JOHN TROST SUBDIVISION

New Fairfield, Connecticut

KING'S MARK ENVIRONMENTAL REVIEW TEAM REPORT

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

Acknowledgments

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.

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Julie Victoria	Wildlife Biologist DEP - Franklin Willdife Management Area (860) 642-7239

I would also like to thank Cheryl Reedy, New Fairfield first selectman, John Wolf, chairman of the Planning & Zoning Commission, Tim Simpkins with the New Fairfield Health Department, Robert Cloutier, the environmental enforcement officer, Peter Tavino, the applicant's engineer, Bob Huttemann, the applicant's consultant and all the area residents for their cooperation and assistance during this environmental review.

Introduction

An environmental review was requested by the New Fairfield First Selectman for the property known as the John Trost Subdivision.

The proposed subdivision consists of 44.7 acres that are to be subdivided into 8 single family house lots. Lots 1 -7 range in size from 2.2 acres to 2.6 acres. Lot 8 is currently 26 acres with the possibility of being subdivided into 2 more lots at a later date by special permit. The property will be accessed from Rocky Hill Road by a new 870' road. The property abuts Pootatuck State Forest on two sides and a five foot public access trail is proposed from the subdivision road to the Forest. All the homes will be served by on-site wells and sewage disposal systems.

The Town has asked for technical assistance to assess the impact of the new subdivision on the drinking water supplies in the surrounding area and the drinking water supply of the subdivision itself. Many residents living in the vicinity of this site have experienced significant problems with their wells regarding yield, and they are very concerned about additional impact from new development.

The Environmental Review Team Process

Through the efforts of the Town of New Fairfield and the King's Mark ERT, this environmental review and report was prepared for the town. This report primarily provides a description of certain on-site natural resources and presents planning, management and land use guidelines. The review process consisted of 4 phases:

1) Inventory of the site's natural resources (collection of data);
2) Assessment of these resources (analysis of data);
3) Identification of resource problem areas, and
4) Presentation of planning, management and land use guidelines.

The data collection phase involved both literature and field research. The ERT field review took place on September 12, 1995. Mapped data or technical reports were also perused, and specific information concerning the property was collected. Being on-site allowed some Team members to verify information and identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Results of this analysis enabled Team members to arrive at an informed assessment of the property's natural resource opportunities and limitations. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

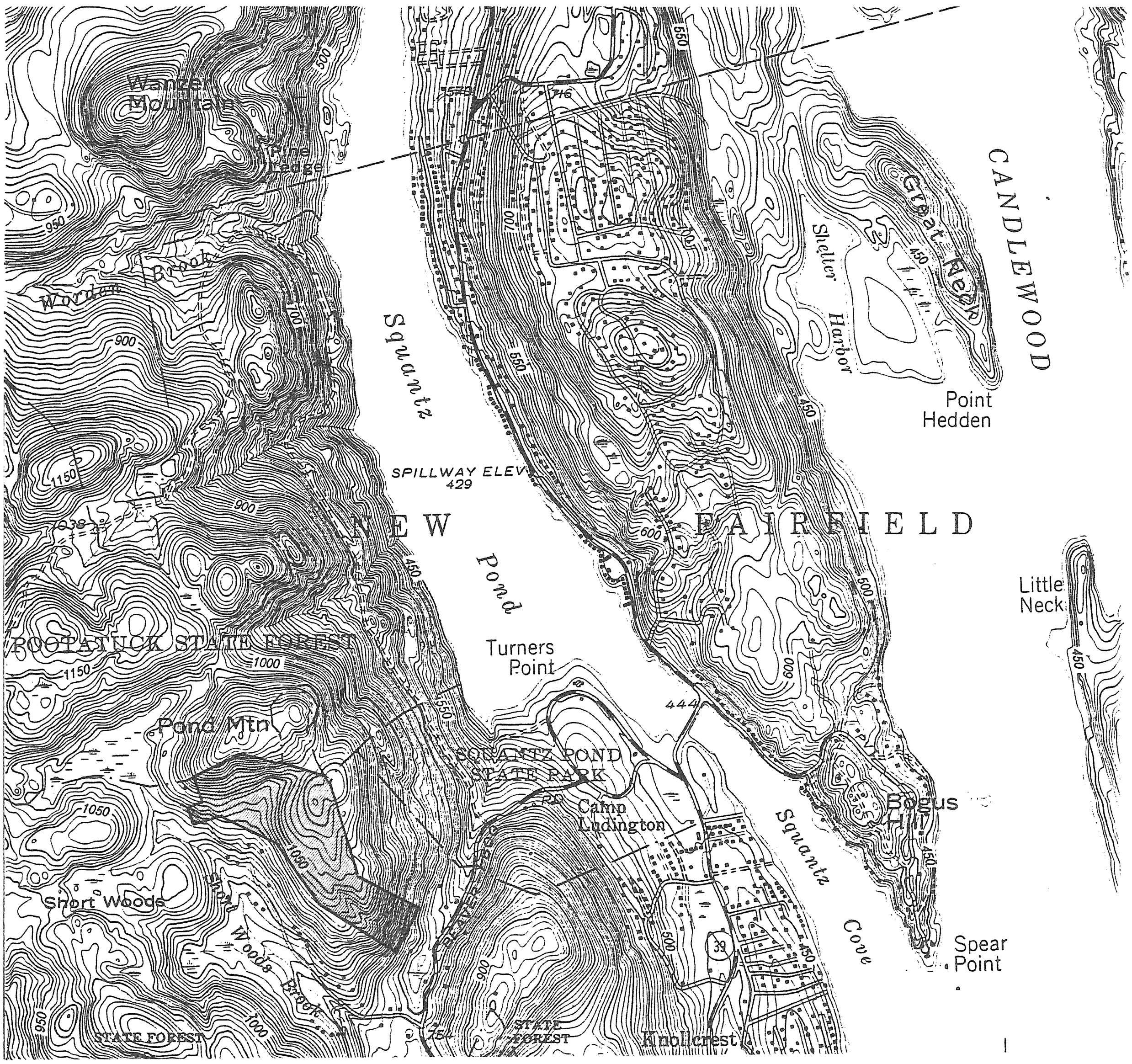
Figure 1

Location Map

N

Scale 1" = 2000

Approximate Site



Hydrogeology of the Fractured Bedrock in the Rocky Hill Road Area

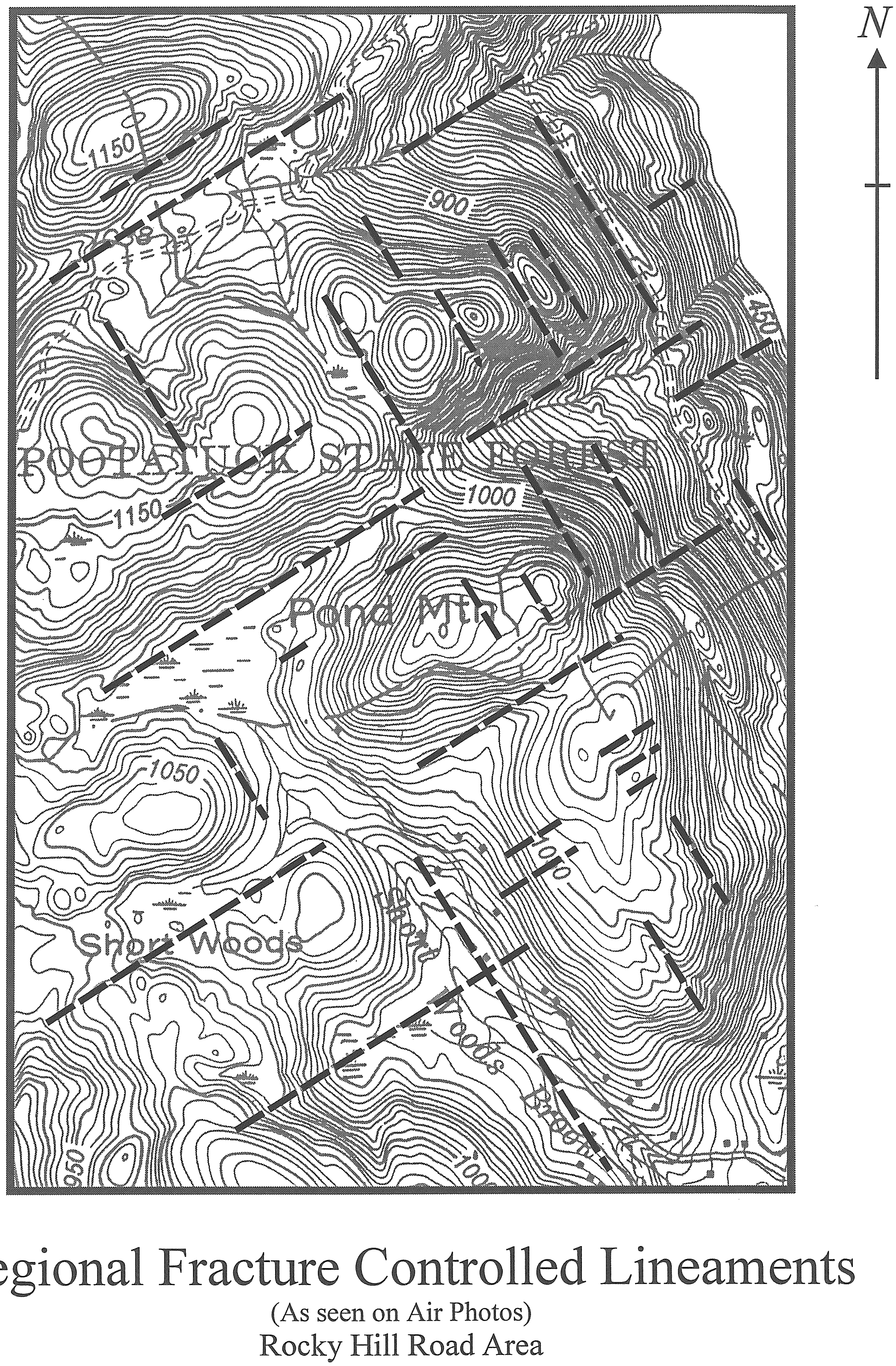
Background

The New Fairfield First Selectman requested the King's Mark Environmental Review Team to assess the potential impact of the proposed Trost Subdivision on the drinking water supply of present and future residents of the Rocky Hill Road area. The Team Geologist examined all information supplied by the town, Peter J. Tavino, the civil engineer for the applicant, the published and open file reports of the Geological and Natural History Survey of Connecticut and the CT-DEP 1990 air photos (13-11-2557 & 2558). In addition a field survey was conducted on September 12, 1995.

Geologic Setting

The area of Rocky Hill Road is underlain by a very distinctive homogeneous, pink colored, coarse-grained foliated augen granite. The rock consists of inch-sized ellipsoidal crystals (augens) of microcline feldspar (45% by volume) embedded in a finer grained matrix of quartz (35%), biotite mica (16%) and hornblende (4%). Although the geology of the area west of Candlewood Lake in the New Milford Quadrangle has never been mapped in detail, the Rocky Hill Road granite extends into the Danbury Quadrangle where it was named and described as the *"Danbury Augen Granite"* by J.W. Clarke in 1958 (CT Quadrangle Report No. 7; The Bedrock Geology of the Danbury Quadrangle). Although well foliated (foliation oriented at about 340°/90°) the granite rarely splits along its foliation. The dominant vertical fractures seen in the field are spaced at about 5 foot intervals and oriented at roughly 060° and 150°. Both sets are somewhat discontinuous, extending perhaps 15-20 feet between 1 to 2 inch en-echelon offsets. The 060° fractures consistently offset to the Northwest and the 150° set to the East. The edges of 060° fractures are iron stained and filled with a half millimeter thick deposit of iron oxides (?). The 150° fractures are unstained and seem much "tighter", averaging perhaps only 0.2 millimeter wide. Perhaps this staining and fracture filling is related to pre-glacial weathering; if so, the fractures are probably open at depth even though the upper few feet is quite impermeable. Sheeting joints spaced at 1 to 5 feet are also well developed in the upper 50 to 100 feet. Such fractures form roughly parallel to the topographic surface as the weight of the overlying rock is removed by slow erosion. In New England these fractures seem to parallel the pre-glacial topography as they intersect the hillsides of valleys deepened by the most recent glaciation. (See Jahns, R.H., 1943, Sheet structure in granites: its origin and use as a measure of glacial erosion in New England. Journal of Geology,v.51, 2, 71-98). It is the combination of the widely spaced orthogonal vertical joints and the near horizontal sheeting joints that produce the huge rectangular granite slabs that seem to "pave" the barren hilltops overlooking Rocky Hill Road. The regularity and homogeneity of the orthogonal vertical fractures is strikingly evident on air photos of the area. Cliff scarps, steepsided gullies and outcrop edges define a conspicuous system of "lineaments" aligned at 060° and 150°. (Figure 2)

The 1:125,000 1985 Bedrock Geologic Map of Connecticut shows contact between the Augen Granite and an Amphibolite following the course of Shortwoods Brook. The map is in error. Based on outcrops examined during



Regional Fracture Controlled Lineaments

(As seen on Air Photos)
Rocky Hill Road Area
New Fairfield, CT

1000 Feet

Figure 2

the ERT field visit, the actual contact must run a thousand feet or more further west. The Laurelwood development is underlain by Augen Granite. The boundary has hydrogeologic significance as the amphibolite is much more intensely and more randomly fractured than the granite. Development in areas underlain by amphibolite would not be plagued by the water supply problems experienced by Rocky Hill Road residents.

The surficial geology of the area is relatively simple as there is only a very thin (0 to 10 feet) veneer of unconsolidated material covering the bedrock. An open file report classifies the material as undifferentiated till. Exposures and excavations in the Trost Subdivision suggest that the till is more bouldery and permeable than normal. The lack of fines seems related to the lack of fractures in the bedrock. Although large slabs were easily plucked, the ice failed to break the large granite blocks into smaller fragments. Most of the fines were probably washed into the open spaces between the large boulders during the melting of the overlying ice.

Conclusions and Recommendations

Although of considerable frustration and concern the difficulties the residents of the Rocky Hill Road have obtaining adequate water supplies from their bedrock wells are understandable in view of the local bedrock geology. Similar problems are expected wherever and whenever wells are drilled into the Augen Granite. Such predictability is unusual in the hydrology of fractured rock aquifers where surprises are the rule. In Connecticut, water bearing fractures are generally randomly oriented and spaced on a scale of feet to inches. Although it is difficult to impossible to predict well yield with any accuracy,

Water Bearing Fractures in Bedrock in the Rocky Hill Road Area

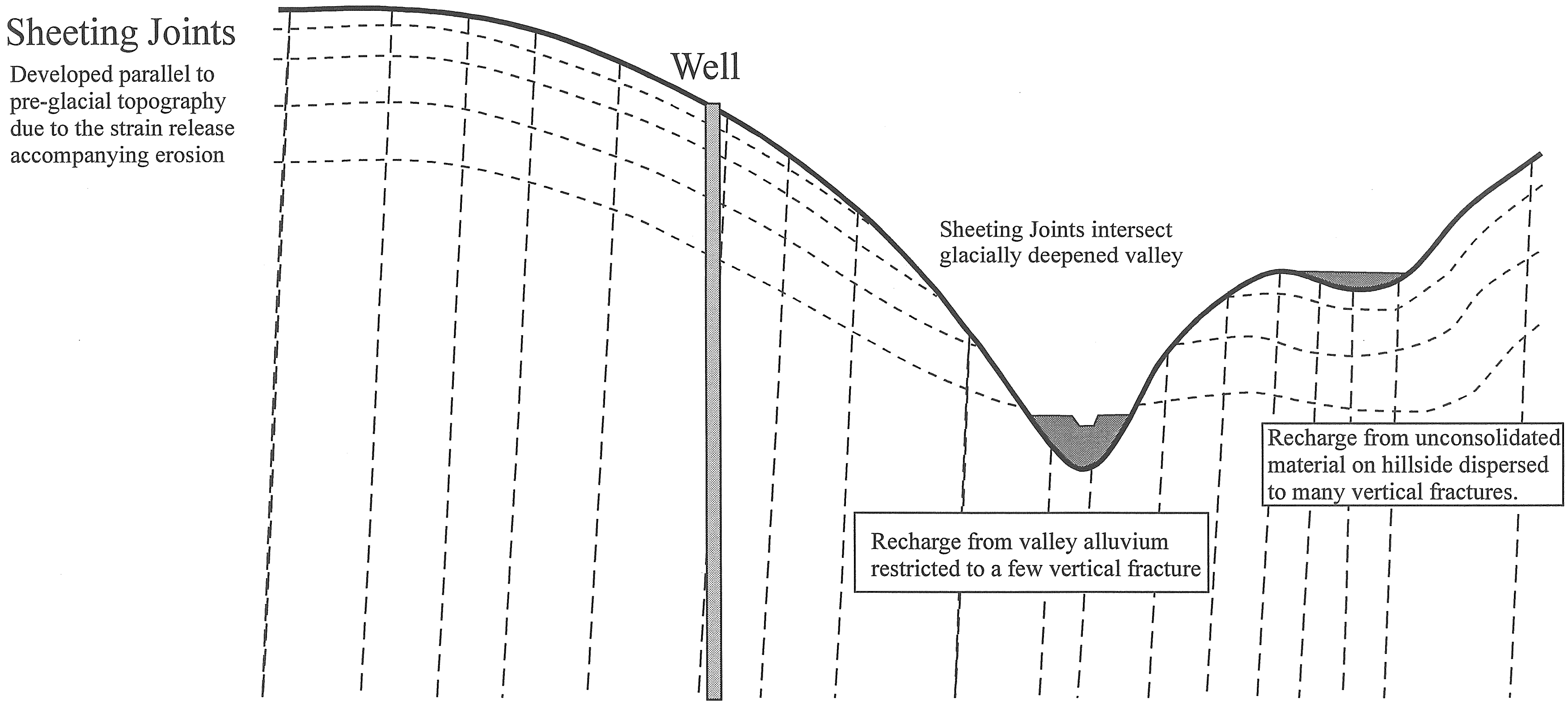


Figure 3

with a fracture density greater than one per foot, a 400-500 foot vertical well is almost guaranteed to intersect enough water bearing cracks to supply sufficient water for a single family dwelling. The granite bedrock in the Rocky Hill Road area is quite different. (See Figure 3) The deep fractures are nearly vertical, spaced 5 to 10 feet apart and oriented in two well defined directions: 060° or 150° degrees from North. Near the surface, sub-horizontal sheeting joints are spaced 2 to 4 feet apart, but the number of such joints should die out quickly downward and are probably totally absent at depths greater than 50 to 100 feet. The amount of water stored in the fracture network is thus at least an order of magnitude lower than normal. In spite of the low density of fractures the amount of water stored in cracks at depth is still substantial. Based on the spacing (approximately 5 feet) and widths (approximately 0.5 millimeters, if not iron oxide filled at depth) of the vertical fractures observed in the roadcuts and outcrops on Laurelwood Drive just west of Rocky Hill Road simple "back of the envelope"-type calculations suggest that nearly 15,000 gallons of water is stored in fractured bedrock within a 100 foot radius of a 500 foot deep well. The real problem is to get the water to the well. Although the fracture density may be only 1/10th of normal Connecticut bedrock, the absence of deep horizontal fractures in the Rocky Hill Road area reduces the horizontal flow of water by a factor of at least 100. Using water table gradients expected along Rocky Hill Road simple calculations demonstrate that a single vertical well could yield something of the order of 0.5 gallons per minute. The fact that probably explains most of the water problems on Rocky Hill Road is that a vertical well cannot intersect a large number of fractures. With fractures spaced 5 to 10 feet apart the best that can be hoped for is to intersect one! Even hydrofracturing is a gamble. With only one or two fractures to work with, its effectiveness will be entirely dependent on how close the nearest blind fracture

The Utility of Hydrofracturing in the Rocky Hill Area

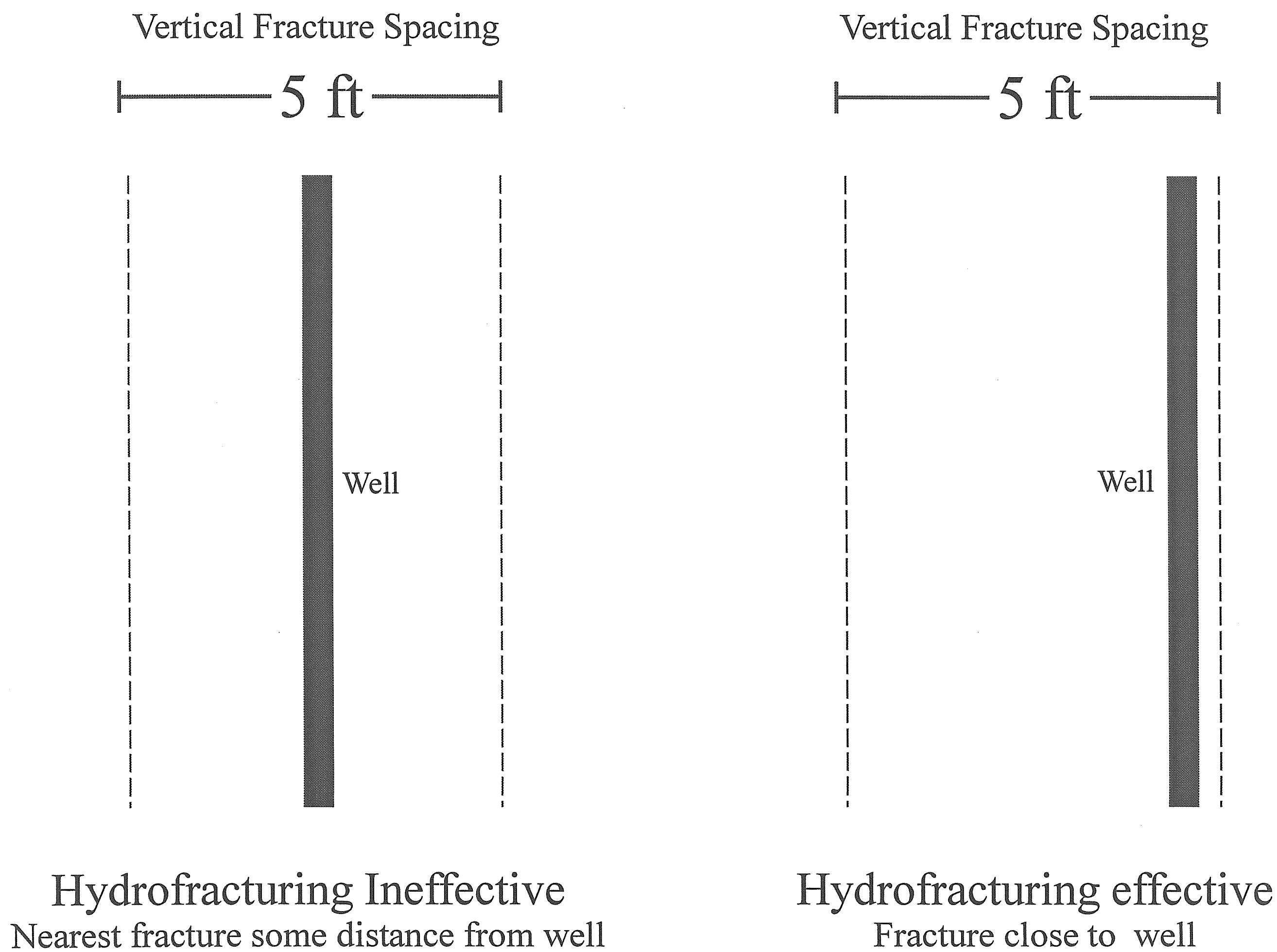


Figure 4

is to the edge of the well. (Figure 4) The only workable strategy to increase the number of fractures intersected would be to drill directionally; preferably vertically to about 50-100 feet and then horizontally in the direction about 125°. (Figure 5)

Given the virtual absence of horizontal fractures and the low horizontal hydraulic conductivity that implies, it seems unlikely that wells spaced 200 to 400 feet apart would ever adversely affect one another. However, there are two situations where some interference might be seen. If the water table is high, the near surface sheeting joints could significantly enhance the horizontal connection between nearby wells. However, once the water table drops below open sheeting joints the wells would become effectively isolated from one another. Although unlikely, it is possible that two wells, a hundred feet or so apart, might intersect the **same** water bearing fracture. If heavily pumped they certainly could affect one another. However, as we know the orientation of the producing fractures, that possibility can be virtually eliminated if the new wells are sited intelligently. (See Figure 6)

Recharge of the groundwater system is another problem. The near surface sheeting joints roughly parallel the topography and probably play an important role in distributing water to the network of vertical fractures, especially when the groundwater table is high. However, glacial erosion has deepened some of the valleys and cut down below the level of well developed sheeting fractures. As a result many of the horizontal joints that crop out on the hillsides where a fair portion of the potential recharge is returned to the surface. Most of the hillsides are blanketed by a very thin veneer of bouldery ablation till which provides a very limited temporary storage for rainwater recharging the fracture

Optimal Well Design
Rocky Hill Road

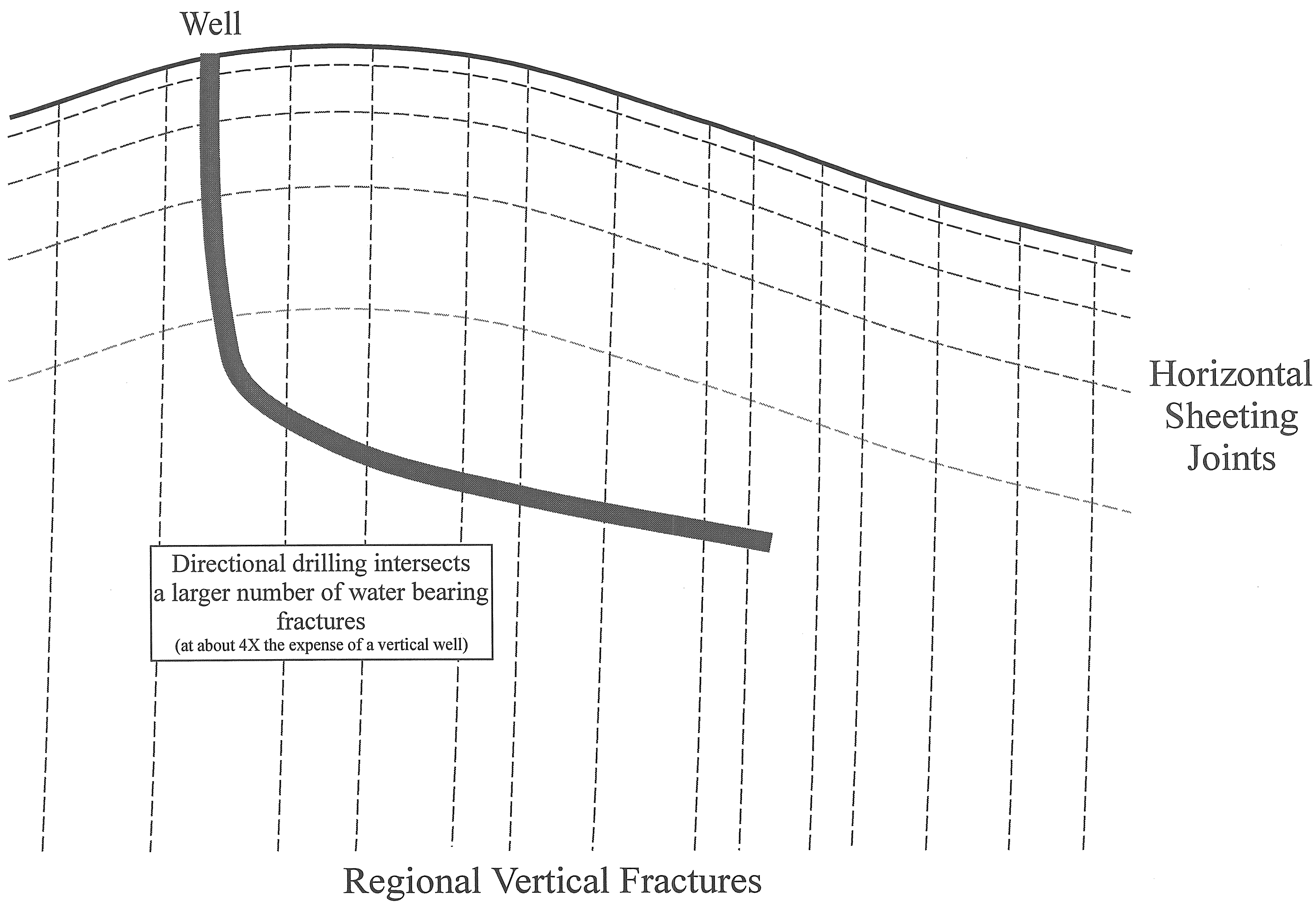
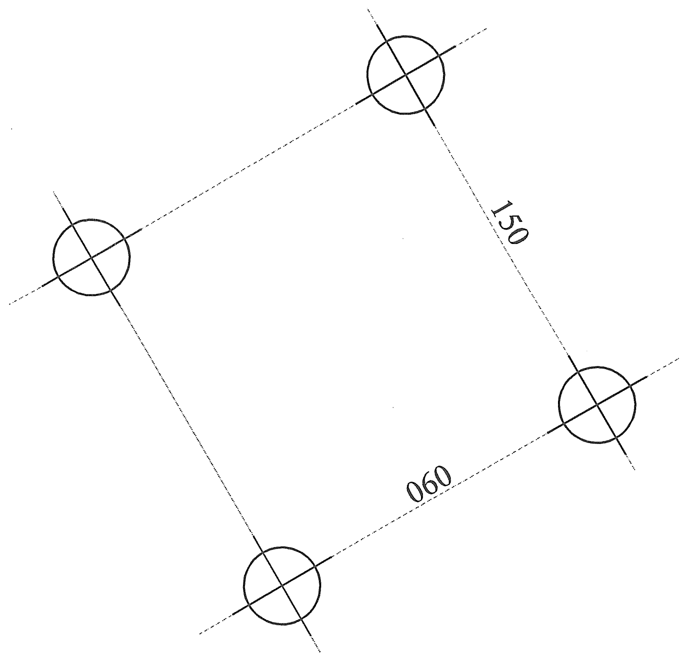
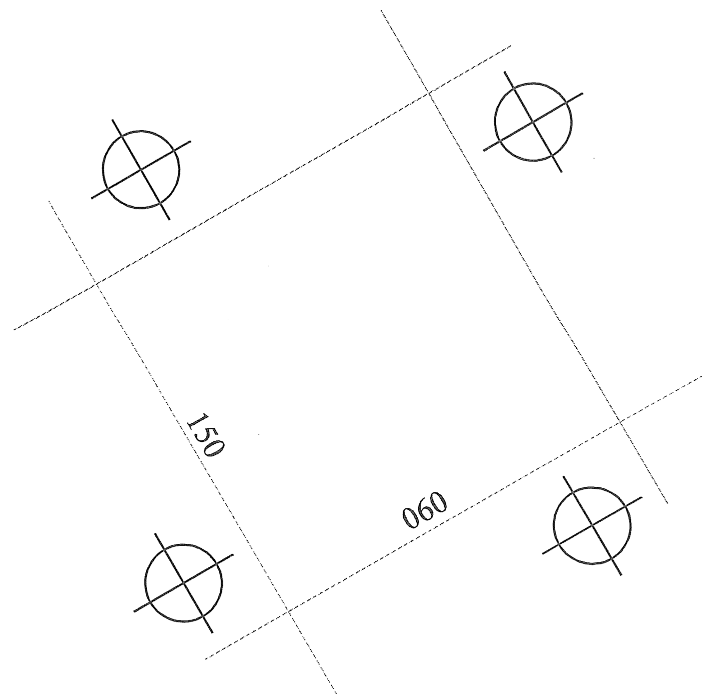


Figure 5

Siting of Wells Relative to regional Fracture Trends



Poor



Optimal

Figure 6

system. Thicker accumulations of this bouldery till are found in the lee (down ice direction) of South facing glacially plucked cliffs. The proposed Trost Subdivision is sited in one such area. As the area probably plays an important role in the regional groundwater recharge, it would be prudent to minimize any disturbance to the drainage and surface properties on the site. It is interesting to note that alluvium along Shortwoods Brook, although saturated for a seasonally longer period probably contributes less to the recharge of the groundwater system than the thicker areas of ablation till on the hillside due to the absence of sheeting joints in the glacially incised valley. Only a few of the vertical joints would be fed directly by the saturated alluvium. With no horizontal fractures to efficiently carry this water to distant fractures, much of the potential recharge is carried off by the brook. (Figure 2)

As the thick overburden in the Trost Subdivision is the site of enhanced recharge to the groundwater fracture system careful attention should be paid to the design of the septic systems for the development. Strict adherence to the Public Health Code will ensure that that septic systems are designed correctly and it is the town sanitarian's job to make sure that they are properly installed. Provided that the septic systems are properly designed and installed, septic system wastewater recharging the local groundwater should be suitably renovated and available for recharge to the bedrock aquifer.

One other point may be of interest to the town. An irregular 10 foot long vertical "crack" in an outcrop 100 feet from the roadcut on Laurelwood Drive was observed. As the fracture offset the glacially polished surface of the outcrop it had to have been post-glacial. It is strongly suspected that blasting for the roadcut produced the "crack" which appears to be restricted to a 2 foot thick slab bounded by the sheeting joints. This observation provides a basis for anticipating possible consequences of blasting during construction of the road proposed in the Trost Subdivision plan. Apparently the near horizontal slabs bounded by the sheeting joints can act as waveguides for the seismic energy generated by blasting. This effect would keep much of the energy released by blasting close to the surface. It is unlikely that deep wells would be impacted. On the other hand one would have to be more concerned about near surface effects such as foundation and driveway cracks even a hundred feet or so from a blast site! This underscores the need for a pre-blast survey to ensure that house foundations, neighboring bedrock wells and driveways are protected.

Soil Resources

Soils and Topography

There are three (3) principle soil types found on the property:

- HrE (Hollis-Rock Outcrop-Charlton complex, 15 to 45 percent slope)
- HpC (Hollis-Charlton-Rock Outcrop complex, 3 to 15 percent slope)
- CnC (Charlton extremely stony fine sandy loam, 3 to 15 percent slope)

The descriptions of these soils follow at the end of this section of the report.

The eight (8) proposed house lots along with driveways, septic leach fields, wells and potential swimming pools/tennis courts are all sited on the steeper HrE complex on 20 to 35 percent slopes. This soil type is rated severe for building because of steep slopes requiring extensive cuts and fills, boulders and bedrock, and the difficulty with re-stabilizing disturbed slope areas. (The soils report prepared for the developer indicates that houses will be built on the less steep 3 to 15 percent land.) The HrE soil is well drained to excessively well drained. Although the site plans show some cutting and filling, they do not show the extent of necessary slope cuts and fills. That is, the limit of lot disturbance required is not shown on the plans. It is these areas of disturbance (which are now stable natural ground) that can impact the seasonal watercourse below. Implementation of erosion control measures on each lot will be very important to minimize impact. This soil complex does contain areas where bedrock is close to the ground surface or even exposed. Does it matter to the town or the future lot buyer if house foundation sites may need to be blasted out of the steep slopes? The town may wish to consider amending their regulations to preclude future building on land sloping in excess of 25 percent or to require a minimum buildable area that is less than 25 percent slope. Some towns already have such restrictions.

Drainage

Runoff from the new road and lots as they are developed is directed into the road drainage catch basins and culverts and also to the fifty (50) foot wide greenbelt/buffer area. A thorough drainage analysis has been prepared. Again, as with development of the building lots, minimizing disturbance of stable natural areas, especially where seasonal storm runoff flows, will be important to lessen downhill impact. Installation of driveways, culverts, catch basins, and related disturbance will best be done quickly, and at the driest seasonal times. Driveways installed, across the greenbelt/buffer, to Lots 7 and 8 will impact the natural drainageway. The culverts will need to be stabilized. If the town wishes to require an undisturbed greenbelt/buffer then driveways should not cross it. It might be possible to combine the driveways to Lots 7 and 8 with only one crossing.

Erosion Control

It is understood that Peter Tavino, P.E. will have the responsibility for the installation of erosion control measures when the road is installed. Also, that he will have oversight responsibilities for individual lots developed. This review and inspection is critical to minimizing impact for sedimentation in drainageways and other undisturbed areas. A review of the control plan prepared shows attention to details, but it is important to remember that implementation of the control measures is what will count. The town should allow no disturbed areas to be left unmulched or otherwise unstabilized heading into winter months. This is important for the future development of lots, as well as for the road.

Soils Descriptions

HrE - Hollis-Rock Outcrop - Charlton Complex, 15 to 45 Percent Slopes

This complex consists of moderately steep to steep, somewhat excessively drained and well drained soils and areas of exposed bedrock. The soils of this complex formed in loamy glacial till. They are in long and narrow or irregularly shaped areas and on hills and ridges of glacial till uplands. Depth to bedrock varies from less than 20 inches to more than 60 inches below the surface. Stones and boulders cover 8 to 25 percent of the surface, which is marked by narrow, intermittent drainageways and a few small, wet depressions. These soils and the exposed rock are in such a complex pattern that it was not practical to map them separately. The water table in this complex is commonly below a depth of 6 feet. Permeability is moderate or moderately rapid in the surface, subsoil and substratum. Surface runoff is rapid and the available water capacity is very low or low in the Hollis soils and moderate in the Charlton soils.

These soils are well suited to community development in areas of the deeper soil. They are not suited to community development where there are shallow depths to bedrock, rock outcrops or in areas where slope exceeds 25 percent.

HpC - Hollis - Charlton -Rock Outcrop Complex, 3 to 15 Percent Slopes

This complex consists of gently sloping, somewhat excessively drained and well drained soils and areas of exposed bedrock. The soils of this complex formed in loamy glacial till. They are in long and narrow or irregularly shaped areas and on hills and ridges of glacial till uplands. Depth to bedrock varies from less than 20 inches to more than 60 inches below the surface. Stones and boulders cover 8 to 25 percent of the surface, which is marked by narrow, intermittent drainageways and a few small, wet depressions. These soils and the exposed rock are in such a complex pattern that it was not practical to map them separately. The water table in this complex is commonly below a depth of 6 feet. Permeability is moderate or moderately rapid in the surface, subsoil and substratum. Surface runoff is medium to rapid and the available water capacity is very low or low in the Hollis soils and moderate in the Charlton soils.

These soils are well suited to community development in areas of the deeper soil. They are not suited where there are shallow depths to bedrock and rock outcrops.

CnC - Charlton Extremely Stony Fine Sandy Loam, 3 to 15 Percent Slopes

This map unit consists of gently sloping to sloping well drained soils. The Canton soil formed in sandy deposits over friable sandy gravelly till and the Charlton soil formed in friable loamy till. It is on the side slopes of upland hills and ridges. Stones cover 10 to 35 percent of the surface. Bedrock is commonly more than 60 inches below the surface. The water table is commonly below a depth of six feet. The permeability of the Canton soils is moderately rapid in the surface layer and subsoil, and rapid in the substratum. The permeability of the Charlton soils is moderate or moderately rapid throughout. Surface runoff is medium to rapid, and the available water capacity is moderate.

These soils are well suited to community development.

Figure 7

Soils Map

N

Scale 1" = 1320'

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files have been reviewed regarding the area known as the John Trost Subdivision. 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. However, according to our records a State Threatened salamander *Plethodon glutinosus* (Slimy Salamander) does occur in very close proximity to this project. Please note an on site inspection of this area was not made nor have any detailed plans been reviewed.

In Connecticut slimy salamanders are found under rotting logs and forest leaf litter in moist, mature mixed hardwood forests with a dense canopy. However, slimy salamanders are extremely difficult to find and with the dry weather experienced this summer they are probably buried very deep. Slimy salamanders probably occur in scattered patches throughout this vicinity where there are ridges with mature trees and a heavy layer of duff. It is suggested that if the homes in the subdivision can be grouped together leaving a contiguous area of mature forest and young second growth forest that this area would serve as a buffer zone. As the buffer zones mature, they may provide additional habitat. If you need more information about this species please feel free to contact Julie Victoria, DEP, Franklin Wildlife Management Area, (860) 642-7239.

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 Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be 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.

Please contact (860)424-3592 if you have any questions concerning the Natural Diversity Data Base. Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Forestry

The site is completely wooded, with 80 - 100 year old trees dominating the forest. The overstory species on the lower slopes are red oak, chestnut oak, beech, and sugar maple, with striped maple, red maple, and black birch comprising the understory. Sections of the lower slope were logged in the mid-1980's, resulting in dense thickets of black birch and striped maple saplings that seeded into the openings created when the timber was cut. The upper slopes are drier and have a great deal of surface boulders. Dominant trees are chestnut oak and hickory, with shadblow, red maple, and mountain laurel in the understory.

If the subdivision is approved, a great deal of excavation will be necessary to develop the site. Inevitably this means the destruction of many trees. However, it is desirable to save as many trees as possible and to protect them during construction so that they survive long after the machines have left. A brochure entitled, "Protecting Shade Trees During Home Construction" is included in this section. Basically some trees on each lot will be worth protecting, and some will not. A qualified professional, such as a forester, should look at the site plans and the trees on each lot and determine which should be removed and which should stay, and establish an effective protection for them.

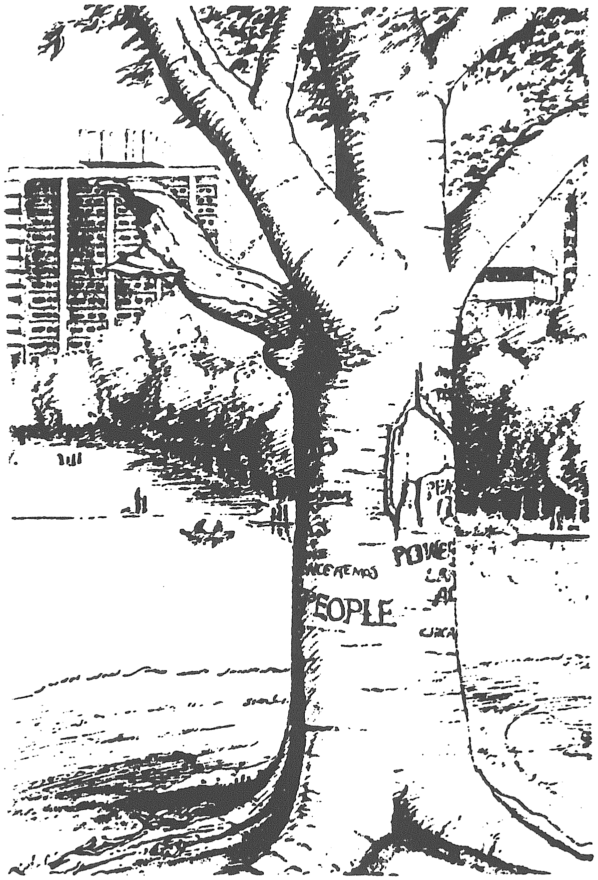
Some factors to consider are species, location, size, age and health. All too often well-intentioned builders leave trees in newly created yards, only for the trees to die a few years later because of fill placed over the roots or by cutting roots to install utilities.

Once it has been decided which trees to save, they must be protected by not allowing construction equipment to damage them by compacting the soil or physically wounding the trunks, branches, or roots. A tree's roots extend beyond the branches, so at a minimum, a barricade such as a snow fence should be erected around the drip line of each tree to be protected.

If trees are planted, use a variety of species that would do well in the conditions found on the site. It is recommended that native species be used such as red oak, red maple, and shadblow (tree form). These are readily available from Connecticut nurseries.

The 5' easement into the State Forest is a good idea to allow access for the public for recreational use, and DEP personnel for maintenance (e.g. boundary marking, forest fire suppression). However, it should be well defined on the ground and located so that it is actually feasible to use (for example, does not run directly into a steep ledge).

WHAT'S WRONG WITH THIS PICTURE?



Yankee Forest
COOPERATIVE PROJECT
P.O. Box 760 Chepachet, RI 02814

A Cooperative Natural Resource Management Agreement

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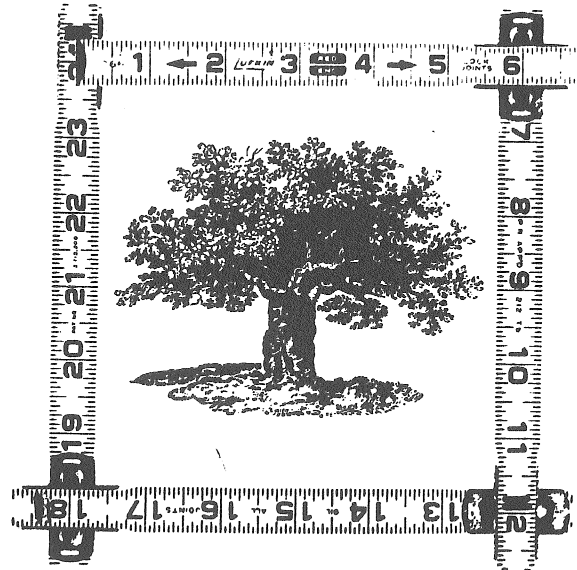
USDA Forest Service,
Northeastern Area
State & Private Forestry

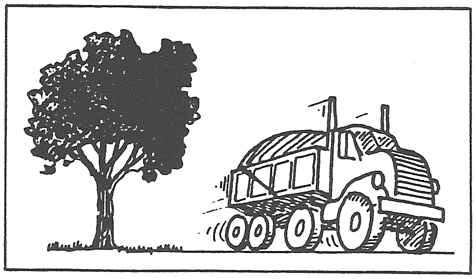
PROTECTING SHADE TREES DURING HOME CONSTRUCTION



PROTECTING SHADE TREES DURING HOME CONSTRUCTION

Should trees be removed from residential property before home construction or should they be saved?

Shade trees can add thousands of dollars to the value of residential property -- yet developers and home building contractors often remove them before starting construction. It's a known fact that saving trees can increase a developer's profit margin. Site preparation, landscaping and maintenance costs can be lower, and by saving existing trees one will increase the value -- and selling price -- of the property. Sound environmental planning is good for a developer's public image as well.



Many trees can be saved with little effort or expense; many are valuable enough to justify considerable effort and expense in protecting them. Besides, saving trees can mean savings on . . .

- Tree removal costs: escalating costs of fuel, labor and machinery make site preparation economy a necessity; leaving solid areas of native vegetation, with only minimal clearing, is especially economical.
- **Landscaping costs:** leaving trees can reduce expensive grading, planting, and follow up watering and maintenance.
- **Maintenance of unsold areas:** remember, landscaping and lawns require constant care.
- **Installation costs of drainage systems:** utilizing natural drainage patterns, leaving natural vegetation in place along streams, ponds and swampy areas can eliminate expensive site work to handle runoff and retention requirements. Where allowable and feasible, sheet drainage -- using wide right-of-way in a natural state to absorb runoff from streets, etc. -- is cheaper, more attractive, and requires less maintenance than curb and gutter installation.

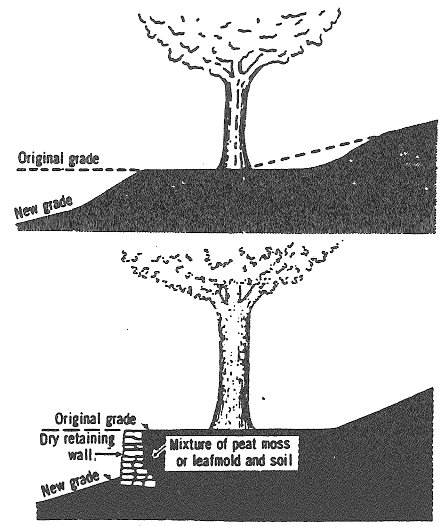
Saving established, healthy, well developed trees on construction sites will also increase consumer demand for the property, lower energy consumption for heating and cooling costs, create quieter and more private living conditions, and improve the environmental quality of the area following construction.

IS THE TREE WORTH SAVING?

Some trees may be worth less than realized by the average homeowner and may not warrant the time, effort, and expense of attempting to protect them. One must evaluate each tree carefully by considering its location, type of tree or species, age, and condition. One must also consider what type of protection will be necessary to save the tree, how much work it will involve and how much it will cost.

Whatever the size and scope of the development, to make the most of what you have it pays to bring in a professional, qualified arborist, urban forester, environmental planner, or landscape architect who knows and understands trees. This professional should be able to determine:

- which trees are desirable, healthy, which need pruning or removal.
- which will survive anticipated changes in grade, drainage, etc. and how to accomplish these changes.
- which trees should be removed from near buildings, weak root systems make trees prone to wind throw, invasive roots cause problems with sewer lines, shallow roots may upheave driveways, sidewalks, etc.
- which trees are relatively pest and disease resistant, and those that cause major problems in this respect.
- which areas of the site, from the standpoint of economy, ecology and beauty, would best be left natural or minimally cleared.
- how to protect single trees, groups of trees, or natural areas of vegetation before, during and after construction.
- where and what trees should be planted, or transplanted, and how to do it.
- whether you can market trees that must be removed for timber, firewood, etc.



A retaining wall protects a tree from a lowered grade.

More severe grade changes will require you to supply air to the roots of the tree. This is usually done by installing drainage tiles and constructing a drywell under the spread of the tree before gravel and porous fill is added. The tiles are laid on the original grade; they form a wagon wheel shape with the spokes of the wheel opening into a dry well built around the tree trunk. The dry well acts as the hub of the tile system and holds fill away from the tree trunk.

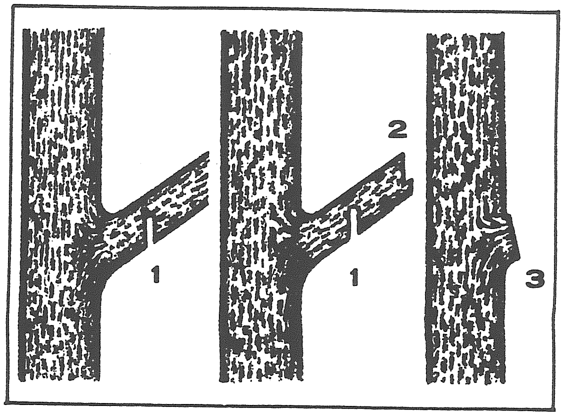
It may also be necessary to place a series of bell tiles vertically over the roots and connected to the wagon wheel system to allow for additional air and water circulation.

For shallow fills, the fill material may be gently sloped down to the level of tree roots, leaving the tree in a depression larger than the spread of its crown.

Deep grade lowering around a tree or group of trees means building a retaining wall at a sufficient distance from the trunk to save most of the roots -- out at the dripline should be adequate.

For shallow grade lowering, the soil may be sloped gently away from the tree roots down to the level desired, leaving the tree on a sort of island a bit larger than the dripline.

Proper tree maintenance including watering, soil aeration, pruning or thinning of the crown to compensate for root injury, wound treatment and fertilization will help trees survive grade changes.



To prevent splitting wood and stripping bark on large limbs, make the first cut part way through from below (1.) Cut off the limb from above (2.) Remove stub with a smooth cut (3.)

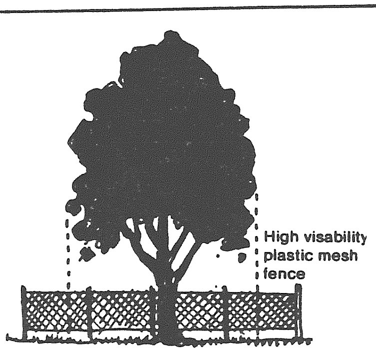
* **Transplanting existing plant materials:** with modern tree moving equipment, it may be possible to move especially desirable native trees and shrubs from construction sites to other locations in the landscape. when selecting native trees for transplanting, choose those that are healthy, young, vigorous specimens of species that move successfully. It is important to get professional advice on all aspects of tree protection during construction!

* **Adding new trees to the construction site:** after all site changes have been completed the final stage of the construction plan may be to add new trees and shrubs to the landscape. Proper plant selection for particular sites is of utmost importance. Select plant materials that will be assets as they mature instead of liabilities. Carefully consider the growing conditions, diversity of plant materials in the area, insect and disease resistance of plant materials and maintenance requirements. Be sure new trees and shrubs are properly planted and watered when necessary.

WHY IS PROTECTION NECESSARY?

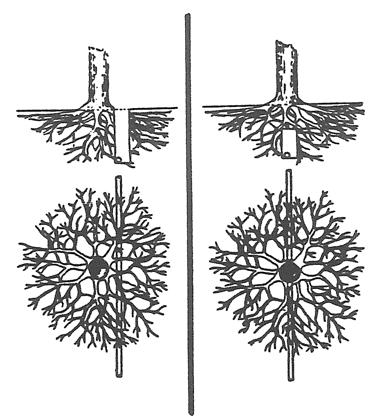
Once the decision has been made to save certain trees on the construction site they must be protected from one or more of the following:

* **Construction equipment and machinery:** impact injuries from heavy equipment like trucks, bulldozers, etc; cutting of roots, soil compaction over roots, wounds to trunk, roots, and low-hanging branches.
- all are hazards that can be avoided. Areas of vegetation, single trees, or groups of trees should be fenced with **barricades.** These should be:
- large enough to include everything inside the spread of the branches or dripline of the tree.
- constructed of sturdy scrap wood (4 X 4 or 2 X 4 stock is ideal).



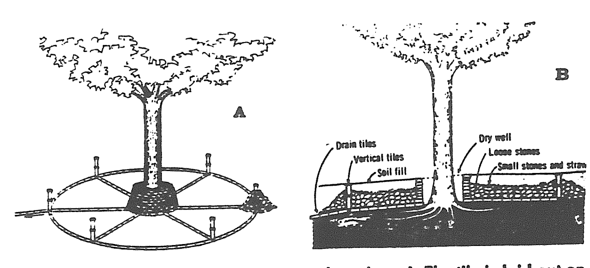
* **Chemical poisoning:** run off from washing down equipment, petroleum products, lime and mortar, misuse (including overuse) of fertilizers, insecticides, herbicides or soil sterilands; residue of chemicals like calcium chloride used to keep down dust on dirt roads -- all can harm or kill trees. Such dangers can be avoided by keeping the area within the dripline of trees free of building materials and run off; by seeing that chemicals are used only by trained personnel and strictly according to directions, and by having closely controlled disposal of excess chemical materials. Preferably off the site.

* **Excavations:** trenching for utility lines, etc., can remove vital tree roots, change drainage patterns. Where possible, trenches should be routed away from trees and outside the dripline. If this is impossible, the next best approach is tunneling under roots, using a power driven soil auger. Tunneling should be offset to one side of the truck to protect major roots. Excavations should be filled immediately, leaving no air pockets.



Tunnel beneath root systems. Drawings at left show trenching that would probably kill the tree. Drawings at right show how tunneling under the tree will preserve many of the important, feeder roots.

* **Grade Changes:** there are two types of grade changes that can be detrimental to tree health. One is raising the grade; the other is lowering it. Tree roots need air, water, and minerals to survive. When the grade level is changed by removing soil from the top of roots or by adding soil or filling over the top of roots, the tree has difficulty obtaining its normal amount of air, water, or minerals. Cutting away or smothering of tree roots affects their water and oxygen supply, often with fatal results. A light fill up to 4 inches of porous gravelly material or good topsoil high in organic matter and loamy in texture usually does little harm to healthy trees.



A tile system protects a tree from a raised grade. *A,* The tile is laid out on the original grade, leading from a dry well around the tree trunk. *B,* The tile system is covered with small stones to allow air to circulate over the root area.

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.