POND BROOK ESTATES SUBDIVISION

Newtown, Connecticut

King's Mark Environmental Review Team Report

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

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Environmental Review Team Report

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

for the
Conservation/Inland Wetlands Agency
Newtown, Connecticut

November 2002

CT Environmental Review Teams
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ACKNOWLEDGMENTS

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

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

The field review took place on Tuesday, August 6, 2002.

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I would also like to thank Sandra Michaud, chairman, conservation commission, Sally O'Neil, Don Collier, Philip Kotch, C. Wesley Gillingham, conservation commission members, Steve Driver, conservation official, Lilla Dean and Bill O'Neil, P&Z commission members, other town officials, Larry Edwards, engineer for the applicant, and concerned neighbors and their consultants for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project, location and soils maps and additional reports. During the field review Team members were given complete plans and additional information. Some Team members unable to make the scheduled field review made visits to the site on their own or conducted plan reviews only. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project -

all final decisions rest with the town and applicant. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in the review of this proposed residential subdivision.

If you require additional information please contact:

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INTRODUCTION

Introduction

The Newtown Conservation Commission/Inland Wetland Agency has requested Environmental Review Team (ERT) assistance in reviewing a proposed residential subdivision.

The 53 acre site is located on a gravel portion of Pond Brook Road in an R-2 zone. The proposal is to create a 14 lot subdivision with 12 new homes. There are two (2) existing homes which will remain. The site contains 12.7 acres of wetlands and Pond Brook flows through the property. There is an old railroad bed that parallels the brook with two bridge abutments where the railroad crossed the brook. Eleven home sites will be located on the westerly side of the brook, with one lot on the easterly side. A number of lots include portions of the brook and railbed in their acreage. A 1650′ road will be constructed that ends in a cul-de-sac. Each lot will be served by an individual on-site sewage disposal system and water supply well. There is a pedestrian easement proposed along both sides of the brook.

Objectives of the ERT Study

The town has asked for assistance because of the significant natural and cultural features of the site and the potential impacts to them. Of major concern are impacts to Pond Brook, its floodplain, and the wetlands. Other concerns include: geology, sewage disposal, aquatic habitat, land use and site design, open space, and archaeological and cultural significance.

The ERT Process

Through the efforts of the Conservation/Inland Wetland Agency this environmental review and report was prepared for the Town of Newtown.

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

The review process consisted of four phases:

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

The data collection phase involved both literature and field research. The field review was conducted on Tuesday, August 6, 2002 and some Team members who were unable to attend the field review date made separate site visits on their own. 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

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Location/Topographic Map

Scale 1″ = 2000′

Figure 2

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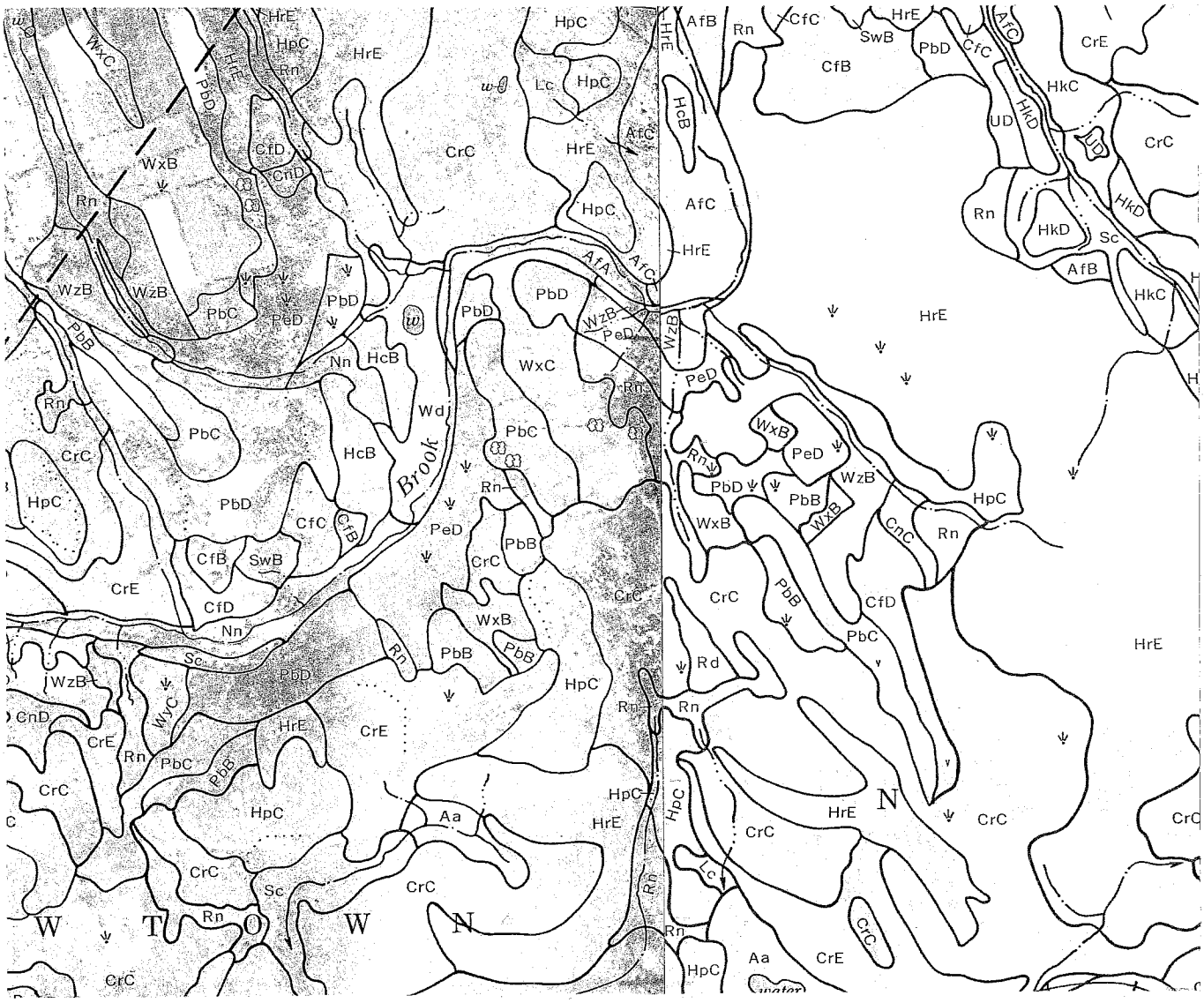
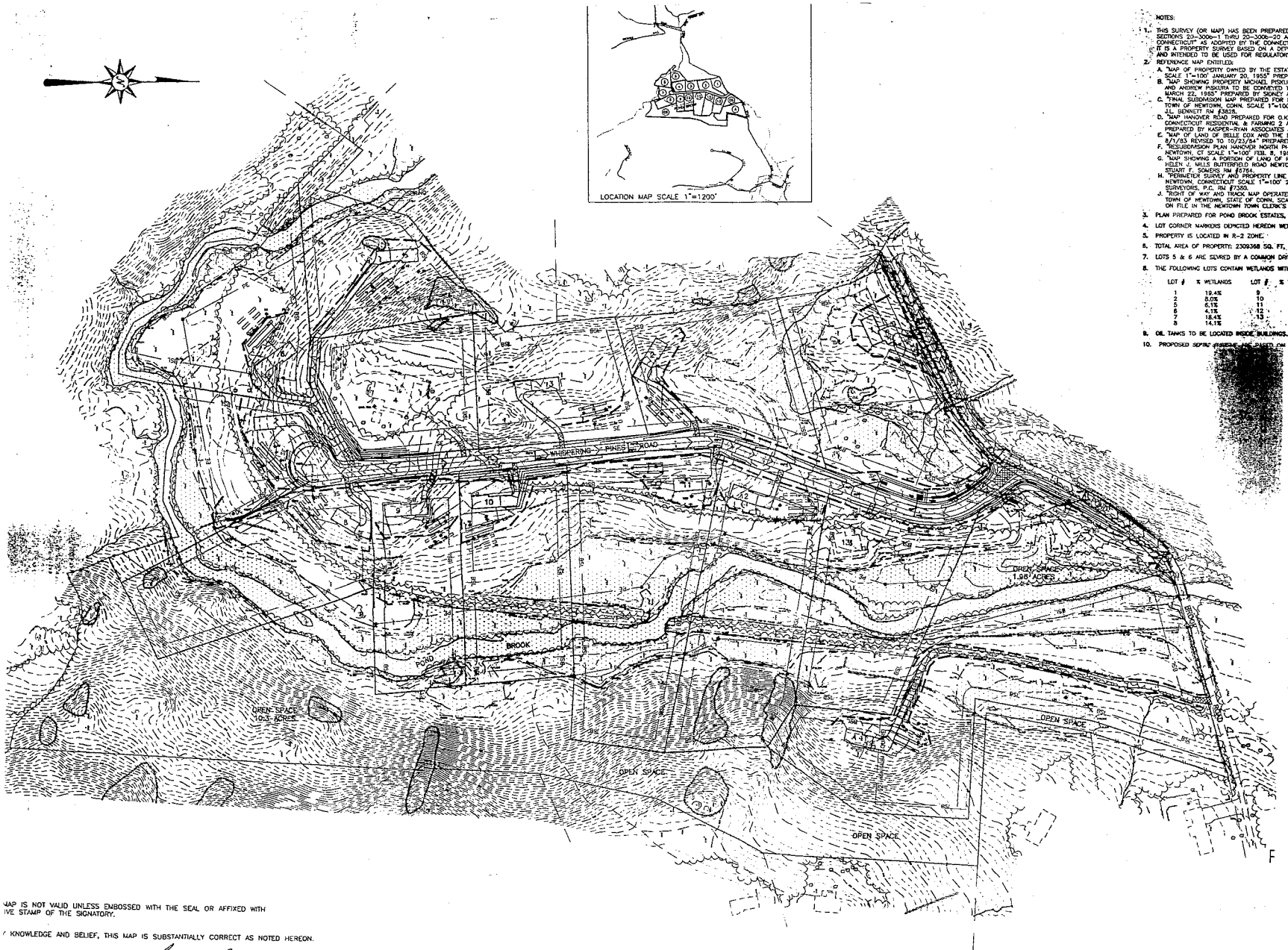
N

Soils Map

Scale 1″ = 1320′





NOTES:

1. THIS SURVEY (OR MAP) HAS BEEN PREPARED PURSUANT T SECTIONS 20-300b-1 THRU 20-300b-20 AND THE "STAN CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIA IT IS A PROPERTY SURVEY BASED ON A DEPENDENT RESU AND INTENDED TO BE USED FOR REGULATORY APPROVAL.
2. REFERENCE MAP ENTITLED:
   - A. "MAP OF PROPERTY OWNED BY THE ESTATE OF PAUL SCALE 1"=100' JANUARY 20, 1955" PREPARED BY JOS
   - B. "MAP SHOWING PROPERTY MICHAEL PISKURA, PAUL PIS AND ANDREW PISKURA TO BE CONVEYED TO JAY RUDIN MARCH 22, 1985" PREPARED BY SIDNEY A. KAPP RM
   - C. "FINAL SUBDIVISION MAP PREPARED FOR FREDERICK A TOWN OF NEWTOWN, CONN. SCALE 1"=100' TOTAL ARE J.L. BENNETT RM #3826.
   - D. "MAP HANOVER ROAD PREPARED FOR O.K. LAND DEVE CONNECTICUT RESIDENTIAL & FARMING 2 ACRE ZONE 1 PREPARED BY KASPER-RYAN ASSOCIATES RM #4083.
   - E. "MAP OF LAND OF BELLE COX AND THE ESTATE OF E 8/1/83 REVISED TO 10/23/84" PREPARED BY STUAR
   - F. "SUBDIVISION PLAN HANOVER NORTH PHASE I HANC NEWTOWN, CT SCALE 1"=100' FEB. 8, 1985 REVISED
   - G. "MAP SHOWING A PORTION OF LAND OF RICHARD ROC HELEN J. MILS BUTTERFIELD ROAD NEWTOWN, CONNEC STUART F. SOMERS RM #5784.
   - H. "HERNANDEZ SURVEY AND PROPERTY LINE CHANGE PR NEWTOWN, CONNECTICUT SCALE 1"=100' 2/2/01 REV SURVEYORS, P.C. RM #7380.
   - J. "RIGHT OF WAY AND TRACK MAP OPERATED BY THE N TOWN OF NEWTOWN, STATE OF CONN. SCALE 1"=100' ON FILE IN THE NEWTOWN TOWN CLERK'S OFFICE.
3. PLAN PREPARED FOR POND BROOK ESTATES, LLC.
4. LOT CORNER MARKERS DEPICTED HEREON WERE FOUND .
5. PROPERTY IS LOCATED IN R-2 ZONE.
6. TOTAL AREA OF PROPERTY: 2309368 SQ. FT, 53.016 AC
7. LOTS 5 & 6 ARE SERVED BY A COMMON DRIVEWAY.
8. THE FOLLOWING LOTS CONTAIN WETLANDS WITHIN THE MI

LOT #	% WETLANDS	LOT #	% WETLANDS
1	19.4%	9	0.2%
2	8.0%	10	7.5%
3	6.1%	11	18.4%
4	4.1%	12	8.8%
7	18.4%	13	19.1%
8	14.1%		

9. OIL TANKS TO BE LOCATED INSIDE BUILDINGS.
10. PROPOSED SEPTIC SYSTEMS AND WELLS ON A FOUR B

MAP IS NOT VALID UNLESS EMBOSSED WITH THE SEAL OR AFFIXED WITH IVE STAMP OF THE SIGNATORY.

KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

Figure 3

Project Layout

No Scale

TOPOGRAPHY AND GEOLOGY

Topography and Surficial Geology

The proposed subdivision straddles a large meander of Pond Brook in the northwestern corner of Newtown. Roughly one half of the 53 acre site bordering the flood plain of Pond Brook is relatively flat and is underlain by tens of feet of relatively permeable post glacial alluvium and stratified sands and fine gravel (Figure 4). The other half of the subdivision is topographically considerably more rugged, with a local relief amounting to 20 or more feet and with moderate to steep slopes This area is veneered by a thin, discontinuous blanket of glacial till - a poorly sorted mix of rock fragments and fine grained ground-up debris dragged along at the base of the mile thick ice sheet which covered New England 20,000-30,000 years ago.

On the regional scale the topography is characterized by two distinct terrains - areas of smooth gentle slopes and rounded hill tops contrasting with areas of irregular hummocky topography and much steeper slopes. The smooth terrain correlates with thick accumulations of glacial till smeared over the underlying irregular pre-glacial topography. In places, such as along Obtuse Road these drumlin-like till mounds are elongated and streamlined in the direction of ice movement - from the NNW to the SSE. The NNW facing slopes on the south side of the Pond Brook Valley were also covered and smoothed over the thick blanket of basal till deposited by the SSE flowing ice. As the hummocky terrain is covered only by a thin discontinuous deposits of till its topography is controlled by the structure of the local bedrock. Zones of weakness along NNW trending bedrock fractures have been etched out by

deep weathering which has produced a conspicuous linear grain to the topography. Long linear features defined by steep cliffs and narrow ravines show up prominently on the topographic map (see Figure 5). Water wells drilled along the lineaments are likely to be highly productive as they would intersect intensely fractured bedrock.

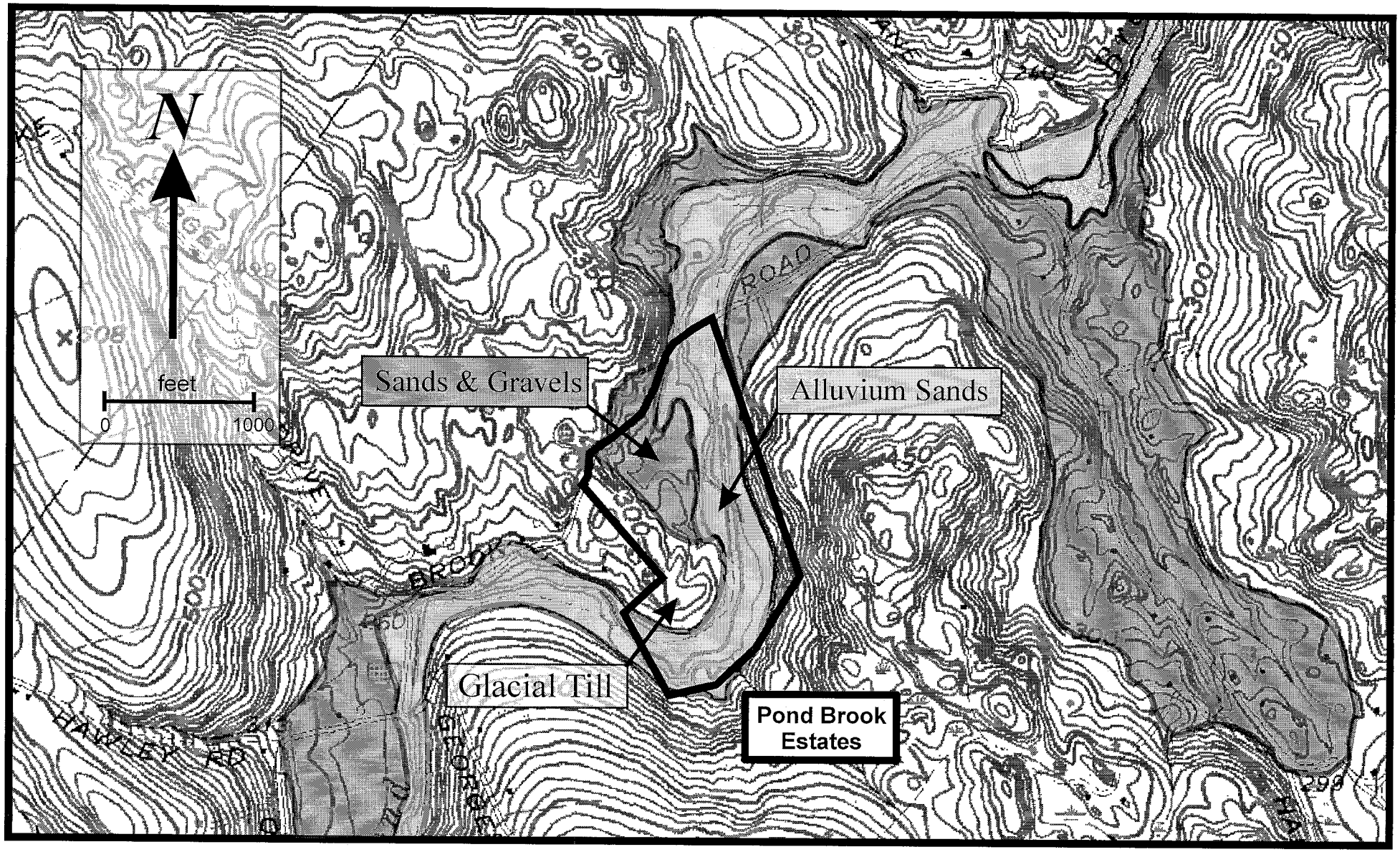
Bedrock Geology

Two different rock types form the bedrock in the area of the proposed subdivision. A silvery colored muscovite-biotite-quartz-plagioclase schist. Porphyroblasts (scattered large crystals) of red garnet and green chlorite are common. Large foot-sized lenses of pure white quartz are widely dispersed throughout the area. In a number of places on the hills west of the site some these quartz lenses were trenched and possibly mined for use as paint pigment. The other rock type exposed in outcrop along the banks of Pond Brook and in the woods in the northwest corner of the site is a massive black amphibolite composed of hornblende along with minor amounts of plagioclase and quartz. Both rock types are metamorphic and developed their present mineralogy, 400 million years ago, during deformation at depths of roughly 10 miles and at a temperature of 500°C. Prior to metamorphism the amphibolite would have been a basaltic lava flow and the schists a layered sedimentary sequence of shale and siltstones. On the Bedrock Geologic map of Connecticut (Rodgers 1985) both rocks are considered to be part of the "Rowe Schist Formation". The Quadrangle geologic map by Stanley and Caldwell (1976) groups them together under the no longer used name "Hartland unit II".

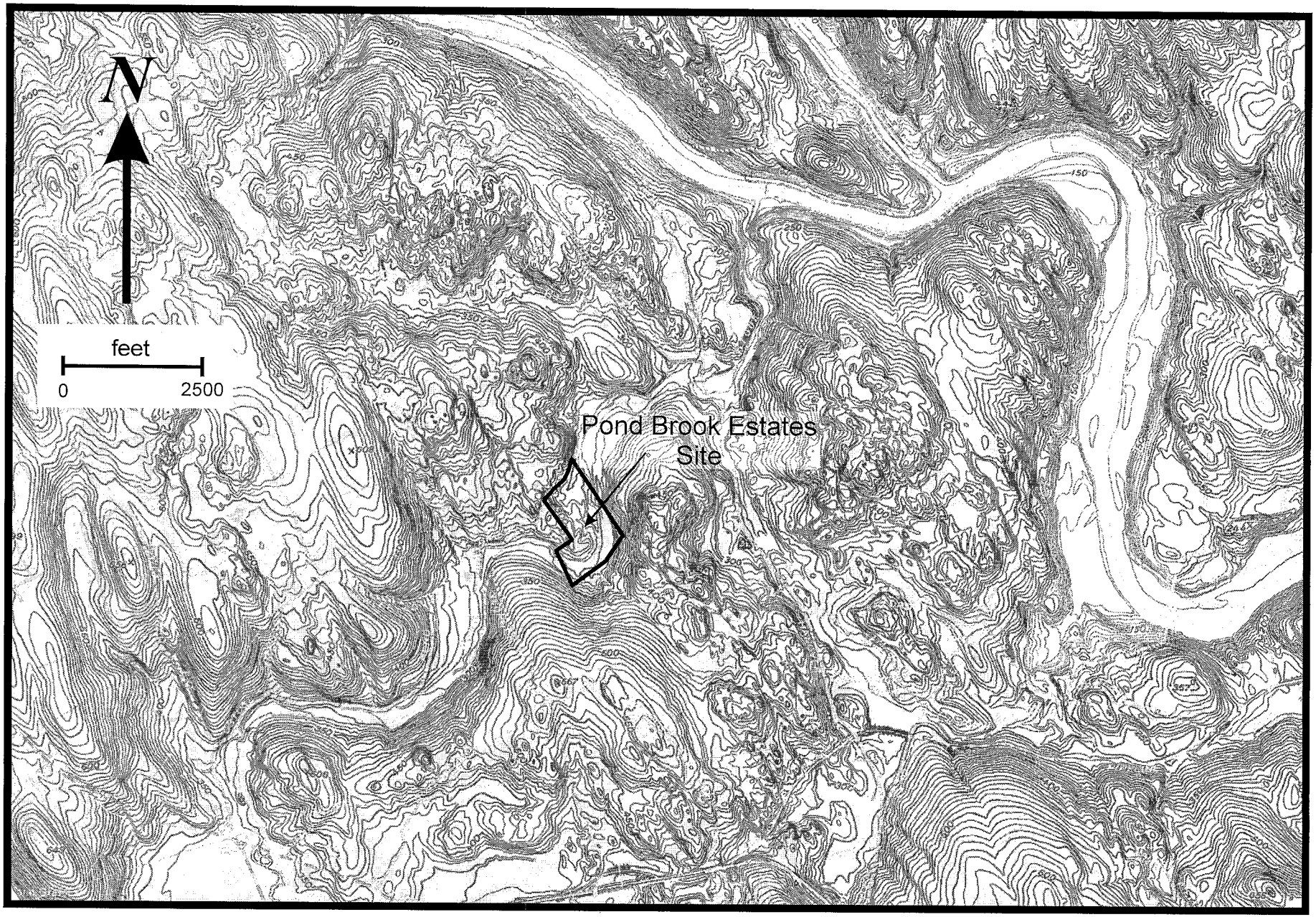
References

Rodgers, John, 1985, Bedrock Geological Map of Connecticut, scale 1:125,000, Connecticut Geological and Natural History Survey.

Stanley, R.S. and Caldwell, Katherine G., 1976. The bedrock geology of the Newtown Quadrangle, Connecticut Geological and Natural History Survey, Quadrangle Report No. 33 .



Surficial Materials in the Vicinity of Pond Brook Estates



Prominent NNW-SSE topographic *'grain'* in the vicinity of Pond Brook Estates

SOIL RESOURCES

Introduction

For the reasons specified in this section of the report, this Team member thinks that a good percentage of the site is unsuitable for development as designed. After setting aside slopes over 25%, wetlands, floodplains, bedrock outcroppings and associated buffers, there is enough suitable land left to develop about 4 - 6 houses maximum, not including the two existing structures, for a total of eight possible dwelling units. Figure 6 indicates a very approximate delineation of areas outside the above-mentioned constrained areas (shown in yellow). Note that this includes buffer areas as outside the suitable development area. Also, the areas in yellow may still contain areas with certain development limitations, such as soils with limited capacity for septic systems or vernal pools. Finally, Figure 6 is a sketch, the buffer distances do not necessarily correspond to any regulations.

This section focuses on constraints of soil and water resources, and does not consider other possible development constraints. All information provided by the Fairfield County Soil And Water Conservation District is strictly advisory.

Developing a site with natural resource constraints while protecting soil and water resources on this site is certainly possible. What needs to be demonstrated are affordable and effective management practices and infrastructure. Furthermore, it must be shown that these practices and structures will be maintained over time. Also, these recommendations are not meant to preclude the use of other conservation measures to protect environmentally sensitive

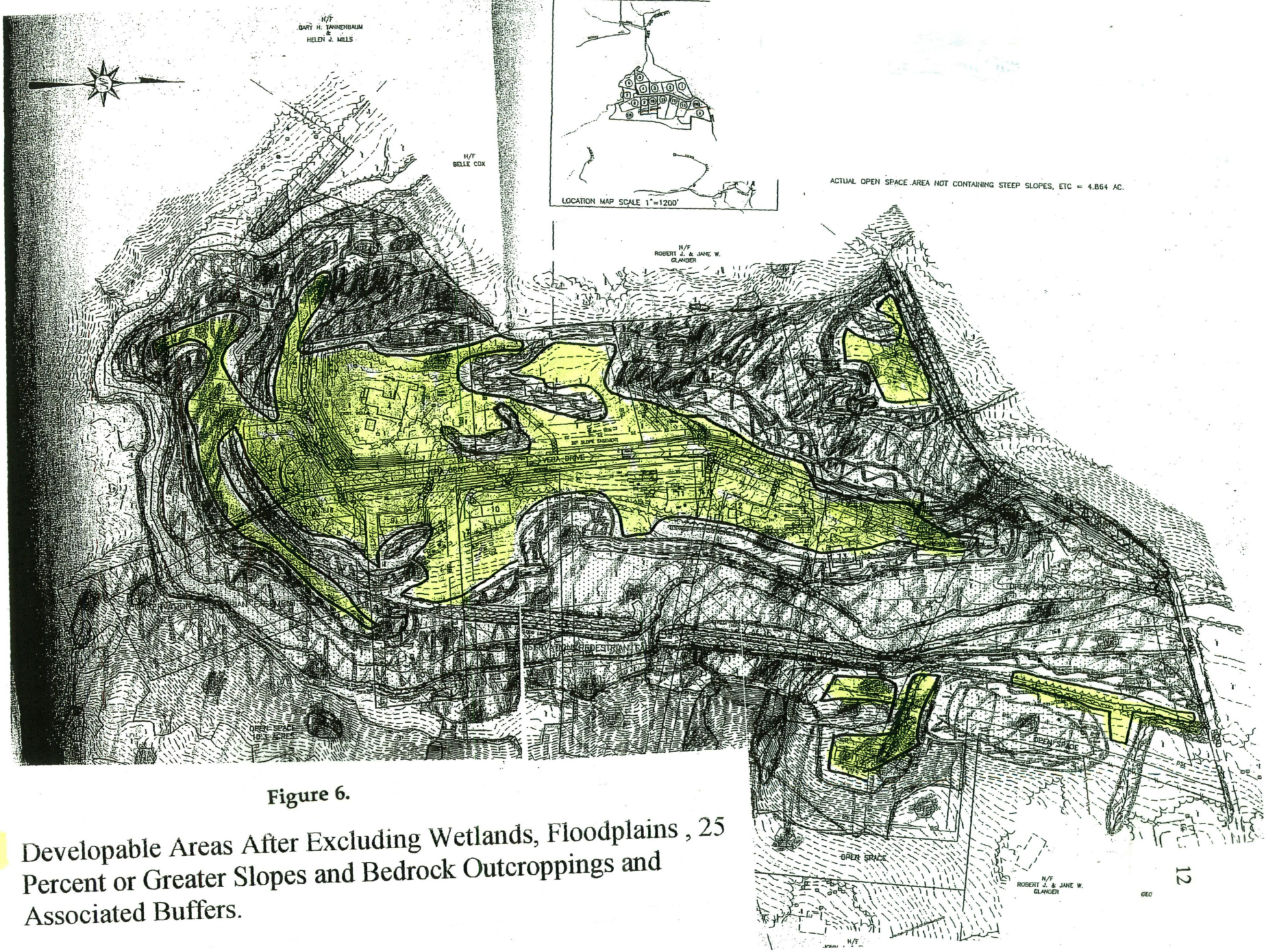


Figure 6.

Developable Areas After Excluding Wetlands, Floodplains , 25 Percent or Greater Slopes and Bedrock Outcroppings and Associated Buffers.

areas such as transferring or purchasing development rights or "conservation" site planning techniques.

Soils Descriptions

Hollis Series

The Hollis series consists of somewhat excessively drained, nonstony to extremely stony soils that formed in a thin mantle of loamy glacial till derived mainly from gneiss and schist. Hollis soils are on the landscape with well drained Charlton soils, moderately well drained Sutton soils, poorly drained Leicester and Ridgbury soils, and very poorly drained Adrian, Carlisle, and Whitman soils.

These Hollis and Charlton soils have moderate or moderately rapid permeability. Runoff is medium to rapid. The available water capacity is low in the Hollis soils and moderate in the Charlton soils. Both soils dry out and warm up early in spring. Both are very strongly acid to medium acid.

These soils are considered having severe conditions for building site development and septic systems (soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required). The major limitations of this complex for community development are the shallow depth to bedrock in the Hollis soils and the areas of exposed bedrock. The shallow depth to bedrock causes the uprooting of many trees during windy periods. Quickly establishing plant cover, mulching, and using siltation basins and diversions help to control erosion and sedimentation during construction.

- HpC - Hollis -Charlton-Rock outcrop complex, 3 to 15 % slopes. This complex consists of gently sloping and sloping soils on hills and ridges. The areas are irregularly shaped and mostly range from 5 to 200 acres. They have an undulating topography marked with exposed bedrock, a few narrow drainageways, and a few small wet depressions. Stones and boulders cover 1 to 5 percent of the surface. Also included are areas of soils with bedrock at a depth of 20 to 40 inches, a few areas where stones cover more than 5 percent of the surface, and a few areas with no stones or boulders on the surface.

- HrE - Hollis-Rock outcrop - Charlton complex, 15 to 45 percent slopes, has 25 percent exposed bedrock.

- Rp- Rock outcrop - Hollis complex is about 50 percent exposed bedrock, with a few areas of slopes greater than 45 percent. The areas of exposed bedrock, the shallow depth to bedrock, and slope limit this complex for community development, especially for onsite septic systems and excavations.

Sutton Series

- SV - The Sutton series consists of moderately well drained, nonstony to extremely stony soils that formed in loamy glacial till derived mainly from gneiss and schist. Sutton soils are on concave positions on lower slopes or in slight depressions of glaciated uplands. Slopes range from 3 to 8 percent. Sutton soils have a seasonally high water table at a depth of about 20 inches from late fall until mid spring. The permeability of the soil is moderate or moderately rapid. Runoff is medium, and available water capacity is moderate. The soil is very strongly acid to medium acid in the surface layer and subsoil and very strongly acid to slightly acid in the substratum. The seasonal high water table and the stones and boulders on the surface limit

community development. Onsite septic systems require special design and installation. Footing drains help prevent wet basements. Quickly establishing plant cover, mulching, and using siltation basins and diversions help to control erosion during construction.

Agawam Series

The Agawam series consists of well-drained soils that formed in a loamy mantle over stratified sand and gravel derived mainly from gneiss and schist. Agawam soils are on outwash plains and terraces in stream valleys, Slopes range from 0 to 15 percent, but are dominantly 3 to 8 percent. Agawam soils are on the landscape with well drained Haven soils, excessively drained Hinckley soils, somewhat excessively drained Merrimac soils, moderately well drained Ninigret soils, poorly drained Raypol soils, and very poorly drained Scarboro soils.

- Af (a,b,c) - Agawam fine sandy loam, 0 to 3 percent slopes. This nearly level, well drained soil is on plains and terraces in stream valleys. The permeability of this Agawam soil is moderately rapid in the surface layer and the subsoil and rapid in the substratum. Runoff is slow, and available water capacity is moderate. The soil dries out and warms up early in spring. It is very strongly acid to slightly acid.

  The rapid permeability of this soil causes a hazard of groundwater pollution in areas used for onsite septic systems. The soil is unstable and thus is limited for excavations. Quickly establishing plant cover, mulching, and using siltation basins help to reduce erosion and sedimentation during construction.

- Nn - Ninigret fine sandy loam. This nearly level to gently sloping, moderately well drained soil is on plains and terraces in stream valleys. The

areas are irregular in shape and mostly range from 3 to 15 acres. Slopes range from 0 to 5 percent. This soil has a seasonal high water table at a depth of 20 inches from late fall until midspring. Permeability is moderately rapid in the surface layer and subsoil and rapid in the substratum. Runoff is slow, and available water capacity is moderate. The soil dries out and warms up slowly in spring. It is very strongly acid to medium acid.

The seasonally high water table is the main limitation of this soil for community development. The water table makes special design and installation of onsite septic systems necessary. Slopes of excavations are commonly unstable. Where outlets are available, footing drains help prevent wet basements. Quickly establishing plant cover, mulching, and using siltation basins help to control erosion and sedimentation during construction. Building Site and septic suitability: severe.

Wetland Soils

Pootatuck Series

The Pootatuck series consists of moderately well drained soils that formed in recent alluvium derived mainly from gneiss and schist. Pootatuck soils are on flood plains of small and large streams throughout the county. Pootatuck soils are on the landscape with poorly drained Rippowam soils and very poorly drained Adrian. Carlisle, Saco, and Scarboro soils.

- Ps - Pootatuck fine sandy loam. This Pootatuck soil is subject to frequent flooding. It has a seasonal high water table at a depth of 20 about 20 inches from late fall until spring. Permeability is moderate or moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. Runoff is slow, and available water capacity is moderate. The soil dries out

and warms up slowly in spring. It is very strongly acid to slightly acid. Flooding limits this soil for community development, and slopes of excavations in the soil are unstable. Building site and septic suitability: severe

- **Rn - Ridgebury, Leicester, and Whitman extremely stony fine sandy loams.**

This unit consists of poorly drained and very poorly drained soils in depressions and drainageways on uplands and in valleys. Stones and boulders cover 5 to 35 percent of the surface. The areas are irregularly shaped or long and narrow and mostly range from 3 to 50 acres. Slopes range from 0 to 8 percent but are dominantly less than 3 percent.

The major soils in this unit have a seasonal high water table at or near the surface from fall through spring. The permeability of the Ridgebury and Whitman soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The permeability of the Leicester soils is moderate or moderately rapid throughout. Available water capacity is moderate in all three soils. Runoff is slow on all three, and water is ponded on the surface of some areas of the Whitman soils. The Ridgebury and Leicester soils very strongly acid to medium acid, and the Whitman soils are very strongly acid to slightly acid. These soils dry out and warm up slowly in the spring.

The high water table, ponding, and the stones and boulders on the surface limit these soils for community development. Onsite septic systems require extensive filling and special design and installation because of the high water table. Excavations are commonly filled with water, and many areas do not have suitable drainage outlets. Quickly establishing plant cover and using siltation basins help to control erosion and sedimentation during construction.

- **Ro - Rippowam fine sandy loam**

This nearly level, poorly drained soil is on flood plains of major streams and their tributaries. The areas are long and narrow or irregularly shaped and mostly range from 3 to 30 acres. Slopes are less than 3 percent. This Rippowam soil is subject to frequent flooding. It has a seasonal high water table at a depth of about 6 inches from fall until late spring. The permeability of the soil is moderate or moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. Runoff is slow or very slow, and available water capacity is moderate. The soil dries out and warms up slowly in spring. It is mainly very strongly acid to slightly acid, but some layers above a depth of 40 inches are medium acid or slightly acid. The frequent flooding and the seasonally high water table are the main limitations of this soil for community development. Extensive filling is needed for onsite septic systems. Excavations are commonly inundated by water, and slopes of excavations are unstable when wet. The seasonal high water table restricts rooting depth and causes the uprooting of many trees during windy periods.

- **Wd- Walpole fine sandy loam**

This nearly level, poorly drained soil is in low areas on plains and terraces. The areas are irregularly shaped and mostly range from 3 to 29 acres. Slopes are 0 to 3 percent. This Walpole soil has a seasonal high water table at a depth of about 6 inches from fall until spring. The permeability of the soil is moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. Available water capacity is moderate, and runoff is slow. The soil is very strongly acid to medium acid. The high water table limits this soil for community development, especially for onsite septic systems. Slopes of excavations in the soil are unstable, and some areas do not have suitable drainage outlets. The seasonal high water

table restricts root growth and causes the uprooting of many trees during windy periods.

General Concerns

1) Vernal Pools - There is evidence of vernal pools on this site (Figure 7). An assessment should be made to determine the extent and viability of any pools. Furthermore, in order to sustain these pools, a minimum natural buffer should be maintained, preferably surrounding the pool area on ALL sides.

Figure 7. One of a number of possible vernal pools on the site

2) Road Wetland Crossing - The proposed road crosses the wetlands at the north end of the property near Pond Brook Road. The current proposal calls for filling the wetlands for the roadbed. Drainage for the intermittent stream from the westerly wetland area will be via a 48 linear foot 48 inch pipe, with a control structure upstream from the proposed road. This outlet structure (shown on sheet nine of the revised plans as outlet structure #4), controls flow of the intermittent stream. Instead a pre-cast arch crossing, for example, would limit impacts on the riparian corridor. (Figure 8).

The currently proposed crossing arrangement impacts the drainage and wetlands in a number of ways. For one, the wetland area upstream of the road will be

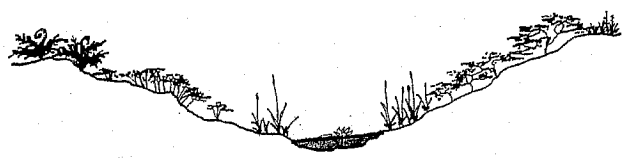
Figure 8.

Alternative Stream Crossings

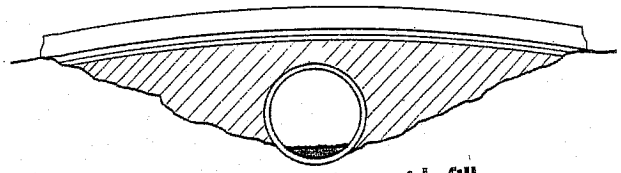
Crossings

There are a number of methods which may be used to address a wetlands or stream crossing. Each involves different costs or benefits; the value of the wetland and the cost of adopting the more protective crossing method are factors in deciding which alternative is prudent. Impacts to the site to consider include:

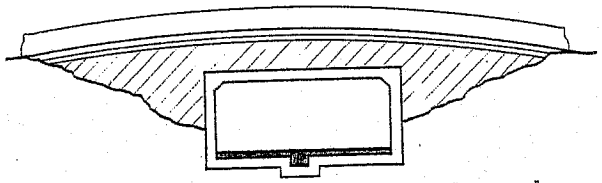
- Extent of disturbance (clearing, excavation, filling, staging)
- Rates of discharge/hydrologic considerations
- Fish passage/aquatic values
- Wildlife passage/riparian habitat
- Recreational or other significant riparian values



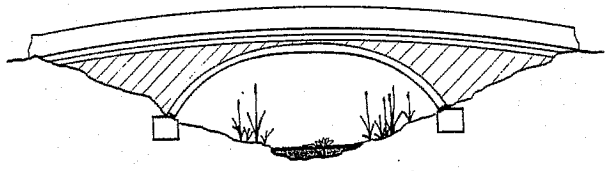
■ Existing Riverbed



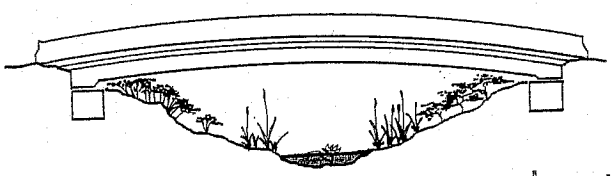
■ Piped crossing with fill
(may be appropriate for intermittent watercourse)



■ Box culvert with low flow channel
(may be appropriate for stocked streams)

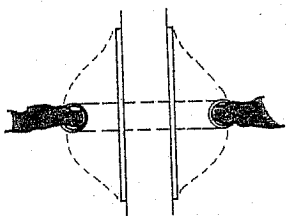


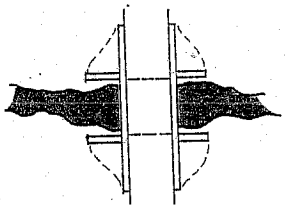
■ Precast arch with abutments in watercourse
(may be appropriate for wildlife passage)

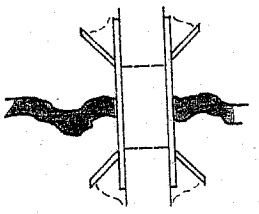


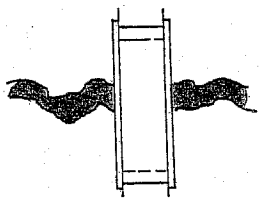
■ Bridged crossing with minor encroachment
(may be appropriate to protect riparian values)

Overhead view showing areas of proposed fill

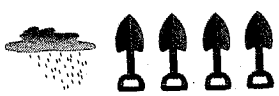


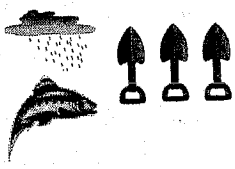


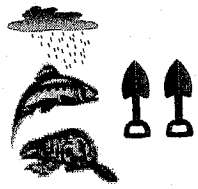


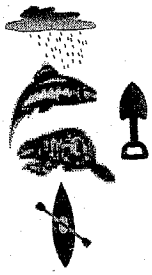


The trade-off: resource value (🌿) vs. disturbance(🚶)









(An Inland Wetland Commissioner's Guide To Site Plan Review. CT DEP 1993; Page 57)

utilized as an impoundment for the storm detention system (Inland wetland and watercourses permit application item #5). This has the potential to alter the plant and animal communities in the wetland and otherwise affect the hydrology and soils of the wetlands area. A detailed assessment of the impacts of using this wetland as an impoundment should be included with the development application. A map indicating the expected areas of inundation resulting from storms up to and including a 100-year storm event should be included.
The road crossing proposed requires filling in of wetlands (0.11 acre). This also disturbs the continuity of the riparian zone and disrupts the natural flow of the stream course. It should be examined as to whether or not the measures indicated in the wetlands application Item #13 mitigate this loss of wetlands and/or other potential impacts.

3) Bedrock Outcroppings - Bedrock outcrops "provide specialized habitat for some plant and animal species". "Altering the bedrock geology to accommodate development can effect the surrounding ecology and impact adjacent wells". (Newtown Plan of Conservation and Development - 2002 Update). (Lot five has a well proposed to be approximately 10 feet from a bedrock outcrop.)

4) Impervious Surfaces - It is well established that increasing impervious surfaces in a watershed negatively impacts the natural habitat of the watershed. The current proposal requires an excessive area of road surface, including long driveways, in order to access difficult to reach building sites. This is combined with off site-increased imperviousness due to the proposed widening of Pond Brook Road.

Locating houses to minimize driveways and other site disturbances and flexibility in road and driveway design (Figure 9) can assist in minimizing the amount of impervious surfaces and maintain a rural road character. Eliminating road curb and catch basins wherever possible disperses runoff and further

minimizes impact on water quality, can reduce initial costs and result in less long-term maintenance and replacement costs. (Figure 10)

Figure 9. Existing drive, though too narrow for the proposed development, demonstrates a drive with minimal environmental and visual impacts.

Steep slopes also require significantly increased relatively impervious lawn areas as a result of cut and fill operations to accommodate reasonable grades, mounding septic systems, retaining walls and other added infrastructure. Slopes over 15 percent should be avoided wherever possible and slopes at 25 percent or greater should be left undisturbed. A natural buffer should be left at the base of steep slopes of exposed bedrock outcroppings.

NOTE: *Observation of Pond Brook Road during this site inspection revealed significant sedimentation from the road surface entering streams and being deposited on areas of this development site. Preventing soil erosion and sedimentation from unimproved curb-less road areas requires special design and maintenance options.*

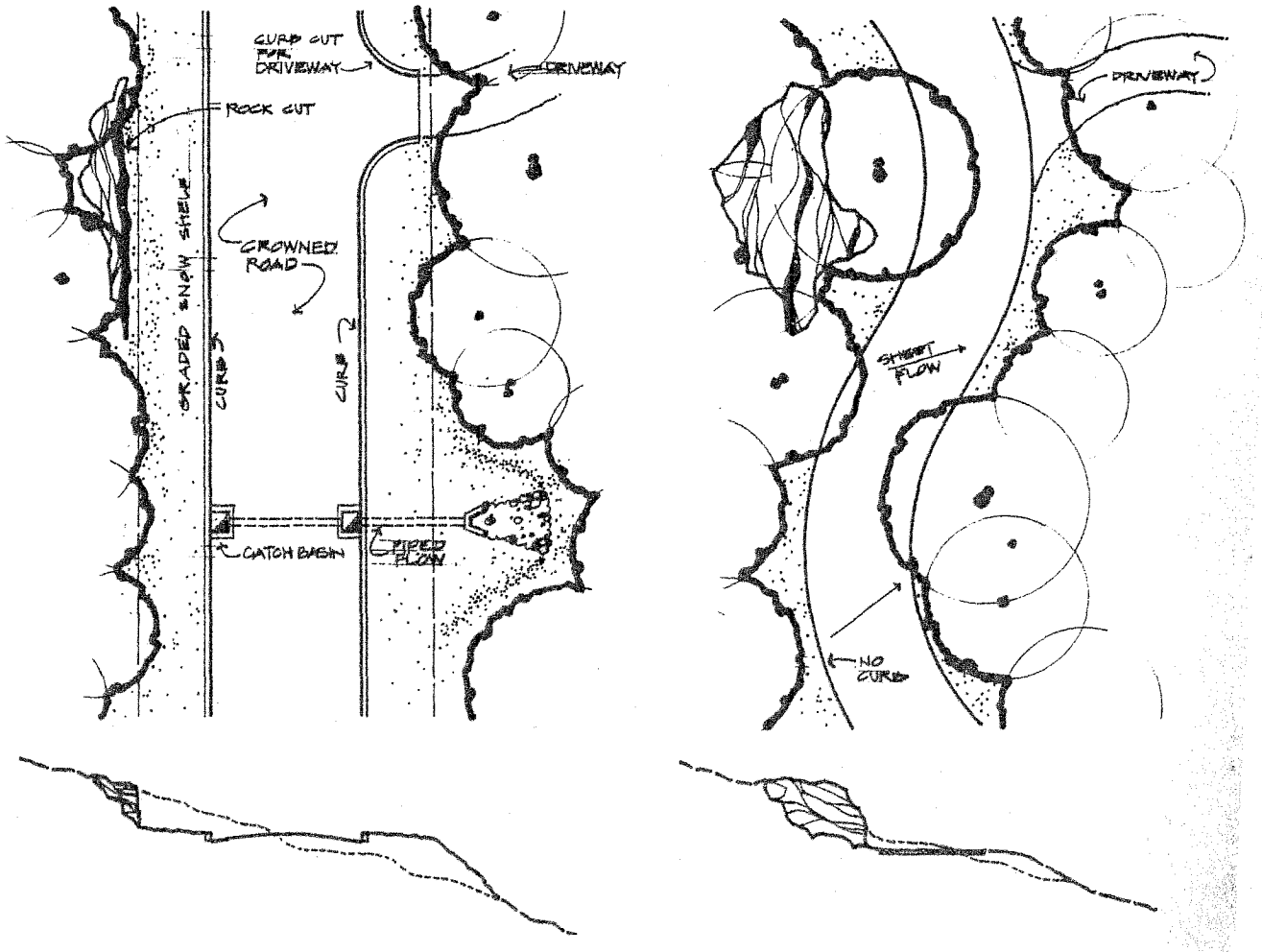
5) Mapping - The site plan should include information on adjoining property, at least including the total area of the sub watershed indicated so that the total of areas that drain onto the property are shown.

Figure 10.

Flexible Road and Driveway Design

Roads and Drives

Strict requirements for roads and drives — grades, rights of way, width, alignment, curbing — including traditional catch basins and piped storm systems may not be best for some sites. Flexibility allows for narrower, gently curving, private or shared drives which are graded to save wetlands and other existing site features. In many cases, reduced pavement widths and sheet flow into grass swales or vegetative buffers may further reduce development impact without threatening public safety. In fact, construction and maintenance costs may be dramatically reduced.



■ Standard road design

■ Flexible road design

(Inland Wetland Commissioner's Guide Page 56)

6) Balancing Development with Environmental Conservation - This development proposal is designed to maximize the number of developable lots, while meeting the minimum requirements of current zoning, state and health department regulations. Even though these requirements may be met, the resulting development ends up in less than environmentally optimal locations, and in some instances in the environmentally least favorable locations. Perhaps the best way to preserve the natural attributes to a parcel such as this would be to utilize land use regulations that "..encourage the use of "conservation" and "open space" subdivision design standards, without consequence to the permitted density of development." (Newtown Plan of Conservation and Development - 2002 Update). For example, easterly areas of lots 7-13 could be set aside as open space, instead of including these sensitive areas as part of lots in order to meet minimum lot size requirements. Setting aside open space through conservation easements or public ownership increases the likelihood that they will be protected.

In order to conserve the water and soil on this site within the context of the development posed, while perhaps possible, requires an engineered infrastructure which is costly, and that also would require extensive permanent maintenance, which cannot necessarily be guaranteed. Installing septic systems and house foundations on steep slopes or marginal soils and concentrating storm water flows into engineered structures from overly large areas of site disturbance maximizes the need for infrastructure and the requisite long-term maintenance costs. Costs that over time are borne by the homeowners and the town.

7) Percolation Tests - As has been noted in a number of reports associated with this application; percolation tests took place in April of this year during an exceptionally dry period. Soil moisture conditions as tested are most likely not indicative of normal seasonal averages.

8) Catch basins 15,16,17 and 18 will divert surface flows that currently enter wetlands on the easterly side of the property. (In the area of lots 10 & 11). Instead this runoff will be redirected to the wetlands at a point above the proposed road crossing. This increases the required capacity for detention upstream of the proposed road and diminishes the flow of water to a particular wetland area, which could have long term localized impacts on soils, and consequently vegetation and wildlife communities.

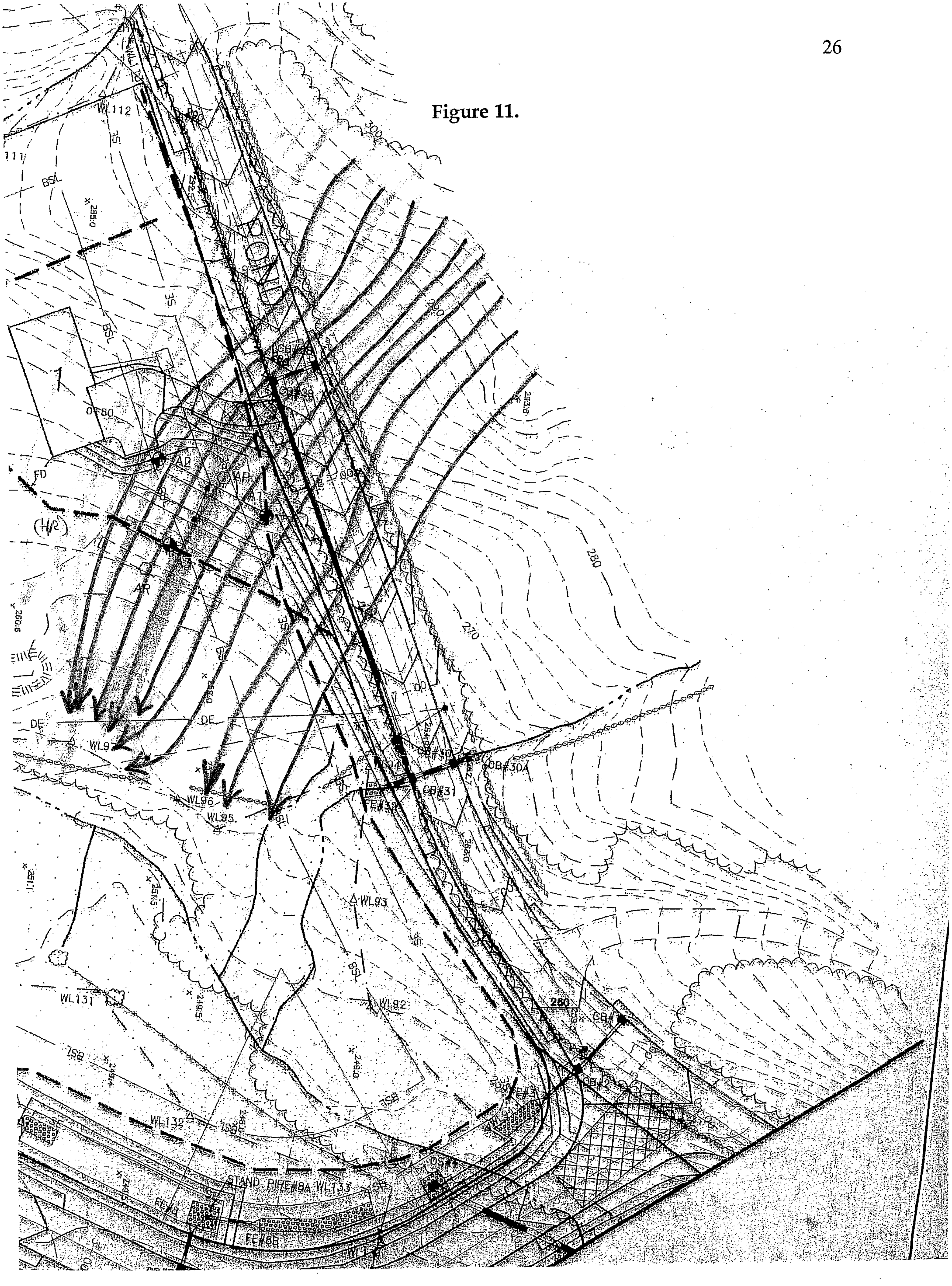
9) The detention structure shown requires periodic maintenance for proper function. The required maintenance procedures should be included in detail with the application. Maintenance responsibility should be stated in the application documentation.

Evaluation by Proposed Lot

(1) Proposed Lot 1.

The natural drainage in the area of proposed lot one concentrates surface runoff from upland areas as the runoff approaches the wetland area. (See Figure 11) This indicates an area of marginal soils, with seasonal high water tables expected to be 20 inches below the surface. Soils in the area of the proposed septic system are likely to have a low permeability substratum (perched water table). The design of and location of the system for lot one should be considered carefully and the design requirements of the system detailed to demonstrate engineering requirements and potential costs. Surface water flows should be directed away from the leaching field, or preferably, the system should be moved from the area of concentrated flow.

Figure 11.


WL112
BSL
3S
285.0
WL113
300
290
280
270
260
CB#28
CB#29
OF80
A2
AP
A1
AR
FD
DE
WL97
WL96
WL95
CB#30
CB#30A
CB#31
FE#32
WL93
WL92
WL131
WL132
283.6
260.6
251.1
251.5
249.5
249.4
249.0
STAND PIPE#8A WL133
FE#8
FE#8B
OS#1
CB#2

2) Proposed Lot 2.

Using the topographic map to approximate the existing surface drainage on lot 2 (See Figure 12), it quickly becomes apparent that: a) the southerly extension of the wetlands on the lot receives a significant amount of runoff from the surrounding uplands and b) the proposed house is situated in an area where surface flows are concentrated. The potential impacts to the wetland should be evaluated, as well as a special consideration for erosion potential during construction and moisture issues on site post construction. Soil tests should be considered for the area of the proposed house. Preferably the house would not be located in an area of concentrated flow.

3) Proposed Lot 3.

Both the house and the septic system are proposed for locations with 25% or greater slopes.

4) Proposed Lot 5.

It is quite possible that subsurface water flow direction does not correspond to surface topography; the house and septic are located in the area of a natural drainage way. Given the proximity of the proposed structure and septic system to exposed bedrock and the shallow depth of soils, a more detailed examination of surface and sub surface flows is warranted. A detail of the engineering required to assure proper long term septic function and the possible need for footing drains around the house should be provided.

The proposed house and septic system are shown on or at the base of slopes of 25% or greater. Generally, septic systems should not be placed on slopes greater than 15%, certainly without extensive evaluation. Surface runoff should be diverted away from the system to prevent sediment from washing onto leaching surfaces and sealing them and to prevent runoff from overloading them. Design should consider the possibility of breakouts due to impermeable soil layers.

Figure 12.

5) Proposed Lot 6.

The house and driveway are proposed for an area of 25% slope. The primary septic system is proposed for an area at the base of a 25% slope. A diversion of surface runoff around the leach field should be detailed The replacement area of the septic system is shown in an area of soils where special design is required due to a seasonally high water table. Also this area, as well as part of the primary system, is shown to be only 4 feet above the indicated 100-year flood zone. The current limit of the flood zone should be verified. The driveway slopes steeply towards the house with extensive cut and fill requirements. Detail of any retaining structures and engineered drainage should be indicated on the plan.

6) Proposed Lot 7.

The septic system is shown within the 100 buffer for the water supply well and the buffer overlaps the buffer for lot 6. The replacement system and part of the primary system is shown in an area of 25% slope. High ground water levels are indicated. Engineering details of the system should be detailed.

7) Proposed Lot 8.

The primary septic system is shown adjacent to an area of 25% slope. The primary and secondary system is proposed in an area of a seasonally high water table. Engineering details should be shown. The primary system is within 100 feet of the proposed well.

8) Proposed Lot 9.

Part of the primary septic system is shown within an area of 25% slope. Soil tests indicate impermeable substratum. Engineering details for the system should be shown. A surface water diversion upslope of the system should be detailed including controls for runoff from the driveway area.

9) Proposal for Lot 10.

The steep driveway proposed warrants a detail of runoff controls adjacent to the driveway surface. The soil tests in the area of the proposed septic system indicate the potential for an impermeable substratum. Engineering details for the system should be shown.

10) Proposal for Lot 11.

Soil tests indicate that the septic system is in an area of marginal soils and engineering details should be shown. The driveway slopes steeply and is indicated as being on the property line of lot 12. Runoff should be directed away from the adjoining property and closely located neighboring house; details should be shown. The 100 foot buffer around the well overlaps the neighboring well buffer. Detail of the grading of the septic tanks and leaching field should be shown. Provided diagrams show the leaching field upslope from the house and tanks, further engineering detail should be required. The septic tanks are shown in the same location as the replacement system.

11) Proposal for Lot 12.

Soil tests indicate marginal soils in the area of the proposed septic system. The soil type indicates a possible relatively impermeable subsurface layer. This suggests the possibility of breakouts down slope, and topography as shown indicates drainage moves from the proposed septic area towards an existing well. Further, the system is adjacent to and upslope from an area of Agawam soils, "the rapid permeability of this soil causes a hazard of ground- water pollution in areas used for onsite septic systems." A more detailed assessment of the soils in the area of the proposed septic and of the area down slope, between the proposed system and the existing well, is warranted.

13) Proposal for Lot A-1.

The proposed driveway is within 20 feet of a wetland boundary. The proposed house is completely surrounded by slopes of 25%, the septic system is located

where the ground water is seasonally near the surface, on a steep slope. The soils are marginal, with bedrock-controlled groundwater, and the upslope drainage area above the proposed house and septic is large. Engineering details should demonstrate how the site drainage would succeed, both during construction and long term, particularly in the area of the septic system. The septic system should be located away from concentrated surface runoff flows (Figure 13).

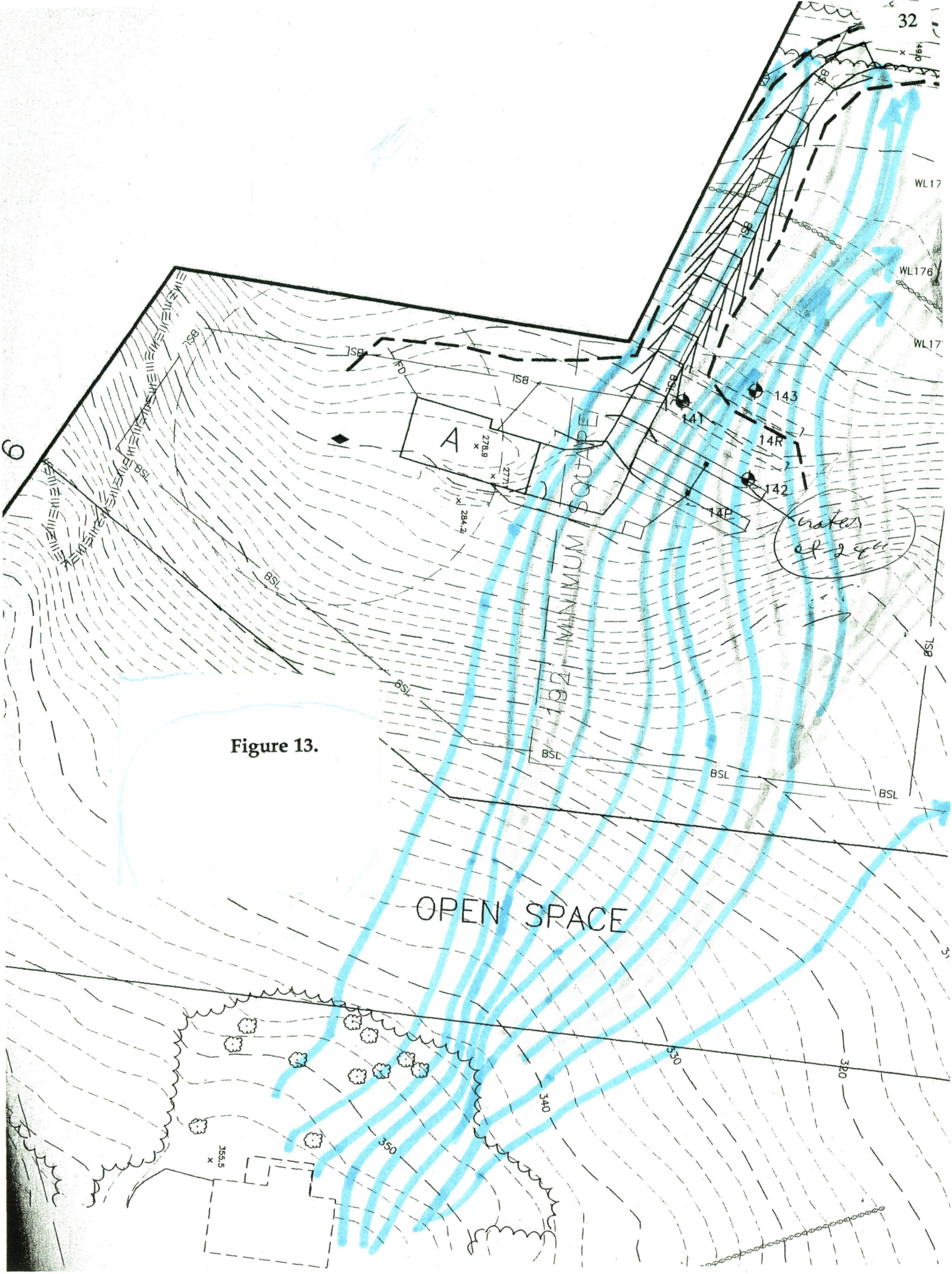

WL17
WL176
WL17
143
141
14R
142
14P
A
278.9
277.1
284.2
1ST MINIMUM SQUARE
BSL
OPEN SPACE
355.5
350
340
330
320

Figure 13.

STORMWATER MANANGEMENT

Stormwater Permitting

Since the site construction involves the disturbance of over five acres, Connecticut' s General Permit for the Discharge of Stormwater and Dewatering Wastewaters (the "Permit") will cover the project. The permit requires that the site register with the Department of Environmental Protection (CTDEP) at least 30 days before the start of construction. The registrant must also prepare, submit and keep on site during the construction project a Stormwater Pollution Control Plan (the "Plan").

Due to the size and potential impacts on natural resources of this project, the Department has recommended to the developer that the pollution control plan be submitted 180 days prior to the start construction. If the Department finds that the Plan is inadequate, Connecticut General Statutes Section 22a-430b and general permit Section 7(c) allow the Commissioner to require an individual permit, process that could delay approval of the project for several months. In order to prevent this and to ensure adequate review time, the Department has requested early submittal of the plan.

Please note that while this review is based primarily on the state Permit, many of the erosion and sedimentation issues are included in the Connecticut Guidelines for Soil Erosion and Sediment Control ("the guidelines"), and are issues that must be dealt with on a local level before being included in the Plan. It should also be noted that the permit requires compliance with the guidelines. The

developer must register for the permit, and the contractor and any subcontractors involved in grading must sign the contractor certification statement in the permit. Any registration submitted by anyone other than the developer will be rejected.

The Plan must include a site map as described in Section 6(b)(6)(A) of the General Permit and a copy of the erosion and sedimentation (E&S) control plan for the site. The E&S plan that is approved by the Town may be included in the Plan. This plan and site map must include specifics on controls that will be used during each phase of construction. Specific site maps and controls must be described in the Plan, as well as construction details for each control used. The permit requires that "the plan shall ensure and demonstrate compliance with" the guidelines.

Due to the amount of soil disturbance, one of the best ways to minimize erosion potential is to phase construction in order to minimize unstable areas. The Plan must be flexible to account for adjustment of controls as necessary to meet field conditions. At a minimum, the plan must include interior controls appropriate to different phases of construction.

This project has steep slopes, a large amount of wetlands, poorly drained soils, and sensitive surface waters that must be protected, which will make weekly inspections and modifications to erosion controls an important part of this project. The 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 plan 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. In addition, the plan must include monthly inspections of stabilized areas for at least three months following stabilization and the end of construction. Due to the scope and potential wetland and stream impacts of this project, there must be someone available to design and adjust

E&S controls for changing site conditions, who has the authority and resources to ensure that such necessary changes are implemented.

Structural practices including sedimentation basins are required for any discharge point that serves an area greater than 5 disturbed acres at one time. The basin must be designed in accordance with the guidelines and provide a minimum of 134 cubic yards of water storage per acre drained. At a minimum, for discharge points that serve an area with between 2 and 5 disturbed acres at one time, a sediment basin, sediment trap, or other control as may be defined in the guidelines for such drainage area, designed in accordance with the guidelines, shall be designed and installed. All sediment traps or basins shall provide a minimum of 134 cubic yards of water storage per acre drained and shall be maintained until final stabilization of the contributing area. Outlet structures from sedimentation basins shall not encroach upon a wetland. The commissioner must approve any exceptions in writing. Silt fence installation must comply with the guidelines, and may be used only in drainage areas of one acre or less. Maintenance of all structural practices shall be performed in accordance with the guidelines, provided that if additional maintenance is required to protect the waters of the state from pollution, the Plan shall include a description of the procedures to maintain in good and effective operating conditions.

Section 6(b)(6)(C)(ii) of the permit requires the plan to address dewatering wastewaters that this site may generate. Specific details for construction control during installation of any wetland crossings must be provided. A description of the operational and structural practices which will he used to ensure that all dewatering wastewaters will not cause scouring or erosion or contain suspended solids in amounts which could reasonably be expected to cause pollution of waters of the State. Dewatering wastewaters shall be discharged in a manner, which minimizes the discoloration of the receiving waters.

Particular attention must be paid to the areas during construction that will drain towards Pond Brook and the intermittent watercourse.

Post-construction Stormwater Treatment

The permit (Section 6(b)(6)(C)(iii)) requires that the plan include a design for post-construction stormwater treatment of 80% of total suspended solids from the completed site. In order to comply with this requirement, the Department recommends incorporating swirl concentrator technology. Although, swirl concentrators are effective at removing sediment, they require a long-term maintenance commitment from the town or a homeowners association greater than that required for a basin once it is fully grown-in and stabilized. If an in-ground, "black-box" solution is used, swirl concentrator technology is a minimum requirement. Some newer generation swirl concentrators also incorporate filtration systems to address other pollutant issues, but these also require long-term maintenance plans.

Erosion and Sediment Control Notes

General permit stabilization requirements include the following: "where construction activities have permanently ceased or have temporarily been suspended for more than seven days or where final grades are reached in any portion of the site, stabilization practices shall be implemented within three days".

Other Issues

It is strongly recommended that the local wetland and zoning commissions ensure that the bond required for this project be adequate to remediate all

wetlands and watercourses in the event of control failures on this site. The developer should be aware that regardless of the storm event size, they would be responsible for remediation of any impacts. The developer must also be aware that if lots are sold off to individual homeowners, the developer is still responsible for maintenance of all control structures for three months after final stabilization of the site.

The best protection for wetlands and watercourses is buffer zones. Making these areas part of the lots does not ensure their future protection, or ensure that there is adequate space on each lot for septic systems and wells that will not have future impacts on these resources. The Department recommends careful placement of houses on lots. There should be a large enough buffer from wetlands and watercourses to prevent a discharge of sediment during construction even if it means reducing the number of lots in the subdivision.

This section of the report addresses some of the major issues concerning the project and does not constitute a complete review of the Plans for permitting purposes.

SEWAGE DISPOSAL

The following are technical comments based on a cursory review of the L. Edwards Associates plans dated 6/15/2002.

- The State Department of Public Health (DPH) has provided local health departments with recommendations on siting new private wells to assure reasonable protection of the source of supply. The attached May 7, 1998 DPH memorandum (Figure 14) contains our recommendation that includes striving for having most or all of the well's protective radius to be within the property bounds of the lot served.

- All soil test data (deep test pits, percolation tests) should be included on the plan.

- The subdivision plans should stipulate the basis of design for each of the proposed subsurface sewage disposal systems. This should also include minimum leaching system spread calculations for each lot or a note indicating MLSS is not applicable.

- The two existing homes that are to remain must demonstrate compliance with Public Health Code Regulation 19-1 3-B 1 OOa.

- The proposed subsurface sewage disposal systems serving lots 7 & 8 are within the 75 foot protective well radius.

- The foundation drain outlet from the proposed dwelling on lot 6 is within 18 feet of the subsurface sewage disposal system. A distance of 25 feet must be maintained and the outlet should be directed away from the leaching area.

- The plan proposes the installation of a storm water drainage system within the subdivision. Some of the subsurface sewage disposal systems are proposed to be installed within proximity to the storm water drainage system. The engineer must verify proper separation between all storm water drains and associated piping and the proposed sewage disposal systems.

- All septic tanks, pump chambers and leaching structures located underneath any driveways must be capable of supporting H-20 loading. Any sewer lines or distribution piping crossing underneath any driveway must also be protected from loading and sleeving is recommended.

- The DPH office concurs with the comments previously made by the Newtown Health District and agrees that the plan submitted demonstrates feasible locations for the subsurface sewage disposal systems provided that all comments and concerns from both Departments are addressed.

Figure 14.

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

MEMORANDUM

TO: Directors of Health, Chief Sanitarians, Licensed Engineers, Installers, and Well Drillers

FROM: Frank A. Schaub, Supervising Sanitary Engineer FAS

DATE: May 7, 1998

SUBJECT: Required Separation Distance From Private Wells To Sewage Disposal Systems And Other Sources Of Pollution.

Section 19-13-B51d(a) sets forth the requirements for all private wells with withdrawal rates less 10 gallons per minute. We are all familiar with the required separation distance of 75 feet to sewage disposal systems or other sources of pollution. Location of private wells as far as reasonably possible from potential sources of pollution is a primary goal of this section.

Over the past several years, our section staff have been involved with complaints from concerned property owners who's wells are located close to a property line with much of their protective well radius on the adjacent lot. Activities on the adjacent property such as gardening, storage of manure, construction of garages or other typical residential lot activities have brought forth cries for protection of their valuable private water supply. Unfortunately, they have no direct control of their portion of the protective well radius beyond the property line.

Similarly, we are faced with both new development and repair of sewage disposal systems adversely effected by the location of a well close to a property line with a protective well radius that consumes valuable space on the adjoining lot necessary for septic system installation. Annually, our section engineers routinely review hundreds of septic systems repairs proposed less than 75 feet from existing private wells, many of which were located unnecessarily close to a property line.

Section 19-13-B51d(a) requires "each such well shall be located at a relatively high point on the premises consistent with the general layout and surroundings; be protected against surface wash; be as far removed from any known or probable source of pollution as the general layout of the premises and the surroundings will permit;..." After reviewing intent of requirements in this section with staff engineers in our Water Supply Section, we are requesting your cooperation with respect to review and approval of all new private well locations in assuring reasonable protection of private wells can be provided where feasible. The only way a property owner can be assured that no unwanted activity occurs adjacent to their well is to have all or substantially most of their protective well radius within their property bounds. There may be circumstances where standard well drilling equipment cannot get to sites which would afford this protection and common sense must prevail in approving alternate sites. There may also be circumstances where several wells on adjacent lots are all clustered in the same general location thereby creating a larger singular protective well radius. We are aware of some towns and health districts who, by regulation, ordinances or policy, routinely require all or most of the well protective radius to be located within the property bounds of the lot served. We encourage the rest of you to consider the importance of providing long term protection for private wells with the minimal adverse impact to adjacent property owners. This clarification is consistence with the Water Supply Section's approval of all new public wells which require a water company to either own or have legal easement to assure long term protection from "any known or probably source of pollution adjacent" to their wells site.

If you have any questions concerning this matter, please contact our office.

c: Len McCain, Local Health Administration
c/sewage/memo/memo22

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Telephone Device for the Deaf (860) 509-7191
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THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question.

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation of data collected over the years by the Environmental & Geographic Information Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

AQUATIC RESOURCES

Site Description

The 14 lot Pond Brook Estates residential subdivision is proposed for development on a 53 acre parcel located north and westerly along a ±3,400 foot reach of Pond Brook. Through this reach, the stream is contained in a channel which is roughly 50 feet in top of bank width and has normal flow depths which average approximately 1.5 feet. The channel is of a moderate grade with surface flow predominated by shallow riffle interspersed by deep moving pool. Stream substrate is composed of small boulder, cobble, gravel, coarse sand, and sand-silt fines.

Hardwoods and woody shrubs predominate as riparian vegetation along Pond Brook on the Pond Brook Estates site. The vegetation provides the stream with a nearly complete overhead cover. Physical in-stream habitat is provided by the water depth in pools, undercut banks, boulder groupings and fallen or overhanging riparian vegetation.

The Pond brook watershed remains primarily forested with a mix of agriculture and residential housing. The limited development to date provides a means of maintaining the streams' water quality. The Department of Environmental Protection classifies Pond Brook as *Class A* surface waters. Designated uses for surface water of this classification are potential public drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other purposes.

Aquatic Habitats and Resources

As mentioned previously, the site of the proposed Pond Brook Estates residential subdivision is bounded north and westerly along Pond Brook with the stream reach containing the physical characteristics of a coldwater stream. Fish survey of Pond Brook have been conducted by the Inland Fisheries Division (the "Division") in conjunction with a multi-year survey of streams across Connecticut. A fish survey within a 450+ foot section of Pond Brook along Pond Brook Road approximately 1/4 mile east of the Obtuse Road intersection (upstream of the Pond Brook Estates site) was conducted by the Division in 1991. The survey confirmed the presence of a diverse coldwater stream fish community of the following species: brook trout *(Salvelinus fontinalis)*, brown trout *(Salmo trutta)*, blacknose dace *(Rhinichthys atratulus)*, longnose dace *(Rhinichthys cataractae)*, common shiner *(Luxilus cornutus)*, cutlips minnow *(Exoglossum maxillingua)*, fallfish *(Semotilus corporalis)*, creek chub *(Semotilus atromaculatus)*, tessellated darter *(Etheostoma olmstedi)*, and white sucker *(Catostomus commersoni)*.

Smallmouth bass *(Micropterus dolomieui)*, redbreast sunfish *(Lepomis auritus)*, bluegill *(Lepomis macrochirus)* and brown bullhead *(Ameiurus nebulosus)* were also collected in the fish survey. These species are common to warmwater riverine and lake habitats and are considered transient in coldwater riverine systems such as Pond Brook.

The Division liberates adult brook, brown and rainbow trout into Pond Brook for recreational angling. Approximately 950 hatchery reared trout are stocked annually in the stream at several locations along Pond Brook Road. In comparison with similar streams surveyed statewide, the Division identified Pond Brook as having the potential to improve its' carrying capacity for trout. Hatchery reared brown trout fingerlings, 2 to 3 inches in length, were stocked

into Pond Brook in the early spring of 1992 and an assessment of their survival and growth was conducted in the late summer. The growth and survival of the fingerling brown trout did not meet with Division expectations. Subsequently, fingerling trout stocking in Pond Brook has not continued.

Attached are Division fish surveys and a report of trout distribution in Pond Brook. (See Appendix A)

Impacts

Historic land use practice (now abandoned railroad line and two single family homes) at the Pond Brook Estates site has allowed the preservation of riparian vegetation along Pond Brook. Plot plans indicate the boundaries of 8 lots will cross the stream. However, conservation easements on these lots combined with 10.3 acres of open space should preserve instream habitats of Pond Brook. Riparian habitats associated with the stream will likewise be afforded protection and in doing so, will best maintain their ability to act as a "filter" to prevent off-site discharge of sediments, nutrients, fertilizers, and other non-point source pollutants from the proposed house lots and access ways to Pond Brook. Such non-point source pollutants can degrade habitat and water quality.

Recommendations

In effort to eliminate the potential for impacts to Pond Brook, it is recommended that the following measures be incorporated into the design of the proposed Pond Brook Estates residential subdivision:

- Incorporate a minimum 100 foot undisturbed vegetated riparian buffer along Pond Brook in conservation easements in all newly proposed house lots. Research has indicated that vegetated riparian buffer zones of this minimum

width prevents damage to aquatic ecosystems that are supportive of diverse species assemblages. The conservation easement area should be clearly marked to prevent encroachment by property owners. Please refer to the attached documentation presenting Division policy and position regarding vegetated riparian buffers for additional information. (See Appendix B)

- Institute a phased development of the site with an approved and completely functional stormwater management system installed initially. Division staff admittedly lack the ability to determine the site specific efficacy of the current design for the proposed stormwater system and defer such an evaluation to the Environmental Review Team member(s) with such expertise. However, the Division does recommend that stormwater not be allowed to directly enter Pond Brook from the site. Stormwater should pass through structures or facilities designed for nutrient and sediment removal. The stormwater system should also be designed to minimize off-site storm flow discharge and maximize groundwater recharge.
- Establish comprehensive erosion and sediment control plans with mitigative measures (detention-infiltration water quality basins, haybales, silt fence, etc.) to be installed prior to and maintained through all phases of site development. Land clearing and other disturbance should be kept to a minimum with all disturbed areas being protected from storm events and be restabilized in a timely manner.
- Limit regulated activities adjacent to riparian buffer zones to historic low precipitation periods of the year. Reduced precipitation periods of summer to early fall provide the least hazardous conditions when working near aquatic environments.
- Establish a parking area(s) either along Pond Brook Road or the access road to Pond Brook Estates. Parking will be needed for the public using the open space area on the site and the trail proposed for development along the abandoned railroad line adjacent to Pond Brook.

- The Division would likely incorporate this reach of Pond Brook to the other areas currently stocked with trout for recreational angling. To do so however, free access to the stream by the general public is required.

ARCHAEOLOGICAL REVIEW

A review of the State of Connecticut Archaeological Site files and maps shows archaeological sites in the project area associated with the historic Shepaug Railroad, an industrial mill ruin, and, prehistoric Native American occupations. In addition, historic review, along with topographic and environmental features, of the project area suggests a high sensitivity toward undiscovered archaeological resources.

The project area consists of 53 acres in the second largest watershed in Newtown. The earliest human occupations of the region were associated with these watersheds as a means of travel and natural resource utilization. It is known that Indian stone artifacts have been recovered from the area, and, testify to these prehistoric settlements. Historically, the area has significance in the industrial development of Newtown. Early 19th-century mill ruins need to be documented to better understand the industrial process and manufacturing at the site. Late 19th-century railroad development has provided evidence in ties, cinder and coal remains, as well as two pairs of ashlar stone trestle abutments, which are well preserved.

The Office of State Archaeology strongly recommends an archaeological reconnaissance survey for the project area. This survey should be conducted to identify all cultural resources and provide recommendations on their significance and preservation. The survey should be conducted in accordance with the Connecticut Historical Commission's *Environmental Review Primer for Connecticut's Archaeological Resources.*

The Office of State Archaeology and the State Historic Preservation Office are prepared to offer the town of Newtown and the applicant any technical assistance in conducting this recommended survey. We believe that these resources may offer important educational opportunities for the community to learn about past cultural adaptations and historic land use.

PLANNING REVIEW

Background

- Newtown is located strategically between the cities of Danbury to the west and Waterbury to the east. Interstate 84 bisects the town. The proposed subdivision is in the northwest corner of the town, north of I-84, approximately 3,000 feet southeast of the Brookfield town line.

- The population of the Town grew faster than projected. The 2000 population was estimated at 21,950, but the 2000 Census shows population grew 20% to 25,031 people.

	2000 Census	2000 Rank	1990 Census	#Change	% Change
Connecticut	3,405,565	***	3,287,116	118,449	3.6%
Newtown	25,031	41	20,779	4,252	20.46%

Source: OPM Web Page, 7/02

- The Plan of Development is a long-range guide to the physical development and preservation of the town. The Newtown Planning & Zoning Commission last updated its Plan in 1993. During 2002, the Planning & Zoning Commission will update the town's Plan of Conservation and Development. The existing town Plan (pg. 7) states that:

> "The Town is composed of a pleasant mixture of country residences and farms set along lanes amount hills. Newer subdivision standards of wide pavements and cul-de-sacs have disrupted this pattern of development. Increasingly,

in newer subdivisions, urban standards impose upon the rural pattern."

- According to the Plan of Development, the town owns by now over 750 acres of open space (pg. 85) as a result of subdivision set asides or other actions. The NRPA standard is 10 acres of local accessible parkland per 1000 residents.

Subdivision

1. The proposed subdivision is situated on 53 acres south of Pond Brook Road, a narrow gravel road; there is a proposal (by the Selectmen) that it be designated as a scenic road. Pond Brook runs through the acreage. To the east lies a pronounced belt of steep land.

2. The proposed subdivision is in an R-2 zone, one has to have the following minimums: a width of 225 ft., a 50 ft. street setback and a 25 ft. side and rear yard. The developer is proposing the town approve 14 building lots, which incorporate two existing houses (Lot #4 and Lot #13). All the lots are served by on-site sewage systems and well water. A common driveway will serve two lots (Lot #6 and Lot #5).

Comments

- **Pond Brook Road Improvements** - The width varies from 12' to 18' with the developer agreeing to widen the road to 22' from the bridge west to end of Lot #1 (approximately 1050 feet).

- **Vera Drive** - Vera Drive, the name of the proposed 1,650 feet paved road, terminates in a cul-de-sac. In general, road lengths should not exceed 1,200 feet; however, the number of lots controls the length of the road in the Town

of Newtown. Silt fences and sedimentation structures are proposed to alleviate potential runoff from road construction.

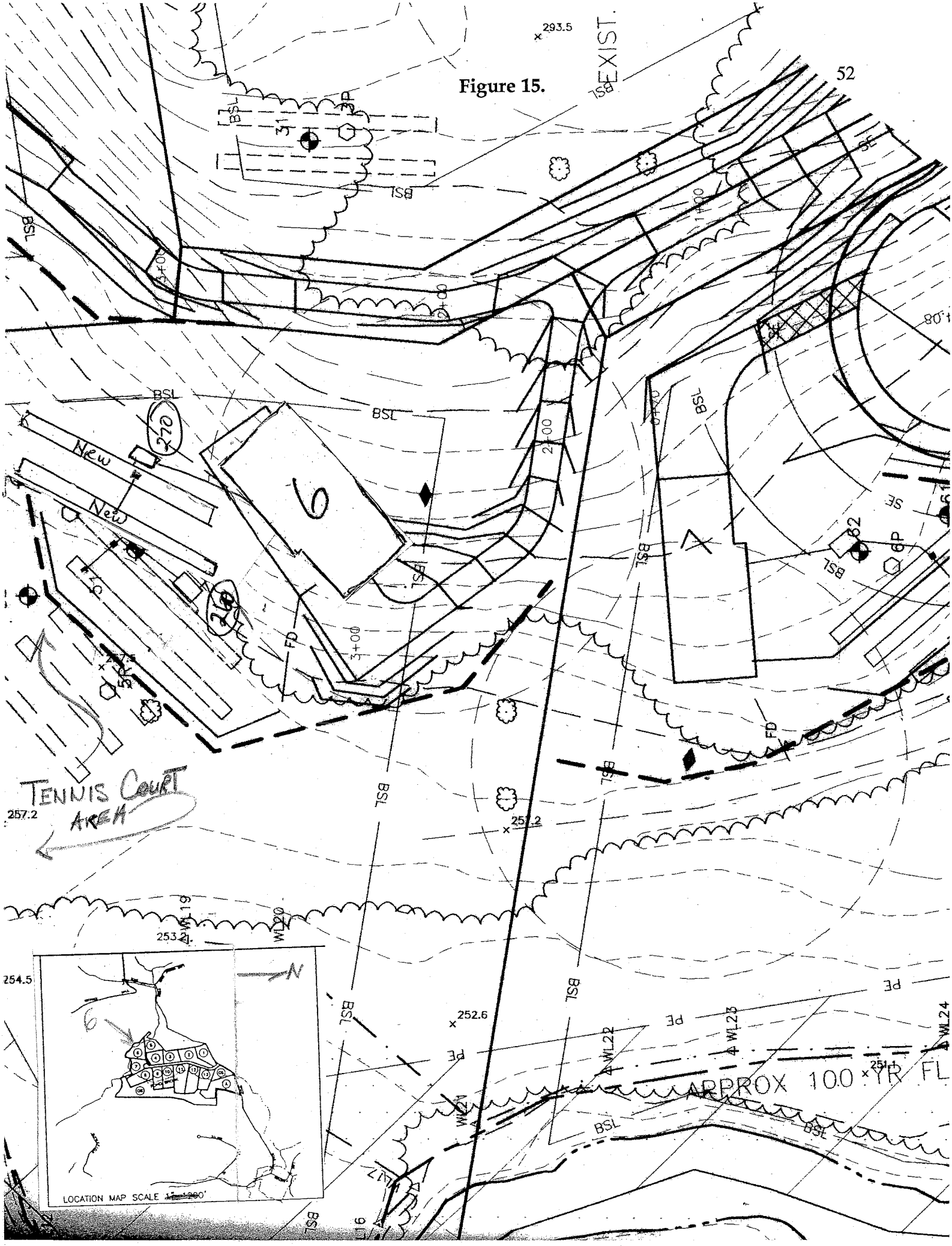
- **Abandoned Railroad Bed** - The railroad bed should become part of a trail system from Hawleyville to Lake Lillinonah. The developer's engineer is proposing to move the right of way towards the brook in order to accommodate the trail (Lot #7 and Lot #8). Steve Driver, Conservation Official, Town of Newtown, indicated there might be grants for two pedestrian crossings over the brook under the Rails to Trails program.

- **Cluster** - The Town of Newtown does not have cluster regulations. Cluster should be employed to preserve more open space and natural features and to avoid unwarranted roadway and infrastructure costs.

- **Open Space** - The developer's engineer says the 46% of the site, with easements and dedications will be available to the public. 12.26 acres (10.3 acres plus 1.96 acres) of open space will be dedicated to the town. Along Pond Brook there will be easements with pedestrian public access that are marked. In the revised Plan of Conservation and Development, the Town definitely should show how these "pieces" of open space fit into the overall town recreation plan.

- **"Tennis court area" (Lot #6)** - Part of the septic system is shown in the so-called tennis court area. Consider moving the septic system between the 260 foot and 270 foot elevation, keeping the footprint of the building in approximately the same location. (See Figure 15)

Figure 15.


EXIST.
293.5
BSL
New
New
TENNIS COURT AREA
257.2
252.6
251.1
APPROX 100 YR FL
LOCATION MAP SCALE
N

APPENDIX A

POND BROOK FISH SURVEY RESULTS

STREAM NAME : POND BROOK SITE #: 3010
SITE DESCRIPTION: PARALLEL TO POND BROOK RD 1/4 MILE DOWNSTREAM OF INTERSECTION WITH OBTUSE RD, NEWTOWN.
SAMPLE LENGTH : 150. SAMPLE DATE: 06/24/1991

PHYSICAL			CHEMICAL		MEAN	STD
AIR TEMP. . . . :	24.00	(C)	DISSOLVED OXYGEN (mg/l). . :		9.80	0.00
WATER TEMP. . . :	19.00	(C)	pH . . . . . :		7.77	0.12
VELOCITY. . . . :	0.129	(m/s)	COND . . . . . (uS/cm3). . :		210.00	17.32
DISCHARGE . . . :	0.107	(m3/s)	ALKALINITY .(mg CaCO3 eq/l):			

	MEAN	STD	
WIDTH. . . . . :	8.00	2.51	(m)
DEPTH. . . . . :	10.80	8.05	(cm)

DOMINANT SUBSTRATE TYPE. . :	4		POOL/RIFFLE RATIO . .:	0.79
TYPE THREE SUBSTRATE . . . :	15.5	(%)	AIR/WATER TEMP. RATIO:	1.26
EMBEDDEDNESS OF TYPE THREE :	65.45	(%)		
OVERHEAD CANOPY. . . . . :	0.89	(%)		
INSTREAM SHELTER . . . . . :	9.245	(m2)		

BIOLOGICAL

SPECIES	POPULATION SIZE (Number/ha)	STANDARD ERROR (Number/ha)
Ameiurus nebulosus	8.	0.0
Lepomis macrochirus	83.	0.0
Salvelinus fontinalis	33.	0.0
Rhinichthys atratulus	883.	41.7
Salmo trutta	83.	0.0
Unknown centrarchid	8.	0.0
Exoglossum maxillingua	83.	0.0
Semotilus atromaculatus	25.	0.0
Luxilus cornutus		
Unknown cyprinid	33.	0.0
Semotilus corporalis	33.	0.0
Rhinichthys cataractae	475.	24.8
Lepomis auritus	8.	0.0
Micropterus dolomieui	16.	0.0
Etheostoma olmstedi	41.	0.0
Catostomus commersoni	125.	0.0

STREAM NAME : POND BROOK SITE #: 4174
SITE DESCRIPTION: PARALLEL TO POND BROOK RD, NEWTOWN (FINGERLING BROWN TROUT EVALUATION)
SAMPLE LENGTH : 451. SAMPLE DATE: 08/31/92

PHYSICAL			CHEMICAL		MEAN	STD
AIR TEMP. . . . :		(C)	DISSOLVED OXYGEN (mg/l). . :			
WATER TEMP. . . :		(C)	pH . . . . . :			
VELOCITY. . . . :		(m/s)	COND . . . . . (uS/cm3). . :			
DISCHARGE . . . :		(m3/s)	ALKALINITY .(mg CaCO3 eq/l):			

	MEAN	STD	
WIDTH. . . . . :			(m)
DEPTH. . . . . :			(cm)

DOMINANT SUBSTRATE TYPE. . :			POOL/RIFFLE RATIO . .:	
TYPE THREE SUBSTRATE . . . :		(%)	AIR/WATER TEMP. RATIO:	
EMBEDDEDNESS OF TYPE THREE :		(%)		
OVERHEAD CANOPY. . . . . :		(%)		
INSTREAM SHELTER . . . . . :		(m2)		

BIOLOGICAL

SPECIES	POPULATION SIZE (Number/ha)	STANDARD ERROR (Number/ha)
Salvelinus fontinalis		
Rhinichthys atratulus		
Salmo trutta		
Exoglossum maxillingua		
Rhinichthys cataractae		
Micropterus dolomieu		
Ictalurus natalis		

STATE OF CONNECTICUT
DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Arthur J. Rocque Jr.
Commissioner

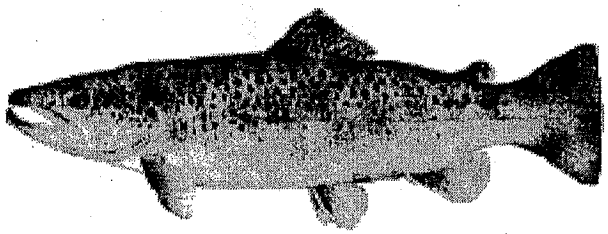
Fisheries Division

FISHERIES INFORMATION CIRCULAR

CONNECTICUT

FISH DISTRIBUTION

REPORT



2000

TROUT DISTRIBUTION

NAME AND LOCATION OF WATER BODY	---- BROOK TROUT ----			---- BROWN TROUT -----			---- RAINBOW TROUT ----			
	YEARL 6-8	ADULT 9-12	SBS	YEARL 6-8	ADULT 9-12	SBS	YEARL 6-8	ADULT 9-12	SBS	TOTAL
FAIRFIELD COUNTY										
BALL POND, NEW FAIRFIELD					4,550			660		5,210
CANDLEWOOD LAKE, BROOKFIELD, ET. AL.					24,160			17,320		41,480
GAY CITY PARK POND, HEBRON		50			100			600		750
GREAT HOLLOW POND, MONROE					50			490		540
MOHEGAN LAKE, FAIRFIELD					130			2,060		2,190
NELLS ROCK RESERVOIR, SHELTON					100			1,030		1,130
PICKETT'S POND, DERBY								800		800
SAUGATUCK RESERVOIR, EASTON, REDDING, WESTON				5,500	5,383			1,500		12,383
STARRET POND, REDDING					100			1,040		1,140
TWIN BROOKS POND, TRUMBULL					50			490		540
ASPETUCK RIVER, EASTON, FAIRFIELD, WESTON		50			50			750		850
BALL POND BROOK, NEW FAIRFIELD	200									200
BYRAM RIVER, GREENWICH		120			100			600		820
EAST SWAMP BROOK, BETHEL, DANBURY	300									300
FARMILL RIVER, SHELTON		630			380	50		2,110		3,170
INDIAN HOLE BROOK, SHELTON	580									580
MIANUS RIVER, GREENWICH, STAMFORD		150			100			1,540	30	1,820
MIANUS RIVER T.M.A., STAMFORD		250		1,000	1,200			980		3,430
MILL RIVER, FAIRFIELD, EASTON					100			870	12	982
MILL RIVER T.M.A., FAIRFIELD				1,000	800					1,800
NORWALK RIVER, NORWALK - RIDGEFIELD		1,620			3,820			3,690	50	9,180
PEQUONNOCK RIVER, TRUMBULL, BRIDGEPORT		1,960			900			4,120	40	7,020
PEQUONNOCK RIVER, W. BRCH, MONROE	660				300			300		1,260
POND BROOK, NEWTOWN		550			100			290		940
POOTATUCK RIVER, NEWTOWN		100			100			1,430		1,630
RIDGEFIELD BROOK, RIDGEFIELD	160									160
RIPPOWAM RIVER, STAMFORD		150			50			280		480
SAUGATUCK RIVER, FLY AREA, WESTPORT		630			750			1,710	30	3,120
SAUGATUCK RIVER, NEW, DANBURY, REDDING		760			400			2,340	50	3,550
SAUGATUCK RIVER, OPEN, WESTON, WESTPORT		2,050			3,390			4,360	50	9,850
SAUGATUCK RIVER, W. BRCH, WESTON, WILTON, WESTPORT		50			100			610		760
SAWMILL BROOK, SHERMAN	160									160
SILVERMINE BROOK, NEW CANAAN, NORWALK, WILTON	250									250
TITICUS BROOK, RIDGEFIELD	550									550
FAIRFIELD COUNTY TOTALS	2,860	9,120	0	7,50	47,263	50	0	51,970	262	119,025
HARTFORD COUNTY										
ANGUS PARK POND, GLASTONBURY					100			700		800
BROAD BROOK MILL POND, EAST WINDSOR					70			660		730
CONGAMOND LAKES, SUFFIELD, MASS.					50			1,880		1,930

APPENDIX B

DEPARTMENT OF ENVIRONMENTAL PROTECTION
INLAND FISHERIES DIVISION

POLICY STATEMENT
RIPARIAN CORRIDOR PROTECTION

I. INTRODUCTION, GOALS, AND OBJECTIVE

Alteration and exploitation of riparian corridors in Connecticut is a common event that significantly degrades stream water quality and quantity. Inasmuch as riparian ecosystems play a critical role in maintaining aquatic resource productivity and diversity, the Inland Fisheries Division (Division) recognizes that rigorous efforts are required to preserve, protect, and restore these valuable resources. Consequently, a riparian corridor protection policy has been developed to achieve the following goals and objective:

Goals

Maintain Biologically Diverse Stream and Riparian Ecosystems, and

Maintain and Improve Stream Water Quality and Water Quantity.

Objective

Establish Uniform Riparian Corridor Buffer Zone Guidelines.

II. DEFINITIONS

For the purpose of implementing a statewide riparian corridor protection policy, the following definitions are established:

Riparian Corridor: A land area contiguous with and parallel to an intermittent or perennial stream.

Buffer Zone: An undisturbed, naturally vegetated area adjacent to or contained within a riparian corridor that serves to attenuate the effects of development.

Perennial Stream: A stream that maintains a constant perceptible flow of water within its channel throughout the year.

Intermittent Stream: A stream that flows only in direct response to precipitation or which is seasonally dry.

III. RIPARIAN FUNCTION

Naturally vegetated riparian ecosystems perform a variety of unique functions essential to a healthy instream aquatic environment. The delineation and importance of riparian functions are herein described. Vegetated riparian ecosystems:

* Naturally filter sediments, nutrients, fertilizers, and other nonpoint source pollutants from overland runoff.

* Maintain stream water temperatures suitable for spawning, egg and fry incubation, and rearing of resident finfish.

* Stabilize stream banks and stream channels thereby reducing instream erosion and aquatic habitat degradation.

* Supply large woody debris to streams providing critical instream habitat features for aquatic organisms.

* Provide a substantial food source for aquatic insects which represent a significant proportion of food for resident finfish.

* Serve as a reservoir, storing surplus runoff for gradual release into streams during summer and early fall base flow periods.

IV. RIPARIAN CORRIDOR BUFFER ZONE GUIDELINES

Recognizing the critical roles of riparian corridors, the Division provides buffer zone guidelines that are designed to bring uniformity and consistency to environmental review. The guidelines are simple, effective, and easy to administer. The following standard setting procedure should be used to calculate buffer zone widths.

Perennial Stream: A buffer zone 100 feet in width should be maintained along each side.

Intermittent Stream: A buffer zone 50 feet in width should be maintained along each side.

Buffer zone boundaries should be measured from either, (1) edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of a riparian wetland, the edge of the stream bank based on bank-full flow conditions.

The riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition. All activities that pose a significant pollution threat to the stream ecosystem should be prohibited.

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths and allowable development uses within these areas, local authorities should be encouraged to adopt the more restrictive regulations and policies.

12/13/91
Date

James C. Moulton
Acting Director

POSITION STATEMENT
UTILIZATION OF 100 FOOT BUFFER ZONES TO PROTECT RIPARIAN AREAS IN CONNECTICUT

BY
BRIAN D. MURPHY
TECHNICAL ASSISTANCE BIOLOGIST
INLAND FISHERIES DIVISION

I. INTRODUCTION

One tenet of the Inland Fisheries Division Policy on Riparian Corridor Protection is the utilization of a 100 foot buffer zone as a minimum setback along perennial streams. The adoption of such a policy is sure to be controversial. Laymen, developers and natural resource professionals alike will ask questions such as: Why was a standard setting method adopted? What's magical about 100 feet? Will 100 feet be sufficiently protective, or will it be overly protective? In response, this paper outlines the ramifications of adopting a riparian corridor policy including the use of a 100 foot buffer zone.

II. STANDARD SETTING VERSUS SITE SPECIFIC BUFFER ZONES

There are two approaches for determining buffer zone width; standard setting and site specific. Standard setting methods define an area extending from the streambank edge or highwater mark to some landward fixed point boundary. Site specific methods utilize formulas that incorporate and consider special site specific land characteristics, hence, the calculation of a variable width buffer zone. In both case, buffers are employed to define an area in which development is prohibited or limited.

A major advantage of standard setting methods is that they are easy to delineate and administer, thereby improving the consistency and quality of environmental assessments. Furthermore, valuable staff time would not be required to determine site specific buffer zones along each and every watercourse of concern.

The exact width of a buffer zone required for riparian corridor protection is widely disputed (Bottom et al. 1985 and Brinson et al. 1981). Buffer width recommendations found in the literature vary from as little as 25 feet to as great as 300 feet (Palfrey et al. 1982). The 100 foot buffer is widely accepted in Connecticut having been adopted by numerous inland wetland and conservation commissions as an appropriate minimum setback regulation for streambelts. In addition, Division staff have been recommending the utilization of the 100 foot buffer zone to protect streambelts since the early 1980's. Scientific research has not been generated to dispute the adequacy of utilizing 100 foot buffer zones to protect Connecticut's riparian corridors. In fact, to ensure that riparian functions are not significantly altered, recent scientific information points towards maintaining buffer zones that would be at a minimum, 100 feet in width (see section III).

Site specific methods define buffer widths according to the character and sensitivity of adjacent streamside lands. These buffer widths, also referred to as "floating buffers," consider physical site characteristics such as slope, soil type, and vegetative cover. The advantage of site specific methods is that buffer widths are designed using site characteristics and not an arbitrary predetermined width. Unfortunately, there is no "one" universally accepted formula or model and none have been developed for use in Connecticut. Most formulas are based on the degree to which sediment can be removed or filtered by natural vegetation, thus, the primary useage is sediment control. Other weaknesses of site specific techniques are (1) all areas must be evaluated on a case-by case basis and, (2) the subjectivity of different techniques (i.e. if the evaluation technique is inadequate, the buffer width will also be inadequate).

Additionally, these formulas only concentrate on one specific riparian function at a time and do not take into account multiple riparian functions, especially those of inland fisheries values as discussed in Section III. Consequently, site specific formulas approach riparian function on a single dimension rather than taking a more realistic, holistic approach.

In the absence of a scientific model to determine buffer widths suitable to protect Connecticut's riparian corridors, the utilization of a standard setting method is environmentally and politically prudent.

III. RIPARIAN FUNCTION

To assess the efficacy of a 100 foot buffer zone, the literature was searched to identify studies which have applied a quantitative approach to buffer width determination. Literature was searched for studies which both support and dispute the 100 foot zone. The following is a summary "by riparian function" of quantitative studies which assess buffer widths.

Sediment Control

Width, slope and vegetation have been cited as important factors in determining effectiveness of buffer zones as sediment filters (Karr and Schlosser 1977). Wong and McCuen (1981), who developed and applied a mathematical model to a 47 acre watershed, found that a 150 foot zone along a 3% slope reduced sediment transport to streams by 90%. Mannering and Johnson (1974) passed sediment laden water through a 49.2 foot strip of bluegrass and found that 54% of sediment was removed from the water. Trimble and Sartz (1957) developed recommendations as to width of buffer areas between logging roads and streams to reduce sediment load. They determined a minimum strip of 50 feet was required on level land with the width increasing 4 feet for each 1% slope increase. Buffer widths as determined by Trimble and Sartz (1957) have been characterized as evaluated guesses rather than empirically defined widths (Karr and Schlosser 1977). Rodgers et al. (1976) state that slopes greater than 10% are too steep to allow any significant detention of runoff and sediment regardless of buffer width. After a critical review of the literature, Karr and Schlosser (1977) determined that the size and type of vegetative buffer strip needed to remove a given fraction of the overland sediment load cannot be universally quantified. Existing literature does suggest that 100 foot riparian buffers will assist with sediment entrapment, although efficacy will vary according to site conditions.

Temperature Control

Brown and Brazier (1973) evaluated the efficacy of buffer widths required to ameliorate stream water temperature change. They concluded that angular canopy density (ACD), a measure of the ability of vegetation to provide shading, is the only buffer area parameter correlated with temperature control. Results show that maximum angular canopy density or maximum shading ability is reached within a width of 80 feet. Study sites were 9 small mountain streams in Oregon that contained a conifer riparian vegetative complex. Whether or not maximum angular canopy density is reached within 80 feet in a typical Connecticut deciduous forest riparian zone is doubtful. Tree height in Connecticut riparian zones is smaller than in Oregon (Scarpino, personal communication), therefore buffers greater than 80 feet in width would be required for temperature maintenance in Connecticut.

Nutrient Removal

Nutrient enrichment is caused by phosphorous and nitrogen transport from, among other things, fertilized lands and underground septic systems. Most research on nutrient enrichment has focused on overland surface flow. Karr and Schlosser (1977) report that 88% of all nitrogen and 96% of all phosphorous reaching watercourses in "agricultural watersheds" were found to be attached to sediment particles; thus, successful nutrient removal can be accomplished through successful sediment removal. There are conflicting reports on the ability of buffer widths to remove nutrients with most research being tested on grass plots. Butler et al. (1974) as cited by Karr and Schlosser (1977) found that a 150 foot buffer width of reed canary grass with a 6% slope caused reductions in phosphate and nitrate concentrations of between 0–20%. Wilson and Lehman (1966) as cited by Karr and Schlosser (1977) in a

study of effluent applied to 300 m grass plots found that nitrogen and phosphorous concentrations were reduced 4 and 6%, respectively. Studies on subsurface runoff as cited in Clark (1977) found high concentrations of nitrates at 100 feet from septic systems with unacceptable levels at 150 feet. Clark (1977) recommended that a 300 foot setback be used whenever possible, with a 150 setback considered adequate to avoid nitrate pollution. Environmental Perspective Newsletter (1991) states that experts who commonly work with the 100 foot buffer zone set by the Massachusetts Wetlands Protection Act are increasingly finding that it is insufficient since many pollutants routinely travel distances far greater than 100 feet with nitrate-nitrogen derived from septic systems moving distances of greater than 1000 feet. Research indicates that the adoption of 100 foot buffer widths for Connecticut riparian zones will assist with the nutrient assimilation; albeit, complete removal of all nutrients may not be achieved.

Large Woody Debris

The input of large woody debris (LWD) to streams from riparian zones, defined as fallen trees greater than 3 m in length and 10 cm in diameter has been recently heralded as extremely critical to stream habitat diversity as well as stream channel maintenance. Research on large woody debris input has mainly been accomplished in the Pacific Northwest in relation to timber harvests. Murphy and Koski (1989) in a study of seven Alaskan watersheds determined that almost all (99%) identified sources of LWD were within 100 feet of the streambank. Bottom et al. 1983 as cited by Budd et al. (1987) confirm that in Oregon most woody structure in streams is derived from within 100 feet of the bank. Based on research done within old-growth forests, the Alaska region of the National Marine Fisheries Service, recognizing the importance of LWD to salmonid habitat, issued a policy statement in 1988 advocating the protection of riparian habitat through the retention of buffer strips not less than 100 feet in width (Murphy and Koski 1989). All research findings support the use of a 100 foot buffer zone in Connecticut for large woody debris input.

Food Supply

Erman et al. (1977) conducted an evaluation of logging impacts and subsequent sediment input to 62 streams in California. Benthic invertebrate populations (the primary food source of stream fishes) in streams with no riparian buffer strips were compared to populations in streams with buffer widths of up to 100 feet. Results showed that buffer strips less than 100 feet in width were ineffective as protective measures for invertebrate populations since sediment input reduced overall diversity of benthic invertebrates. Buffer strips greater than 100 feet in width afforded protection equivalent to conditions observed in unlogged streams. The ultimate significance of these findings is that fish growth and survival may be directly impacted along streams with inadequate sized riparian buffer zones. All research supports the feasibility of implementing a 100 foot buffer zone in Connecticut to maintain aquatic food supplies.

Streamflow Maintenance

The importance of riparian ecosystems in terms of streamflow maintenance has been widely recognized (Bottom et al. 1985). In Connecticut, riparian zones comprised of wetlands are of major importance in the hydrologic regime. Riparian wetlands store surplus flood waters thus dampening stream discharge fluctuations. Peak flood flows are then gradually released reducing the severity of downstream flooding. Some riparian wetlands also act as important groundwater discharge or recharge areas. Groundwater discharge to streams during drier seasonal conditions is termed low flow augmentation. The survival of fish communities, especially coldwater salmonid populations is highly dependent upon low flow augmentation (Bottom et al. 1985). Research, although documenting the importance of riparian zones as areas critical to streamflow maintenance, has not investigated specific riparian buffer widths required to provide the most effective storage and release of stream flows.

IV. OTHER POLICY CONSIDERATIONS

Measurement Determination

The proposed policy states that buffer zone boundaries should be measured from either the edge of the riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or in the absence of a riparian wetland, the edge of the streambank based on bank-full flow conditions. This boundary demarcation is absolutely necessary to ensure that all riparian wetlands are protected. For example, if all measurements were to start from the perennial stream edge and extend landward for a distance of 100 feet, many riparian zones that contain expansive wetlands greater than 100 feet in width would be left unprotected.

Also, since boundary demarcation includes wetland delineation, the ultimate width of the buffer will vary according to site specific features. Consequently, buffer width determination as stated by Division policy is a "hybridization" of both standard setting and site specific methods. This hybridization of methods is advantageous since it acknowledges the sensitivity of streamside wetlands.

Home Rule

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths, local authorities would be encouraged to adopt the more restrictive regulations and policies. This feature incorporates flexibility to acknowledge the importance of local "home rule" regulations or policies already in accepted practice. Conversely, towns and cities without accepted policies and regulations could choose to enact the Division policy.

Allowable Uses in Buffer Zones

The Division policy states that "the riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition and that all activities that pose a significant pollution threat to the stream ecosystem should be prohibited." In essence, the buffer zone becomes an area where no development should be allowed. For this policy to be effective, there should be no exceptions, a blanket restriction of all uses would be recommended. Further clarification and more precise definitions of allowable uses will, however, be required in the future if the policy evolves into a departmental regulation.

Recently, the Connecticut Supreme Court has ruled that local agencies can prohibit specific development within buffer zones. The *Lizotte v. Conservation Commission of the Town of Somers, 216 Conn.320 (1990)* decision ruled that the construction or maintenance of any septic system, tank, leach field, dry well, chemical waste disposal system, manure storage area or other pollution source within 150 feet of the nearest edge of a watercourse or inland wetland's seasonal high water level can be prohibited (Wetlands Watch 1990). If this decision is a precursor of the future, Connecticut courts will continue to the support the use of buffers, especially those which restrict or prohibit detrimental activities.

V. CONCLUSIONS

The following actions are required to preserve, protect, and restore Connecticut's riparian corridors:

1. The Inland Fisheries Division needs to adopt and implement the proposed policy so that staff can use it as a guideline to assist cities, towns, developers and private landowners with making sound land use decisions. This policy will act to solidify a collective position concerning riparian corridor protection.

2. While the proposed policy in its "current form," represents a recommendation from the CTDEP Inland Fisheries Division, the ultimate goal of the Division should be to progressively implement this policy as either a CTDEP regulation or State of Connecticut statute.

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About the Team

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

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

Purpose of the Environmental Review Team

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

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

Requesting an Environmental Review

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

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