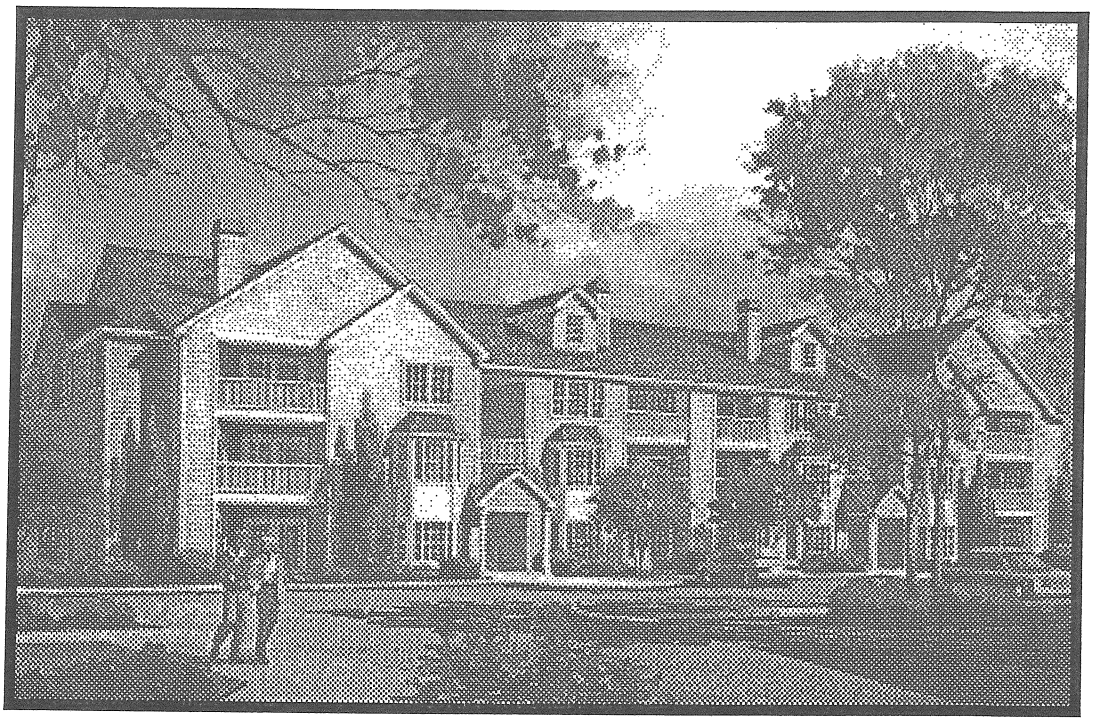
Avalon at Newtown



King's Mark Environmental Review Team Report

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

Avalon at Newtown

Newtown, Connecticut

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 Commission
Planning and Zoning Commission
Newtown, Connecticut

December 1999

CT Environmental Review Teams
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Acknowledgments

This report is an outgrowth of a request from the Newtown Conservation Commission and the Planning and Zoning 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 Thursday, July 29, 1999.

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I would also like to thank Steve Driver, conservation official, Donna McCarthy, Newtown Health District, Mark Forlenza, Avalon development director, Eric Alletzhauser, attorney for the applicant, Andrew Greene, engineer for the applicant and Michael Klein, soil scientist for the applicant 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. Some Team members unable to make the scheduled field review made visits to the site on their own. 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 luxury apartment complex.

If you require additional information please contact:

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Introduction

Introduction

The Newtown Conservation Commission and the Planning and Zoning Commission have requested Environmental Review Team (ERT) assistance in reviewing a proposed luxury residential apartment development.

The approximately 40 acre site is located on the north side of Mt. Pleasant Road (Route 6) near the Bethel town line in the Pond Brook watershed. The applicant proposes to construct 304 apartments contained within eleven buildings. The project will have over 700 parking spaces. The site is currently wooded with areas of steep slopes and bedrock outcrops. There are 4.2 acres of wetlands that drain directly or ultimately to Pogund Brook. There is one direct wetland impact and five other regulated activities within the upland review area. Dedicated open space will abut Bethel Land Trust property. The applicant proposes to extend public water to the site and to access the proposed sewer line, once constructed.

Objectives of the ERT Study

The town is concerned with the impact of this proposal on the 40 acres, as well as potential impacts to the Pond Brook watershed. The watershed is under development pressure and a study has never been conducted for this watershed analyzing the flood hazard. Other resources and concerns that the Team was asked to address include: topography, geology and geologic limitations; soils and erosion and sediment control; hydrology, stormwater management and water quality; wetland resources and impacts; fisheries habitat and impacts; wildlife resources and impacts; archaeological significance; and traffic and access.

The ERT Process

Through the efforts of the Conservation and Inland Wetlands Commission and the Planning and Zoning Commission 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 Thursday, July 29 , 1999 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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Topographic Map

Scale 1" = 2000'

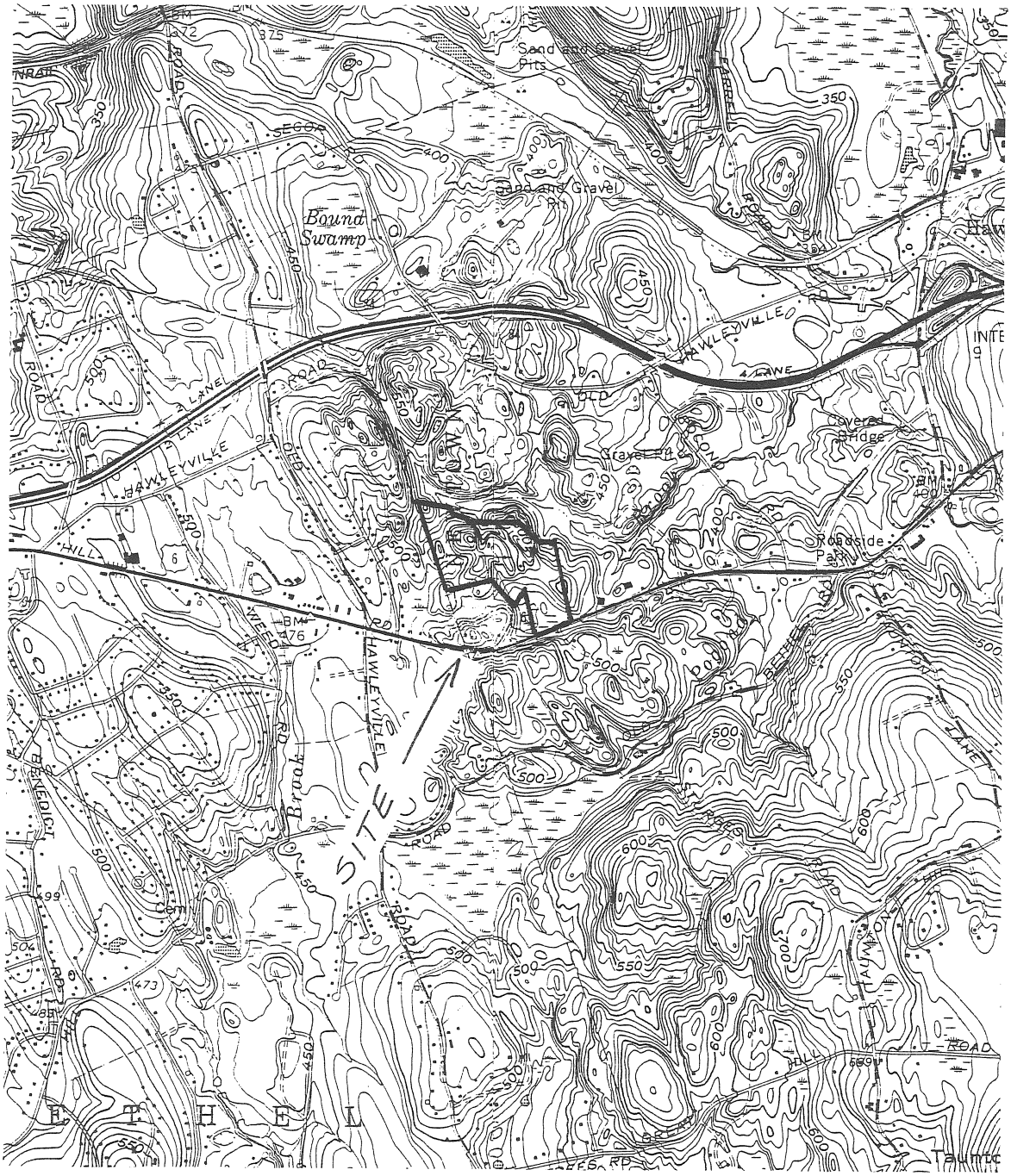

Figure 2

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Vicinity Map

Scale 1" = 1200'

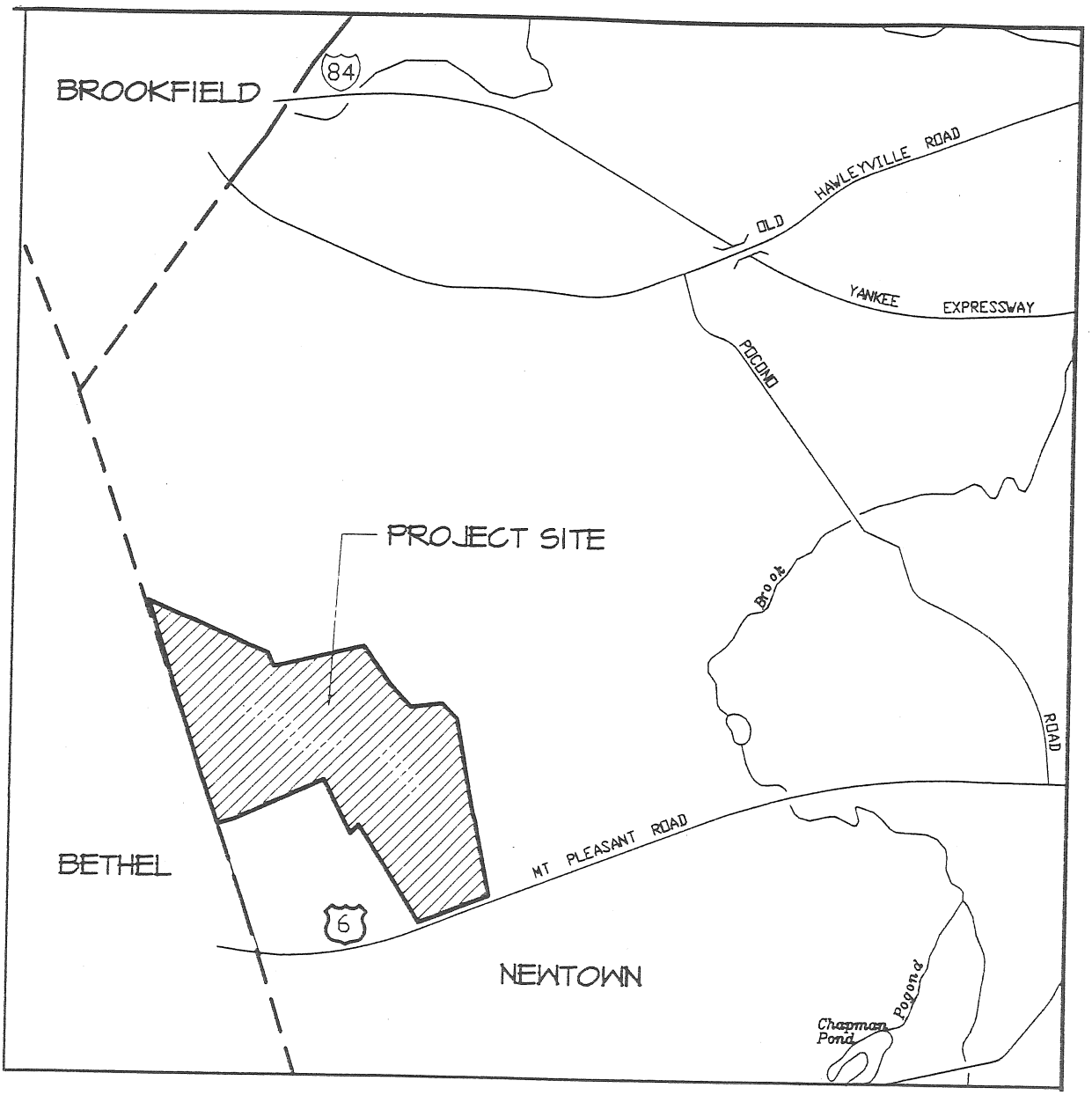
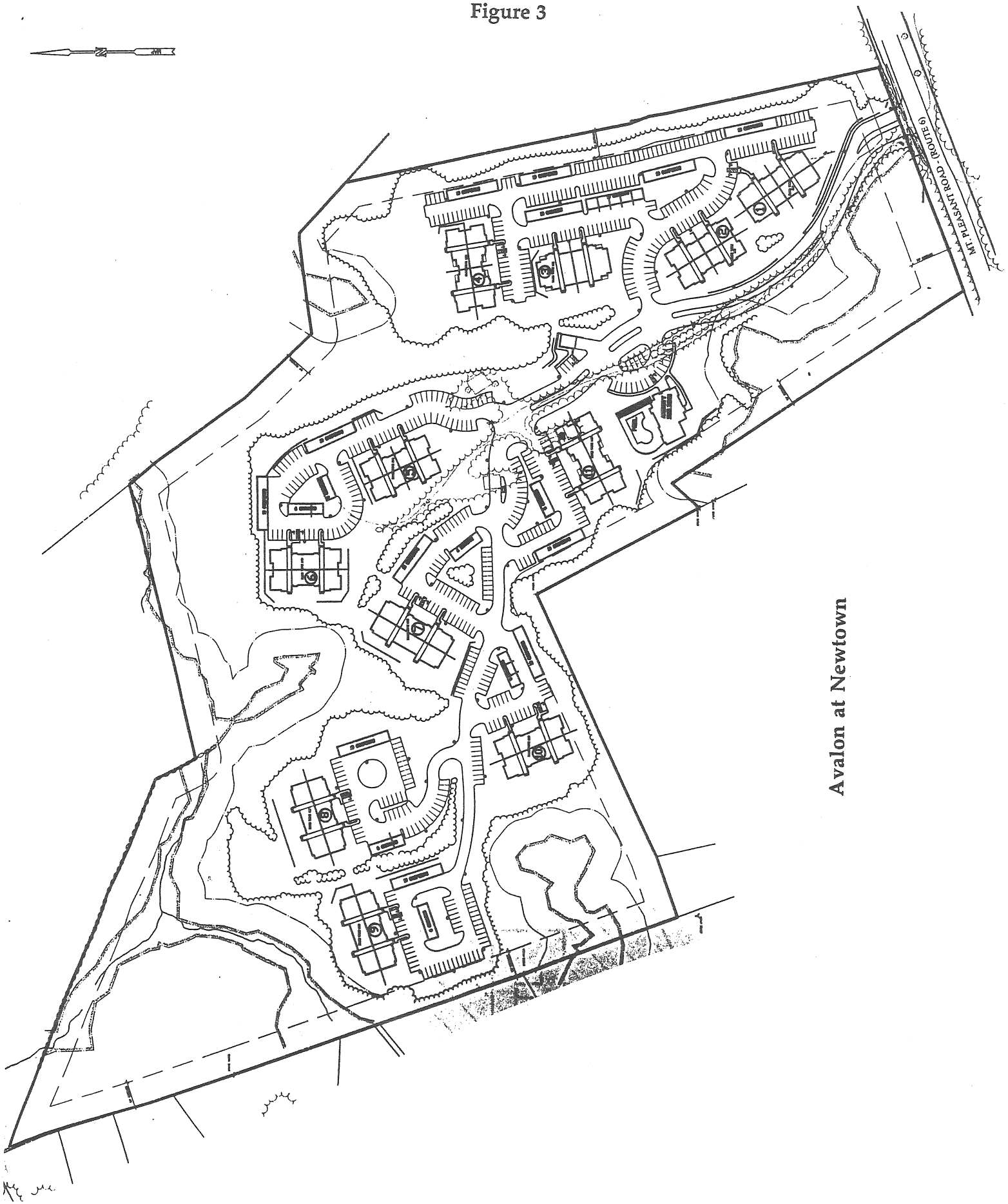


Figure 3



Topography, Surficial and Bedrock Geology

The 40.1 acre proposed site for the luxury residential apartments straddles an upland area dissected by small, steep sided East-Northeast and North-Northwest trending ravines. Bedrock is very shallow over most of the area and rock outcrops are plentiful. A few feet of poorly sorted glacial till constitutes the surficial cover. A thicker blanket, perhaps up to 10 feet thick, of glacial meltwater deposited sands and gravel underlies a distinctly topographically flatter area just east of the site. The organic sediments of the low-lying wetlands on the northern edge of the property could also be underlain by the same sand and gravel unit.

The bedrock exposed on the site is predominantly medium grained muscovite (white mica), biotite (black mica), quartz-feldspar schist with prominent porphyroblasts (large crystals) of garnet. Two different formations are mapped in the area of the proposed development: Or - Rowe Mountain Schist and OCr - the Ratlam Mountain Schist. Both are Ordovician in age (i.e. roughly 480 million years old); the Rowe Schist is interpreted as slightly younger in age than the Ratlam Mountain Schist. Aside from age, the only difference between the two units is the presence of locally abundant, layers of rusty weathering (i.e. sulfide bearing) gneisses in the Ratlam Mountain Schist. The Brookfield Gneiss, homogeneous biotite-feldspar-hornblende-quartz gneiss outcrops northwest of the site along Route 1-84.

The foliation and layering in the schists trends East-West and dip steeply to the North. Several North-northwest trending steeply dipping 'ductile' fault zones are exposed in the walls of an abandoned quarry just west of the site. These zones are highly fractured and clearly control the location of the North-northwest linement valleys on the proposed site. The East-Northeast linements appear to reflect weak zones of intense jointing.

Environmental Concerns

Stormwater Runoff

The present thin surficial till cover on the upland area has minimal storage potential. Most of the stormwater runs off directly into the surrounding wetlands. Regrading, clearing and landscaping will probably have little affect on the hydrologic budget of the site, especially as public water and sewers are planned.

Acid Drainage

The underlying bedrock is locally rusty weathering due to the presence of small amounts of pyrite and pyrrhotite sulfides. If fresh, unweathered sulfide containing rock is exposed by blasting or as a result of related changes in the local groundwater table the oxidation of the sulfides can produce acid that may affect the acidity of the groundwater entering the surrounding wetlands. The effect would only be temporary, and after a few years, once the newly exposed sulfides were completely oxidized the groundwater would return to its present ambient state.

Further Information

See attached maps.

Bedrock Geology
Clarke, James W., 1958. The Bedrock Geology of the Danbury Quadrangle, Connecticut Geological and Natural History Survey QR-7, 47p.
Stanley, Rolfe, S., and Caldwell, Katherine G. 1976. The Bedrock Geology of the Newtown Quadrangle, Connecticut Geological and Natural History Survey QR-33, 44p.

These reports use a variety of names for the different mapped units. The currently accepted names are listed on the most recent statewide geological compilation.

Rodgers, John. 1985. Bedrock Geological Map of Connecticut, l: l 25,000. Connecticut Geological and Natural History Survey.

Surficial Geology
Quadrangle scale maps are open filed at the Connecticut Geological and Natural History Survey.
The information in these reports is incorporated in
Stone, Janet. l 992. Surficial Materials map of Connecticut, l: l 25,000, Connecticut Geological and Natural History Survey.

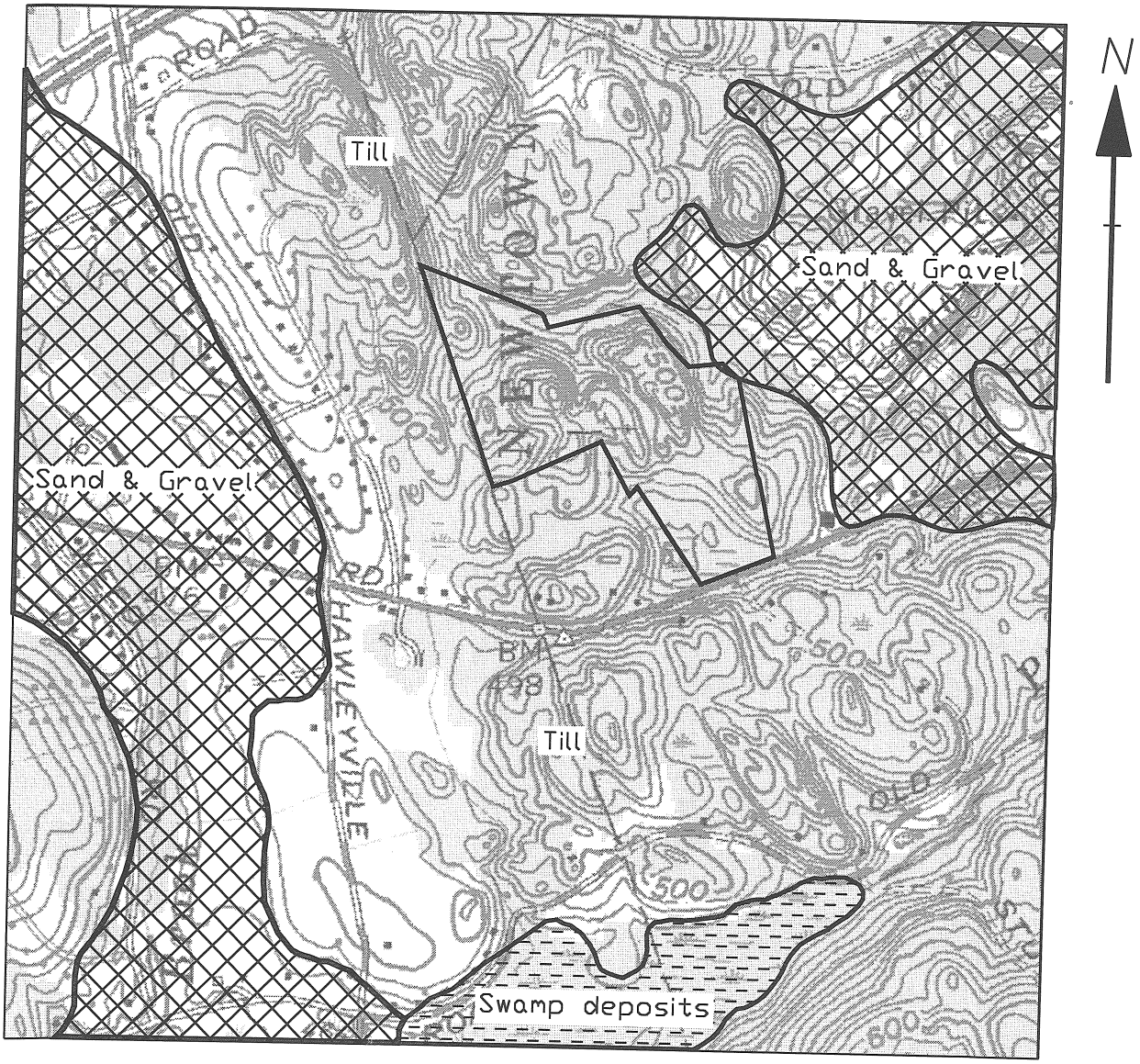
Figure 4

Air Photo - "Avalon at Newtown"

Scale

Figure 5

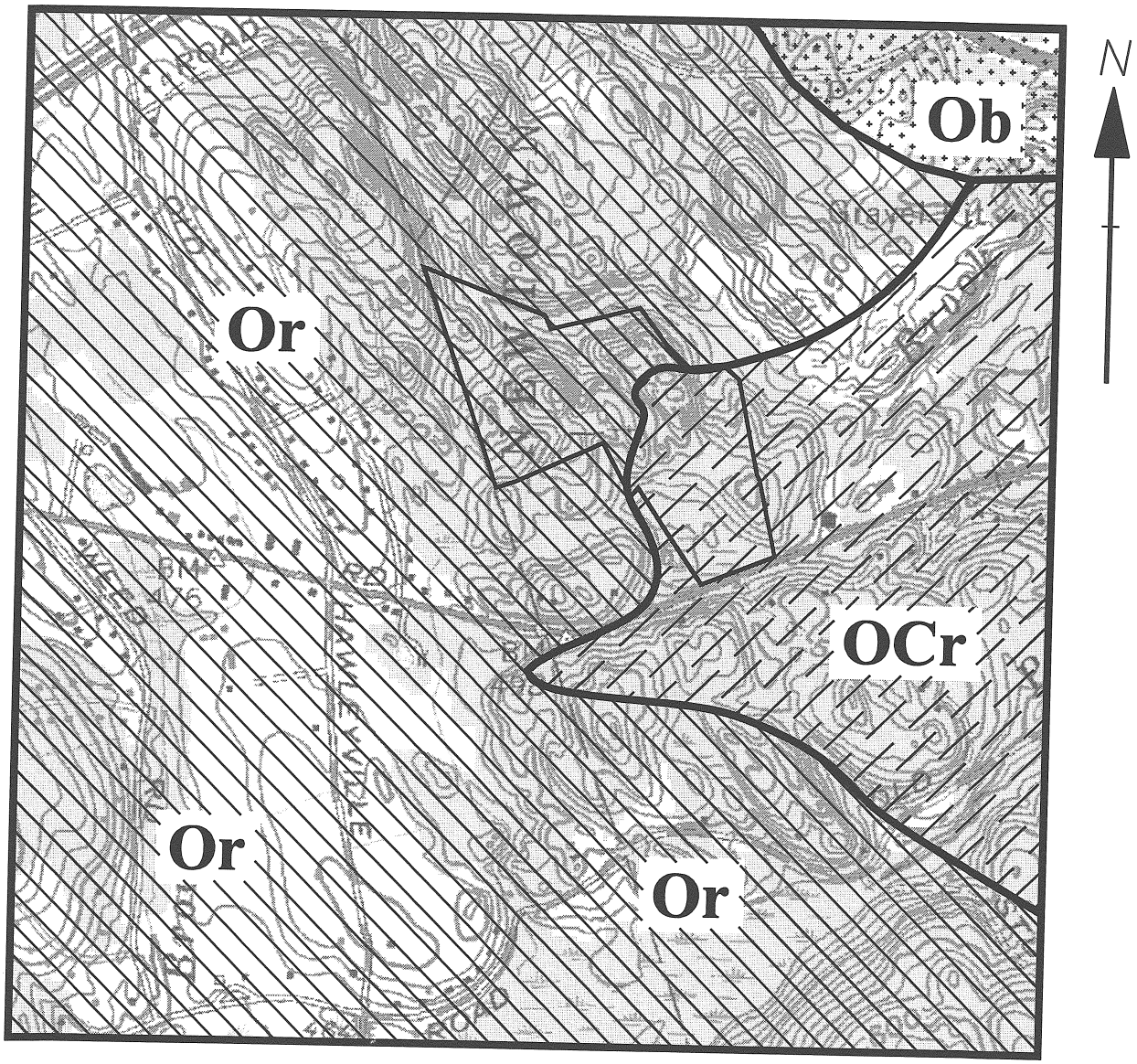
Surficial Geology - "Avalon at Newtown"



Scale

Figure 6

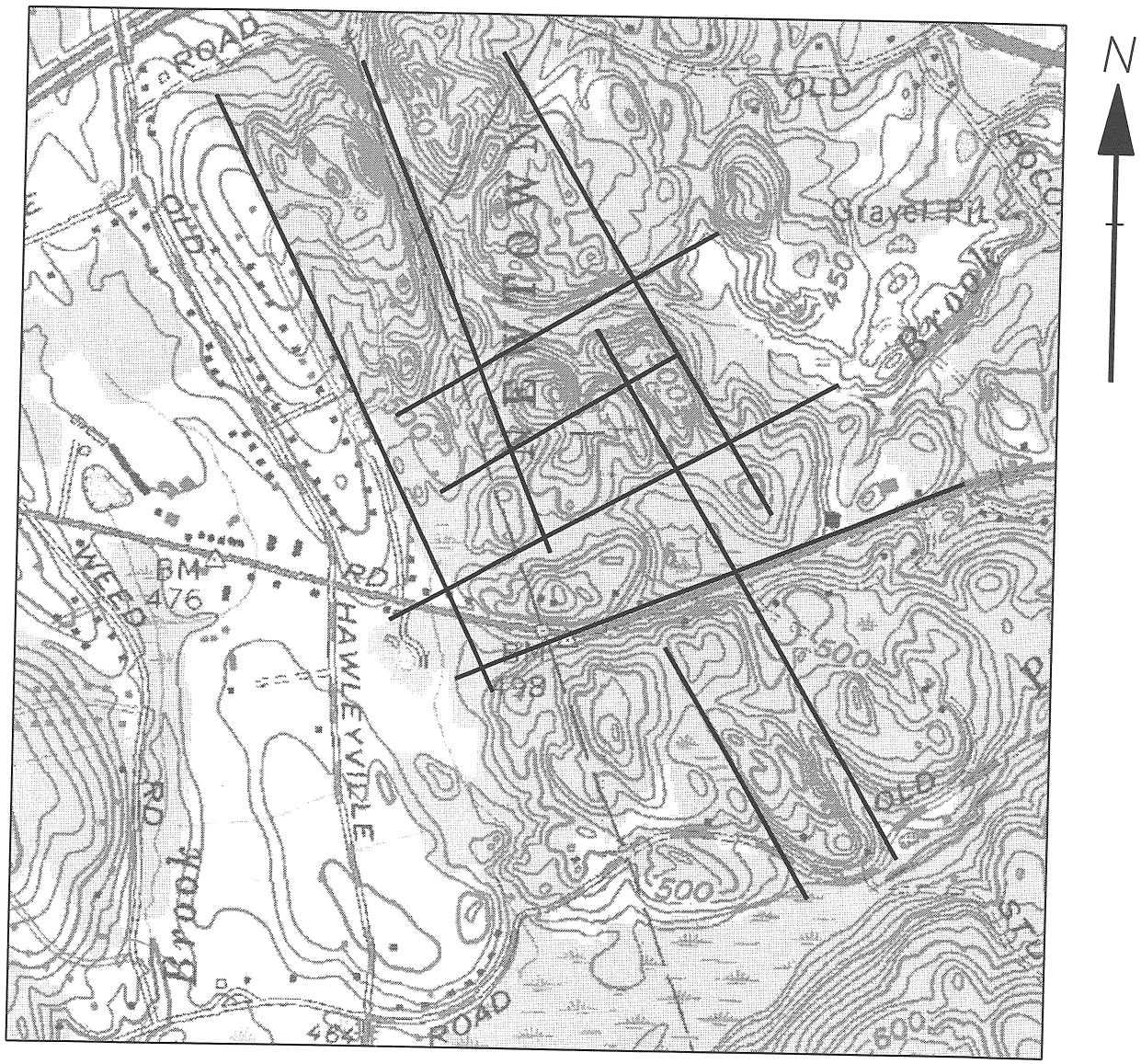
Bedrock Geology - "Avalon at Newtown"



Ob Brookfield Gneiss
OCr Rowe Schist
Or Ratlum Mountain Schist

Figure 7

Prominent Linements - "Avalon at Newtown"



0 1000

feet

Scale

Figure 8

Soils Map

Scale 1" = 1320'

Stormwater Management

The project is a proposed 41 acre luxury apartment development on Mt. Pleasant Road (Route 6) with 304 apartment units. The units are divided into one-, two or three-bedroom apartments and will be served by water and sanitary sewer from Mt. Pleasant Road. Greater than 30% of the site will be maintained as open space. The site topography is quite varied with grades averaging over 10%. There are several areas with grades over 50% and some near-vertical rock faces. Wetland areas and a wetland corridor following an intermittent watercourse surround the site to the west and north. The total amount of wetlands on site is approximately 4.2 acres.

The proposed development includes eleven (11) apartment buildings with associated garages and carports. There is also an amenity building with an adjacent pool. The main access road through the site is approximately 1900 feet long with two spurs leading to additional buildings. With garages, carports and outdoor spaces, there are 733 proposed parking spaces. The proposed drainage system consists of a series of catch basins eventually discharging to one of six detention basins. The outlets of these basins would then discharge to the wetlands and intermittent watercourse surrounding the site to the west and north. According to drainage calculations submitted, there will be no increase in post-development peak flows. The culvert along Mt. Pleasant Road would be increased to 36 inches to relieve the currently undersized 24-inch culvert. The design for the detention basins includes the installation of a pervious berm to create a sediment forebay within each basin. For the larger drainage systems, a "sediment chamber" is proposed prior to discharge to the basin.

The design plans indicate that during construction, most internal site drainage will be directed by temporary swales into the detention basins which will be modified to function as sedimentation basins. The engineer indicated that construction will be phased to minimize the area of soil exposure at any given time. Perimeter silt fence reinforced with haybales is proposed throughout the site. Gravel dam reinforcement of

the silt fence should be considered in areas where length, steepness or area of slope present the possibility of high flows. To prevent, as much as possible, the transport of sediment on the site, gravel and silt fence check dams should be provided along the roadway shoulders and diversion swales. Although the plans call for check dams along the diversion swales, the spacing is not indicated and a detail is not included. Details for these should be included on the plans. In addition, the proposed sediment chambers should be designed utilizing swirl concentrator technology or equal. A simple baffled chamber is not adequate. A maintenance schedule must also be included for all erosion and sedimentation control measures.

One of the most significant concerns with this site is the amount of steep slopes. The grading plan necessitates areas of significant cut slopes. Measures to control groundwater erosion of the steep cut slopes required for this project must be addressed. Special slope stabilization measures may be necessary. These should all be indicated on the plans. The use of erosion control blankets is shown on some slopes. It should be indicated for any slope exceeding 3 to 1 throughout the site. Also, a regular maintenance schedule should also be specified for the site prior to final stabilization and for the drainage system once complete.

Two of the proposed detention basins are of particular concern. The first is the basin in the northwest corner of the site. This basin and its outlet are located in an area of approximately 10 - 15% slopes. The potential for erosion of the basin slopes and existing soils at the outlet is high. The basin should be relocated as far downslope as possible and the outlet extended to discharge to a more level area. The other basin of concern is at the northeast corner of the site. This basin includes a 30 foot high 2 to 1 slope. The Connecticut Guidelines for Soil Erosion and Sediment Control indicate that high slopes should incorporate a reverse slope bench every 15 vertical feet. This should be included on this slope as well as a berm at the top of the slope to divert upgradient runoff. The slope bench, diversion berm and temporary construction diversion swales should be directed to an appropriately designed riprap downchute leading into the basin. Although the detail sheet indicates the use of level spreader structure at all basin

discharges, the plans indicate only a riprap splash pad. Level spreader discharges should be used and a detail included.

One way to reduce the impact of stormwater discharges is to reduce the discharges themselves. The town and the applicant should investigate means of reducing runoff from the site. The proposed development currently provides 2.4 parking spaces per unit, while 77% of the units are two bedrooms or less. The elimination of 125 spaces would still allow for 2 spaces per unit and could eliminate almost an acre of impervious surface. In addition, curbing for the access road and other paved areas could be eliminated, allowing sheet flow to disperse and infiltrate rather than discharge to the drainage system. Other means of reducing runoff such as segregating and infiltrating roof runoff should also be investigated.

A registration for the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities must be submitted at least 30 days prior to the start of construction. A Stormwater Pollution Control Plan must also be prepared and submitted at the same time. In general, erosion and sediment control measures utilized must be appropriate for a steeply graded site with potential groundwater interception. The detention basins shall each have a capacity of at least 134 cubic yards per acre drained in order to serve as construction sediment basins. Disturbed areas to be left bare for over 30 days will receive temporary seeding or heavy mulch. All disturbed areas must be seeded as soon as possible. No areas may be left bare by the end of the planting season. On a site as steep as this, care must be taken to properly stabilize seeded areas with mulch and/or geotextiles. Properly constructed and maintained, the development should have minimal impact on the adjacent wetlands and watercourses.

Wetland Review

This section of the report will deal with the proposed and potential impacts to wetlands and watercourses resulting from the construction of this residential apartment complex. With minimal direct impacts (approximately 450 square feet) taking place for the reconstruction of the main drive as it crosses the roadside swale along Route 6, much of the focus of this report will be on the potential for indirect impacts such as impaired storm water quality, erosion and sedimentation control, and wildlife. Other members of this ERT are also commenting on these indirect impacts as part of their reports. To avoid duplication, certain items will not be repeated here, however, critical points may be repeated for emphasis.

Alternatives to reduce the amount of direct alteration necessary to access this parcel are limited and may not be prudent based on the relatively small area involved as well as the fact that this activity will only be replacing and expanding an existing culvert in place for the current unimproved lot access. Reduction of the width of this proposed access is one possible alternative. The narrowing of this "boulevard" style access way would also act to reduce the amount of impervious surface and thus have its own benefits in the area of stormwater management and water quality control.

The "50 foot wetland buffer" indicated on the plan was most likely placed on the plans due to the fact that the Newtown Conservation Commission (NCC) maintains a 50 foot upland review area. However, this does not infer that this 50 foot upland review area would necessarily provide an adequate buffer to certain wetland areas given the nature of the surrounding landscape or special wildlife concerns. The NCC can have jurisdiction over certain activities outside this upland review area if the activity can reasonably be expected to have an impact on the subject wetlands and/or watercourses.

There are two areas of concern relative to adequate wetland buffers. First, the area where regulated activity #1 is proposed, is located at the bottom of a 700 foot run from a high knoll down to a wetland area. The wetland buffer in this area is approximately 20 feet wide. This is inadequate to protect against potential sedimentation resulting from erosion during the construction period. Even with the best erosion and sedimentation (e&s) control measures and maintenance thereof, some excessive amounts of sediment, usually consisting of fine, suspended soil particles along with adsorbed nutrients, pass beyond the controls and into down-slope wetlands and watercourses. A more substantial wetland buffer will help to further protect the receiving wetland. It is recommended that the applicant consider alternative site designs which would allow for a more significant, undisturbed wetland buffer taking into consideration the slopes involved at this location.

Secondly, regulated activity areas #2 and #4 encroach upon what could serve as a valuable transitional wildlife habitat for wetland dependent species utilizing the large wetland area on the southwestern portion of the property. Narrowing the access drive as well as possibly moving it more to the east would help to resolve this issue.

In an effort to reduce the proposed increases in stormwater **volumes** (not peak stormwater velocities/rates which the applicant has demonstrated to have reduced) leaving this site, it is suggested that possibilities for stormwater infiltration be investigated by the applicant. Much of the upland soil is classified as "well drained" and may lend itself to this practice.

It is recommended that the applicant explain how the length of all outlet protection pads are to be sized in order to insure no-erosive stormwater velocities at the end of the pads.

As discussed in the field, relocation of the northerly detention basin further to the north may be advisable. It is suggested that the basin be moved as far as possible to the north without moving into the 50 foot buffer area and then angling the outlet pipe to the north to outlet onto flatter land within the 50 foot setback area.

The constructed basins proposed for this parcel were referred to as water quality basins, however, there is little information on how these basins will attenuate water quality. Specifically detaining the water quality volumes (the first 0.5-1.0 inch of rainfall) for 12 to 24 hours is usually recommended for this purpose. Detention for only the larger peak-flow volumes often does not accomplish this goal.

A construction sequence should be included on the plan which specifically requires the construction of e & s controls (e.g. sediment basins, diversion swales, sediment fences, etc.) be constructed prior to earth moving activities.

The outlets for the temporary sediment basins as designed may become plugged with accumulating sediment. A simple riser of corrugated metal piping is preferred to eliminate this possibility.

Maintenance schedules for both temporary (sediment fences, sediment basins, swales) and permanent (detention basins, outlet pads) erosion control measures should be included on the plan.

The general areas of upland soils map units should be placed on the e & s control plan.

Several of the detention basins are proposed in areas of significant cuts (8-12 feet). Will this create a permanent water body which would effect calculated storage volumes?

The applicant should consider how the diversion swales and temporary sediment basins will be modified, as the proposed grade changes take place around them, in order to maintain their function.

Some analysis should be performed to determine if the areas designated for topsoil stockpiling will be sufficient.

It is recommended that the permanent detention basins be stabilized before the stormwater management system is allowed to be routed into them.

Proposed dam location and design, including temporary and permanent sediment/detention basins should be reviewed by the Dam Safety Unit of this division for permit need determination. Contact Wes Marsh at (860) 424-3706 to pursue this matter.

Engineering Review

The Team engineer was not able to make the field review, but has read the engineering report titled "Avalon at Newtown, Mount Pleasant Road, Newtown, Conn., dated April 22, 1999" prepared by Milone and MacBroom, Inc. He has also reviewed the materials package given to team members at the July 29, 1999 meeting, and discussed the project with Doug Hoskins of the Inland Water Resources Division of DEP.

The engineering report was not reviewed for technical errors. The review was conducted to check the general assumptions, choices of hydrologic parameters made in the analyses and the theory and rational used to develop the report conclusions.

This project will be constructed on 41 acres within a larger watershed of 1108 acres (Pogond Brook at Mouth). This sub-drainage basin is located in the upper third of the Pogond Brook watershed and is even more remote (removed from the center of the watershed) when considering the Pond Brook watershed. Because this site is located in the upper portion of the watershed, it is appropriate to design for on-site detention. It is not always required, but in this case with known flooding problems on Pond Brook, it should be a necessity.

The breakdown of the watershed to be developed into 7 sub-watersheds is not necessary, but when the site is developed, the 7 sub-watersheds prove desirable. The detention provided for each sub-watershed results in a decrease in peak flows leaving the sub-watersheds. It is also important that these drainage areas are not situated in series and are not added together. Drainage Areas Al & A2 flow south to the Road; Drainage Areas B & C flow separately into a large wetland system to the southwest; Drainage area D flows to the

north in the NE corner of the project; Drainage area E & F flow to the north in series; and Drainage area G flows to the north at the NW corner of the parcel.

As can be seen by the previous descriptions, this site naturally spreads out the drainage areas and therefore the peak flows throughout the perimeter of the site. This natural spreading of the drainage areas, coupled with the detention in the upper portion of the watershed should allow this project to have no perceived flow volume impacts off of the site. There will be a decrease of peak flows leaving the site. The Team engineer doesn't feel that this decrease will have an impact further down the watershed.

The only impact that is seen on the general hydrology of this area is destabilization of the local drainageways. By putting this flow into detention basins and allowing for point discharges, the stream banks and stream beds can become unstable. There are not a lot of options, given that the development will increase impervious area, and a more diffused overland flow doesn't seem practical for this site. This will especially be noticeable in watersheds G & F. In watersheds G & F the drainageways are not presently subjected to concentrated flows and the slopes of the ground at these valleys are quite steep. It is the Team enginner's opinion that these drainage ways will need to be armored to the confluence with a larger stream. (It may be preferable to allow for some stream erosion if the existing soils consists of larger stones and erosion will be minimal.) At the confluence with a larger stream, the increase in duration of flow that comes from detention and longer slower releases will be proportionally minimal compared to the larger flows of the larger stream.

Soil and Water Conservation District Review

The Soil and Water Conservation District has some concerns that should be addressed concerning soil erosion prevention and water quality issues. The first item that needs to be addressed is the potential erosion problems. Under section 7-17 5c of the Guidelines for Erosion and Sediment Control reverse slope benches shall be provided whenever the vertical height of any 2 to 1 through 5 to 1 slope exceeds 15 feet. The plan should be revised to allow for reverse slope benching at all these slopes and vertical heights that fall within this category. Some of these areas include:

Slope 1: The slope south of the Amenity Building
Slope 2: The slope northwest of Building 3
Slope 3: The slope northwest of Building 4
Slope 4: The slope east of building 11
Slope 5: The corner north of building 5 and east of building 6
Slope 6: The slope on west side of building 10
Slope 7: The slope northeast of building 10 near the roadway and carports as you approach building 8
Slope 8: The slope east of the 10 carports as you approach building 8

The slopes along the water quality basins along with any other developed areas on the plan need to be checked and verified to determine if they also fall into reverse bench slope category.

The other area of concern is the type of construction phasing that will be implemented. The site should be developed in small phases because of the topography and the potential for a large erosion problems. Phasing construction will limit the amount of exposed soil and potential erosion problems. Disturbed areas should be temporarily seeded with a conservation

seed mix and applied at a rate of 40 lb./acre or mulched as needed to reduce erosion potential during construction. Areas should be temporarily seeded if the contractor knows that new construction will not occur for a time greater than one month. Any stockpiles on site should be left in a stable condition. The piles should be shaped and stabilized with temporary seeding. Trees left on site should be fenced off so that damage from equipment will be minimized. The amount of construction disturbance within the 22 acres will be quite extensive. There needs to be sufficient oversight and maintenance of erosion and sediment controls and of water quality basins. All E&S controls should be maintained per Connecticut Guidelines throughout the construction period.

Future Maintenance

During the ERT review there was a question about the maintenance schedule of the catch basins and water quality basins. These areas will be cleaned once per year after the construction is completed. A regular documented inspection of these sites should occur as a regular maintenance item of the entire facility. There will be monthly and seasonal maintenance requirements of this facility. These structures should also be cleaned as needed and not just once per year. Frequent inspections by maintenance personnel will give them a better sense of cleaning requirements. This maintenance schedule should be maintained throughout the life of the development.

Impervious Surfaces

One goal that the District would like to be met is a reduction in the amount of impervious surfaces. The Avalon plan calls for the construction of 733 parking spaces with 110 spaces as an overflow area. The development of these spaces will increase the amount of impervious surfaces and increase surface water runoff. The District recommends a reduction in the amount of parking

spaces or using an alternative surface material, like Grasscrete. This type of material is a reinforced grass/concrete porous pavement that drains stormwater runoff. The best situation for this project would be a reduction in the amount of spaces and leaving the existing vegetation undisturbed. The plan should also consider using vegetated nature type trails around housing units. They can add scenic beauty and reduce the area of impervious surface. These alternate walkway areas may be an option for some areas of the site.

The last issue of water quality is the installation of curbing material around the development. The usage of curbing material is not clear in the site plans but many developments use them. The site should not contain any curbing because it will channelize stormwater. The site should contain vegetated edges that allow for surface water infiltration. The use of vegetated swales and buffers should be used to replace stone or concrete whenever possible.

Wetland Capacity

The last issue the District would like to address is the wetland capacity to handle the new stormwater and still maintain water quality. There was some discussion at the ERT review about a future development on the adjacent property along the northern section of the Avalon development. The majority of the stormwater will be draining into the surrounding wetland areas. The plan calls for the installation of water quality basins to provide for the removal of sediment before entering the wetland areas. The District is concerned about other materials like fertilizers, oils and automobile pollutants from adjacent lawns and parking areas. The development of the site adjacent to the property is a concern especially if stormwater from that development will also be discharged into the wetland. The wetland area should be studied further to determine specific capacities while still maintaining water quality of the watershed. Consideration should be given to increase the buffer zone around wetland areas to a distance greater than 50

feet. Increased buffer zones allow for greater infiltration of pollutants and lessen the fringe impacts on the wetlands and vernal pools. The local wetlands commission should determine the exact distance.

The last wetland item for discussion is the road along the Route 6 entrance. The roadway will be close to the adjacent wetland area. The concern is the stormwater runoff that will be entering the wetland area. The District is concerned about the impacts this will have on the water quality of the watershed.

Other Concerns

The final change in the reviewed plan is that the limit of disturbance for the entire construction site is not drawn on the plans. This line should be placed on all site plans so that nothing is assumed when construction occurs.

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.

It is now possible for you to conduct an initial endangered species review using the "State and Federal Listed Species and Significant Natural Communities" maps available for viewing through each town's Town Hall. The Town Planner should have a copy of the map and instructions on how to use the maps. This map shows the generalized locations for listed species and communities as gray-shaded areas on a 1:24,000 scale map of the town.

Wildlife Resources

Existing Wildlife Habitats and Values

The environmental report submitted by *Environmental Planning Services* provides a fairly thorough description of the property's vegetation and physical characteristics. This section will therefore provide general habitat descriptions with emphasis on the functional values of the habitat types.

Wildlife habitat is said to be the complex of vegetative and physical characteristics that provide for all the requirements of wildlife, which are food, shelter, resting, nesting and escape cover, water and space. Generally, the greater the habitat diversity and degree of interspersion of various habitat types (desirable habitat types), the greater the variety of wildlife there will be using an area. Many factors influence how valuable a certain area is for wildlife habitat including size, habitat types and qualities, location, degree of isolation, diversity within a habitat type and productivity of the habitats.

This site provides wildlife habitat for a wide variety of species, due mainly to the mix of wetland type and woodland type habitat and the fact that the site is surrounded by undeveloped land which provides wildlife habitat. The value of any wetland increases if it is connected to a larger wetland complex and protected upland habitat. Wetlands are important in and of themselves, but most species utilizing wetlands also require an area of uplands to use in addition to the wetland. Maintaining the connection between wetlands and upland habitats is of particular importance to certain amphibian species that use woodland pools for breeding and then migrate hundreds of feet into adjoining uplands to forage. For instance, species like the spring peeper and gray tree frog, which may use some of the wetlands on site, spend much of their non-breeding time in forested uplands.

A wide variety of wildlife species could be expected to use this area to serve all their needs while many more would find it a place to meet some requirements. Species which could utilize an area such as this for some or all of their requirements would include; deer, coyote, red fox, big brown bat, raccoon, weasel and mink; various birds like the American woodcock, ruffed grouse, eastern wild turkey, barred owl, hairy woodpecker, eastern phoebe, eastern wood peewee, scarlet tanager, American Robin, hermit thrush, gray catbird, black-and-white warbler, chestnut sided warbler, American redstart, ovenbird, northern waterthrush, red-eyed vireo, Baltimore oriole, northern cardinal and eastern towhee; and reptiles and amphibians such as wood frog, northern spring peeper, gray tree frog, red-backed salamander and eastern garter snake.

Wildlife species that were observed during the site review were mallard, eastern wild turkey, pileated woodpecker, downy woodpecker, red-bellied woodpecker, yellow-shafted flicker, American goldfinch, black-capped chickadee, white-breasted nuthatch, American robin, wood thrush, tufted titmouse, ruby-crowned kinglet, blue jay, song sparrow, pickerel frog, chipmunk, gray squirrel and woodchuck.

Wetlands

The four wetlands on the site not only differ in habitat type from each other, they also exhibit diversity within each wetland, especially the northern wetland complex. The greater the diversity and interspersion of habitat types, the more valuable the site becomes in terms of wildlife habitat and ecological function.

Wetland #1 is a scrub/shrub wetland that provides excellent food sources in the form of insects, berries from shrubs and poison ivy. Although this is a small wetland, its value increases with its connection to the upland habitats.

Wetland #2 provides evergreen cover and seasonally ponded, providing components that differ from the other wetlands on site. Again, the value of this wetland increases with its connection to the other habitat types.

Wetland #3 contains a diversity of habitat types. The habitat type towards the western portion contains a dense shrub and herbaceous layer with an interrupted canopy. This changes to a muddy habitat with a moderate herbaceous layer, a sparse shrub layer, and a continuous tall tree canopy as you head east. This type of interspersion provides a variety of foraging, nesting and escape opportunities.

Wetland #4, the northeast wetland, is extremely valuable to wildlife. Although most of the wetland complex is not within the property, any impact to the area within the property boundary affects the entire wetland ecosystem. The area within the property boundary is providing food for a large flock of American robins. These birds will overwinter in areas that provide winter food and cover. Mallards, yellow-shafted flickers, downy woodpeckers, red-bellied woodpeckers, golden-crowned kinglets, black-capped chickadees, blue jays, eastern wild turkeys and a song sparrow were also seen in this small portion of the wetland that falls within the property boundary. This section of the wetland is very important because it is connected to the larger wetland complex and to the wooded uplands. The wetland/upland interface provides cover and abundant food in the form of seeds, acorns, berries and invertebrates.

Woodlands

The woodlands on site contain a variety of tree, shrub and herb layers. Each of these layers provides habitat for various birds. For example, the red-eyed vireo feeds on insects in the upper canopy, the black-and-white warbler gleans insects from trees and shrubs in the mid to lower canopy, and the wood thrush forages for insects and worms on the forest floor. In general, the greater the vertical diversity, the greater the bird diversity. Portions of the site with dense hemlock provide nesting habitat for birds such as black-throated green warbler, and winter cover for resident birds. Most of the site is mixed hardwoods and, due to past logging, consists of some early successional habitat. This stage of growth is very important to many wildlife species. The functional evaluation from *Environmental Planning Services* noted that "(t)he nature and extent

of previous development have had a moderate negative impact on the ecological integrity of the site." Logging roads and trails can have a negative impact especially near streams and wetlands. However, logging operations, if performed properly, can have a positive effect on wildlife by providing early successional habitat. Disturbance regimes that produce results similar to logging, have always been a natural process in the landscape, and had maintained the various stages of growth that wildlife species depended upon. This site could continue to recover from past operations, and could be maintained to provide several stages of growth.

Assessment of Impacts to Wildlife

As with any development of an undeveloped area, the impact on wildlife habitat will be negative. As land is developed, there will be an immediate and lasting negative impact on wildlife. The primary impact is the direct loss of habitat due to buildings, roads, driveways, parking areas, walkways, recreational facilities, and other structures. Loss of habitat also occurs where cover is cleared for lawns and landscaping. Additional impact occurs with increased human presence, which could drive out some of the less tolerant species, vehicular traffic and the number of free roaming dogs and cats. Free roaming cats are a major source of mortality to songbirds, and as more and more cats are introduced to the edges of forests that are becoming smaller and smaller, the effect becomes more devastating to the remaining songbird populations. Ground nesting forest birds such as ovenbirds and towhees are highly susceptible to predators. Populations of predators that are adaptable to human induced changes, such as raccoons and skunks, are likely to increase. Starlings and house sparrows, two invasive introduced species, are also adaptable to human activities and are likely to increase in numbers at developed sites. These species outcompete native species, such as chickadees, titmice, woodpeckers, and bluebirds, for nesting sites. Edges that are created by development also attract brown-headed cowbirds that parasitize the nests of birds that may attempt to nest in the remaining habitat patches. Brown-headed cowbirds lay their eggs in the nests of other species. Because the young cowbirds hatch earlier than

the host species and are more demanding of food, they outcompete the other young birds in the nest, which are neglected by their parent.

Construction of the road at the main entrance is very close to Wetland #1. During this construction, siltation into the wetlands is likely to increase, having a negative impact on the ecological functions of the wetland. Once the construction is complete, runoff is likely to increase due to the loss of vegetation at points adjacent to the wetland. This could change the water level regime of the wetlands, affecting the vegetative structure and wildlife species in this wetland. This runoff could also affect water quality if lawn chemicals are used. The continuos disturbance created by the traffic may drive out the less tolerant species using this area. Most of the upland habitat needed by species using the wetland will be eliminated.

Species that use the wooded uplands at this site will be negatively impacted. The pileated woodpecker requires large tracts of woodland or smaller woodlots connected by wooded corridors. This bird would lose foraging trees and possibly nesting trees. Amphibians that may breed in the ephemeral wetlands on site and then migrate to the uplands would also be negatively impacted.

The construction for buildings #3 and #4 and their garages and carports will have the most devastating impact on the wetland complex and its wildlife. Erosion and siltation into the wetland is likely to occur, cover and food will be removed for the wildlife species using this area, the most likely path used by amphibians will be obstructed, and the disturbance to the wetland may drive out the less tolerant species from the wetland complex, not just from the area within the property boundary. Many wetland species are very sensitive to human disturbance.

General Recommendations

In a small but heavily developed and populated state like Connecticut, where available habitat continues to decline on a daily basis, it is critical to maintain and enhance where

possible existing wildlife habitat, and/or reduce the impact at sites where development is occurring.

In planning and constructing a development there are steps that should be considered in order to help minimize adverse impacts on wildlife. **It should be noted that despite these measures, wildlife habitat will increasingly be adversely impacted as the amount of development increases on a site.**

Every measure should be taken to insure that siltation created during and after the construction not enter the wetland. Siltation can seriously degrade several of the functions of a wetland, including that of wildlife habitat. Runoff from the housing development containing chemicals such as fertilizers and pesticides could negatively affect the quality of the wetland for wildlife habitat. Increased or decreased runoff into wetlands after development can change the vegetation makeup of some of these wetlands. Although changes in vegetation makeup do not always result in a loss of habitat value to wildlife, cases where the changes are not directed at improving conditions for wildlife often do result in a such a loss.

1) A buffer of undisturbed vegetation should be left all along the streams and wetlands. A minimum of 100 feet of undisturbed vegetation left between any wetland/brook and any development or disturbance including lawns is recommended. This buffer of vegetation provides some habitat, helps to filter sediment and reduces disturbance to the wetlands. Although a minimum standard recommendation, it helps to preserve some measure of usefulness of the brooks/wetlands complex for wildlife.
2) Great care should be taken to protect the water quality of the wetlands on site and those off site, that could be impacted due to chemical laden runoff. All possible and prudent measures should be taken to limit and restrict the amount of chemicals used in the establishment and maintenance of lawn areas. If water quality is negatively affected, the entire species complex using a wetland, from the

invertebrate life to bird and mammal life, can be negatively impacted, both on and off site.

3) Utilize natural landscaping techniques as much as possible (minimize the amount of lawn and thus the amount of herbicide and chemical runoff) to help reduce habitat impacts.
4) During land clearing, care should be taken to maintain certain forest wildlife requirements:
    1. Conserve and encourage larger mast producing trees (i.e., oaks, hickories, beech). A minimum of five mast producing trees per acre should be maintained, 14 inches dbh (diameter at breast height) or larger.
    2. Leave a minimum of 5 to 7 snags (standing dead trees) per acre to provide for the nesting and foraging needs of various birds and mammals.
    3. Exceptionally tall trees, used by raptors as perching and potential nest sites, should be encouraged.
    4. Trees with native fruit producing vines should be encouraged.
5) Shrubs and trees that produce fruit should be encouraged or can be planted in conjunction with landscaping. Native tree species, or at the minimum, non-invasive non-native species with proven wildlife value should be used when and wherever possible when landscaping.

<u>Specific Recommendations</u>

1) Although any of the proposed development will have a negative impact on wildlife habitat, the Team wildlife biologist strongly recommends at the least to avoid any construction where buildings #3 and #4 are proposed. This area has high wildlife value due to its mast and berry production, its cover and connection to wetland #4. This is also the area that would have the most significant negative impact to wildlife and wetlands.

The entrance road is too close to wetland #1 and should be moved east which may require eliminating the carports for buildings #1 and #2 and moving the parking area up against the buildings.

Aquatic Resources

Site Description

The site proposed for the luxury residential apartment development contains the headwaters of two unnamed watercourses which are tributary to Pogond Brook. The two unnamed watercourses are contained in low to moderate gradient channels approximately 6 feet in top of bank width. Stream substrate is composed of cobble, gravel, coarse sand, and sand silt fines. Dense growths of hardwoods and woody shrubs predominate as riparian vegetation and provide the site's streams with a nearly complete canopy.

Aquatic Resources

The unnamed streams on the site are intermittent in flow and are not anticipated to support viable populations of fish or aquatic invertebrates.

Impacts

As the Avalon at Newtown site does not contain perennial aquatic habitat, the development as proposed is not of site-specific consequence to aquatic resources. However, land use change within the steeply sloped, forested areas of the site, such as that currently proposed, has the potential to adversely impact aquatic habitats and resources found in proximate off-site reaches of both Pogond Brook and Pond Brook should mitigative measures not be implemented. Adverse impacts to aquatic resources commonly associated with development such as Avalon at Newtown include:

- Soil erosion and subsequent sediment transport through increased runoff from unvegetated areas. Excessive erosion, sediment transport, and sediment deposition can degrade both water quality and physical habitat, in turn affecting the resident

fish population. Specifically, excessive siltation has the potential to cause a depletion of oxygen within the water column; disrupt fish respiration and gill function; reduce water depth resulting in a reduction of habitats used by fish for feeding, cover, and spawning; reduce fish egg survival; reduce aquatic insect production; and promote aquatic plant growth.

- Development adjacent to streams often results in the alteration or removal of riparian vegetation. Changes to riparian vegetation can result in a lessened capability of the natural "filtering" effect of vegetation in preventing sediments, nutrients, fertilizers and other non-point source pollutants from upland sources from entry into streams; such non-point source pollutants can degrade habitat and water quality; and decrease the riparian corridor's ability to serve as a "reservoir" storing surplus runoff for gradual release back into the streams during summer and early fall low flow periods.

- An influx of stormwater drainage may cause aquatic habitat degradation due to the release of pollutants from developed areas. Such pollutants include gasoline, oil, heavy metals, road salt, fine silts, and coarse sediments.

- Stormwater runoff from the site can affect stream hydraulics resulting in higher peak flows, more frequent floods, accelerated bank and streambed erosion, lower water quality and a lessened diversity of aquatic habitat and species composition.

- Nutrient enrichment from fertilizer runoff from manicured lawns will stimulate aquatic plant growth. Herbicide runoff from manicured areas may result in fish kills and water quality degradation.

Recommendations

Reportedly, the Avalon at Newtown development site proposed for development contains 4.2 acres of wetlands associated with the two unnamed intermittent tributary streams. The following measures are recommended for incorporation into the design of the project in an effort to mitigate the potential impacts to the off-site habitats and resources found in the Pogond Brook and Pond Brook:

- Maintain, at a minimum, a 50 foot buffer zone of undisturbed habitat adjacent to the two streams onsite. The buffer zone boundaries should be measured from either, (1) the edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of riparian wetlands, the edge of the stream bank based upon bank-full flow conditions. Buffers absorb surface runoff, and the pollutants they may carry, before they enter wetlands or surface waters. Please refer to the documentation in the appendix presenting Fisheries Division policy and position regarding riparian buffers for additional information.

- 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 detention basin and defer such an evaluation to the Environmental Review Team member(s) with such expertise. However, the Division does recommend that the stormwater detention basins be enhanced with a "biofilter" capability to further the system's capacity for nutrient removal.

- Establish comprehensive erosion and sediment control plans with mitigative measures (haybales, silt fence, etc.) to be installed prior to and maintained through all development phases. Land clearing and other disturbance should be kept to a minimum with all disturbed areas being protected from storm events and restabilized in a timely manner.

- Limit liming, fertilizing, and the introduction of chemicals to developed land susceptible to runoff into streams or wetlands.

- Limit regulated activities adjacent to riparian buffer zones to historic low precipitation periods of the year.

Review of Forestry Practices Management Plan

It is very difficult to determine the impact of the proposed harvesting plan without knowing the stocking levels of the forest prior to the harvest, and what the residual forest will look like after the harvest of 72,000 board feet and 114 cords of wood. From the description in the plan, most of the sawtimber is in the 14" or smaller diameter class due to a previous harvest. If this is the case, it is assumed that most, if not all the sawtimber, will be removed during the harvest operation. Without knowing what the site looks like (this Team member was not on site), it is assumed that the residual stocking will be mostly smaller diameter poles with no significant commercial value. This Team member could not determine if the residual poles and saplings will be sufficient to fully stock the site after the harvest.

Under State Statutes, Forest Management Plans can only be prepared by Certified Foresters and there is no indication on the plan submitted that it was prepared by a Certified Forester.

Archaeological Review

A review of the State of Connecticut Archaeological Site Files and Maps shows no known archaeological resources in the project area, or its immediate proximity. However, field review indicates that the topography has areas of steep slopes with several ridges running north/south. The bedrock outcroppings along these ridges could have provided prehistoric Native Americans with opportunities to camp under existing overhangs. Rockshelter sites in the Newtown area have dated to over 5,000 years ago.

The Office of State Archaeology recommends that these bedrock outcrops be surveyed for archaeological resources if extensive blasting is proposed for these areas. Should proposed plans call for these areas to be maintained then no archaeological fieldwork appears warranted. The Office of State Archaeology is prepared to offer any technical assistance in conducting the recommended survey.

Traffic and Access Review

- The site appears to be well laid out for a large complex.

- Sight lines from Mt. Pleasant Road (Route 6) are good (normally, sites this large have multiple access points, but traffic operations will perform adequately enough).

- Mt. Pleasant Road in this area is classified as a Principal Rural Arterial, capable of handling the proposed traffic volume from the new development.

- Site development should be coordinated through the CT DOT District Four Office in Litchfield.

Appendix

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
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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

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.

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.

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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.