachypoda* Gray Fern), another small single-leaved orchid in our range, could be confused with green adder's-mouth. Not only do both have terminal racemes of small greenish flowers, but they may both occur in the same wetland (e.g., a bog or wooded swamp). Nevertheless, several factors distinguish them. Most obviously, the lip of white adder's-mouth is not tridentate; instead it ends in a single sharp point. Furthermore, the pedicels (flower stalks) of *M. brachypoda* are much shorter than those of *unifolia*: only 1-2 mm (.04-.08 in.) as compared to 4-8 mm (1.6-3.2 in.) in *unifolia*. Finally, even when the two species are growing in the same wetland, *M. unifolia* is found in drier, more acidic micro-habitats, such as on sphagnum hummocks, while *brachypoda* prefers wetter, near neutral to calcareous pockets. Another very similar appearing orchid in its range is *M. bayardii*, which differs from *M. unifolia* mainly by the length of its flower stalks. The pedicels of *M. unifolia* are 4-10 mm long while those of *M. bayardii* are only 2-4.5 mm long.

**Range:** The range of green adder's-mouth extends from Newfoundland, Nova Scotia and Ontario west to Manitoba and south to Florida, Texas, Mexico, and Central America. The species also grows in Cuba. In New England, there are extant populations in every state except Rhode Island, where the species was last seen in 1980.



US Range



o Historical \*Current

**Habitat:** Green adder's-mouth can occupy a wide variety of habitats with acid soils. Specific habitats in southern New England include seepy scrapes (areas where the soil has been bared and water seeps to the surface), bogs, the sphagnum edge of a swamp, a cranberry bog, a wet slough near a rhododendron swamp, a cedar swamp, and a semi-open youngish forest of mixed hemlocks and hardwoods. (In this latter case, the plants were very near an old logging road.) Nevertheless, in the northern portions of its range, it has been found in dry, semi-open to open sites. Associated species at these sites include wild lily of the valley (*Maianthemum canadense*), ragged fringed orchid (*Platanthera lacera*), club-spur orchid (*Platanthera clevelandiana*), yellow bartonia (*Bartonia virginica*), a species of spike-rush (*Eleocharis tuberculosa*), marsh willow-herb (*Epilobium palustre*) and tawny cotton-grass (*Eriophorum virginicum*).

**Life History and Reproductive Ecology:** The family Orchidaceae is one of the largest families of flowering plants, with at least 17,000 species. All orchids have an inferior ovary (sepals, petals and stamens appear to arise from the top of the ovary). Orchid ovaries contain thousands of ovules (the reproductive structures that form seeds after fertilization); hence, orchids can produce vast quantities of seeds. (These seeds are extremely tiny and can be carried some distance on air currents.) Orchid seeds have no food reserves and require the presence of fungi, which supply energy and nutrients, in order to germinate. The association between host roots and soil fungi is called "mycorrhizae." In the northern part of its range, green adder's-mouth begins growth in the spring. Every Spring it forms a new corm next to last year's corm, which disintegrates. In our area green adder's-mouth flowers from late June to late August. The lowermost flowers in the inflorescence open first. The lip starts out uppermost, but, as the flower matures, it turns upside down, making the lip lowermost. This process is called resupination. Generally, not many flowers are fertilized. An interesting characteristic of the species is the pronounced increase in vegetative growth that follows flowering.

**Official Designation:** Green adder's-mouth is not a federally listed species; however, it is either historical or uncommon in every New England state but Maine. In Massachusetts, where it is on an unofficial "Watch List," there are three current populations and at least one historical population. (Old specimen records exist for several towns in the western part of the state.) In Connecticut, where the species is currently listed as "Endangered," there are four current stations. Rhode Island has five historic stations and lists the species as "State Historic."

**Management Recommendations:** These plants are usually found in habitats with a fair amount of dappled sunlight. For orchids in general, if the population is declining and heavily shaded, it can be beneficial to do some selective thinning of the surrounding woody vegetation; however, the habitat must not be totally open. Succession to a closed forest may pose a threat to this species.

## Fisheries Resources

### Billings Lake

Much of the following lake and fish description is from "A Fisheries Guide to Lakes and Ponds of Connecticut" by Jacobs and O'Donnell (2002). Billings Lake is a natural lake within the Thames River drainage basin, its water level having been raised 10 feet by a concrete dam. There is one central basin of deep water surrounded by numerous small islands and considerable rock shoal areas less than six feet deep. The Billings Lake Watershed is 448 acres of mostly woods and wetland with a small percentage of residential and agricultural land. The lake is fed by bottom springs and surface runoff from two marshes along the eastern shore. It drains northward into Billings Brook.

The lake's shoreline is mostly wooded with moderate to light residential development concentrated on the western shore. Maximum water depth is 33 ft., and average depth is 14 ft. Water transparency is clear, approximately 12-15 ft. in depth during the summer. Bottom substrates are comprised of sand, gravel, coarse rubble, boulders and ledge. Aquatic vegetation is comprised of water-milfoil and fanwort, which are abundant to depths of 12 ft. with some water-nymph, bladderwort and pondweeds present. Floating mats of white waterlily, yellow pond-lily, water-shield and floating-heart are found in the shallow cove areas and at the southern end of the pond.

Billings Pond is considered to be oligotrophic containing low levels of nutrients. During the process of eutrophication or aging, a pond typically passes through three major states of succession: oligotrophy, mesotrophy, and eutrophy. The transition from one state to the next may take thousands of years; however; eutrophication can be rapidly accelerated by man-made inputs of nutrients such as excessive lawn fertilizer, soil erosion, stormwater runoff, and septic leachate.

Billings Lake is stocked each spring with 800 adult (9-12") catchable-size brown and brook trout. Few trout survive or holdover past summer due to the limited area of suitable deep-water habitat. Largemouth bass, sunfish and possibly chain pickerel and bullhead are moderately stockpiled. A stockpiled fish population refers to one that has too many slow-growing, small fish and relatively few large ones. Largemouth bass (<12 inches) and chain pickerel (<15 inches) are abundant, but densities of larger fish are only average. Densities of 8-12" black crappie are slightly above average. Sunfish (mostly bluegill, some pumpkinseed) are abundant, but rarely exceed 7". Brown bullhead in the 9-12" range are abundant. The forage base includes higher than average densities of golden shiners. Other fish species present at low densities are smallmouth bass, yellow perch, and alewives.

### **Recommendations**

Specific aquatic concerns as listed by the Town of North Stonington evolve around possible short and long-term environmental impacts to Billings Lake due to housing development. Lakeview Subdivision North will include six single family homes located on an approximate 70 acre parcel on the north side of Billings Road, which includes approximately 16 acres of open space. Surface water drainage from this parcel is variable, mostly draining west and north eventually outletting to Billings Lake Brook with a smaller portion of the property draining to Billings Road and Billings Lake. Lakeview Subdivision West is an approximate 81 acre parcel located on the east side of Route 201 and south side of Billings Road with a proposed 11 lots. Most surface drainage from this parcel flows west eventually to Anderson's Pond Brook.

The growth of aquatic plant and algal life depends on nutrient supply with the primary nutrient that stimulates excessive growth of plants being phosphorous. Given that Billings Lake is oligotrophic, with very low levels of phosphorous, it is essential that development around the lake and its watershed be geared

towards minimizing and controlling the introduction of phosphorous. Phosphorous is a major component of lawn fertilizer, thus fertilizer can be carried in runoff to the lake where it can increase nutrient levels. 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 put on your lawn. Whenever possible, landowners should use fertilizers with little or no phosphorous. Phosphate free fertilizers have a middle number "0". The use of low or non-phosphorous fertilizers can provide nutrients to turf grass while avoiding threats to water quality.

As with most housing construction projects, it's essential that the erosion and sediment plan be properly implemented and maintained to contain exposed soils from runoff. Research has shown that about 85% of available phosphorous is bonded to small soil particles. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth and degraded water quality. Consequently, proper installation and maintenance of erosion/sediment controls is critical to environmental well being. This includes such mitigative measure as filter fabric barrier fences, staked hay bales, and temporary sediment basins. With the proper precautions and maintenance, excessive erosion can be preventable; thus, potential significant environmental threats to Billings Lake would be expected to be minimal as long as E&S best management practices are followed. Past siltation disturbances in Connecticut have occurred when individual contractors either improperly deployed mitigation devices or failed to maintain these devices on a regular basis especially after storm events.

New housing development will increase roadway usage on unimproved roads as well as potentially generate additional stormwater runoff, some of which can enter Billings Lake. Roadways, both town and private that are being considered for upgrading should incorporate an effective stormwater management plan to

control additional stormwater runoff, runoff that could contain hydrocarbons (gasoline and oil), herbicides, heavy metals, road salt, fine silts, and coarse sediment containing phosphorous. The effective management of stormwaters and roadway runoff can include implementation of such controls as the proper design and location of deep sump catch basins. Catch basin maintenance is very critical. Catch basins should be regularly maintained, at least once per year to minimize adverse impacts to aquatic resources. The use of sand and sodium chloride road salt to de-ice paved surfaces should be minimized.

It was learned that future housing development may occur within the Billings Lake Watershed. With future watershed development comes the possibility of more cumulative long term impacts to Billings Lake water quality due to gradual and incremental housing development. Such future developments should be scrutinized either by the Environmental Review Team or perhaps by a qualified environmental consultants hired by the town. Perhaps prior to allowing future development, the town should consider the creation and development of a comprehensive Billings Lake Watershed development plan designed to effectively control and limit future housing development with the goal of protecting Billings Lake water quality.

### **Literature Cited**

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



## Archaeological Review

The Office of State Archaeology (OAS) and the State Historic Preservation Office (SHPO) note that the proposed subdivision locations possess a moderate to high sensitivity for prehistoric and historic archaeological resources. In particular, three prehistoric archaeological sites (#102-78, 102-79, and 102-80) are located in immediate proximity to the development areas. In addition, they share the concern expressed by the North Stonington Inland Wetlands Commission that historic and industrial archaeological resources and remnant landscapes associated with the 19<sup>th</sup> century Ashwillet Village area be professionally evaluated and protected to the maximum extent feasible.

Field review suggests that areas of highest sensitivity for Lakeview West pre-Contact Native American sites exists on the knolls along Route 201 in proximity to the wetlands toward the east and the pond toward the west. While it is understood that some of this area will be left as open space, undisturbed portions will have a high potential to yield Indian sites. Likewise, terraces to the east of the wetland are also sensitive.

Field review of Lakeview North suggests two areas of concern: 1 ) eastern ridges which may contain outcroppings of bedrock which may have been used by hunters-gatherers for natural shelters, and, 2) historic farming ruins, including a series of stone piles associated with Lot 4. The western, lower portions exhibit a high density of stone piles, which are primarily the result of agricultural activities including stonewall construction, and may not suggest burial sites, however, their preservation is highly recommended by the OAS and SHPO. The proposed house location is situated to the higher elevations to the east and should avoid the area of concern. Should these plans change, Lot 4 should be surveyed to best determine the origins of these stone features.

The Office of State Archaeology and the State Historic Preservation Office recommend that a Phase I reconnaissance survey be conducted for the sensitive portions of the project area, in order to identify and mitigate any cultural resources on the project area that would be effected by construction activities. All archaeological studies should be conducted in accordance with the Connecticut Historical Commission's *Environmental Review Primer for Connecticut's Archaeological Resources*. In addition, our offices are prepared to offer any technical assistance in conducting the survey.

Finally, the Office of State Archaeology strongly encourages that significant archaeological resources be avoided, conserved *in situ*, and considered for State Archaeological Preserve designation pursuant to Connecticut General Statutes Section 10-384.

## Planning Considerations

The proposed development of both subdivision applications is very low density with seventeen total homes proposed on approximately 150 acres. Lot sizes range from slightly over two acres to 36 acres. Eleven homes will have driveway access onto Billings Road, three will access Route 201, and three will access Legend Wood Road via Cedars Road. Most of the proposed development area is located within an aquifer protection zone, which allows single-family homes at low densities. A portion of the lots which front on Route 201 are located within the "A" zone according to the North Stonington flood insurance rate map. However, the proposed home locations are located well outside of this area.

Three lots will have driveway access onto Cedars Road, a private road/driveway. These lots should have common driveway agreements established so that they have the right of passage over this road and are required to participate in the maintenance and upkeep of Cedars Road just as the current homeowners do. These agreements should be made part of the subdivision approval process.

A contiguous open space area of 15 acres is proposed in the Billings Brook valley adjacent to Connecticut Pachaug State Forest holdings. A contiguous piece of land such as this is desirable as a stream valley/greenbelt form of open space preservation and could be part a greenbelt leading to the Avalonia land holdings farther to the north. The 1990 Town Plan of Conservation and Development indicates this area north of Billings Lake as a major open space area, so locating the proposed open space in this area demonstrates compatibility. The developer has indicated that beach access rights to the small beach on Billings Lake, located at the end of a short road on the north side of Legend Wood Road, would not be provided to future lot purchasers. The road leading into this area is narrow and there is almost no off-street parking at this beach. It would not be desirable to bring more users into this confined area.

From a land use and zoning perspective, the proposed development is compatible with existing development, zoning and the Town Plan of Conservation and Development.

# 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, elderly housing, recreation/open space projects, watershed studies and resource inventories.

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

## REQUESTING A REVIEW

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

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