



Minuteman West Bikeway

# Rail to Trail



**Supplemental to the Feasibility Study**

**Submitted to**  
**Town of Bedford**

**Submitted by**  
*Vanasse Hangen Brustlin, Inc.* 

**November 14, 2008**

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## Scope and Purpose

This document is a supplement to the previous West Bedford Bikepath Feasibility Study dated November 2005. The purpose of this Feasibility Study Supplement is to provide additional information on several aspects of the proposed West Bedford Bikepath (now called the Minute Man West Bikepath) including:

- Path surface treatment options including constructability and maintenance requirements and costs
- Cross sectional width options and anticipated impacts
- Funding options and requirements

The scope will include a field review by VHB staff to obtain critical measurements and dimensions of the existing rail bed and GPS data on the specific locations of the measured sections.

Rail-trail shared-use paths have grown in popularity and much has been learned regarding the operations and maintenance of these facilities. Additional information regarding the operation and maintenance requirements of shared-use path has been included with this document.

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## Trail Surface Treatment Options

The town has requested consideration of various trail surfaces including hot mix asphalt, stabilized soil, stone dust and gravel. Factors to be considered include ADA compliance, construction requirements, durability/maintenance requirements and costs, initial construction cost and eligibility for funding.

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## General Evaluation

VHB staff has recently visited numerous trails throughout New England with both paved and unpaved surfaces and discussed construction, bicycle and pedestrian compatibility, durability and maintenance requirements with the trail maintenance staff. Numerous state and federal agencies were also contacted for information on the construction, maintenance and costs issues of various trail surface materials.

Each surface type has certain advantages over the other types. For example, unpaved surfaces with their natural appearance are considered by some to have less visual impact than a bituminous paved surface. On the other hand, for the unpaved surfaces, careful gradation of the aggregate particles is critical. Too fine a distribution results in a surface that resembles loose dry sand which would not meet the firmness criteria. Too large an aggregate will have the larger particles breaking free and collecting on the trail surface ultimately resulting in a hazardous condition for bicycles. In addition, the unpaved surfaces are more susceptible to rutting and surface erosion from runoff.

Paved surfaces are generally more durable than unpaved but as noted can be visually intrusive. Paved surfaces are prone to erosion however, runoff flowing along the edge of a paved trail surface can erode the unpaved shoulder resulting in a hazardous drop-off at the pavement edge.

Maintenance requirements and costs (both initial construction and maintenance) vary as does the expected design life of each surface.

A summary evaluation of the trail surface alternatives is contained in the Table 1. Additional details are contained in the following paragraphs.

**Table 1: Suitability of Surface Materials for Shared-Use Paths**

	ADA Compliance	Durability	Multi-Use	Weather Resistant	Cost <sup>2</sup>	Maintenance
Hot Mix Asphalt	Yes	Most Durable	Snow Melt For X-C skis	Most Resistant	\$185,000 \$20,000	Crack seal, leaf removal, 12 yr life replacement
Stabilized Soil	Yes	Somewhat Durable <sup>1</sup>	Yes	Somewhat Resistant	\$156,000 \$175,000	Leaf removal, annual dressing, 6 yr life replacement
Stone Dust	Yes	Durable	Yes	Very Resistant	\$91,500 \$222,500	Leaf removal, annual dressing, 6 yr life replacement
Gravel 3/4 minus	Yes	Somewhat Durable <sup>1</sup>	Loose, aggregate – not ideal for bicycles	Resistant	\$156,000 \$175,000	Leaf removal, annual dressing, 6 yr life replacement

1 Susceptible to rutting especially in wet weather

2 Initial construction cost / 12-year maintenance cost 2008 dollars

### ADA Compliance

For shared-use paths, 521 CMR requires the surface be firm, stable and slip-resistant, without slopes greater than the maximum allowed and without level changes greater than ¼ inch.

### Construction Requirements

The construction techniques and equipment to construct any of the trail surface alternatives are similar to typical road construction in New England. All of the trail surface alternatives should be constructed over a prepared subgrade and gravel subbase to provide structural support to the trail surface and prevent damage from freeze-thaw cycles. All wet, organic soil or otherwise unsuitable material should be removed from the subgrade under the trail surface and shoulder. Roots of trees or shrubs can pierce the trail surface breaking the structure and causing heaves. The

Vermont Agency of Transportation Trail Manual recommends an application of soil sterilant or lime at the subgrade level to prevent growth of new vegetation.

A suitable gravel granular subbase should be constructed to insure drainage of the trail surface structure whether paved or unpaved. Lack of a properly completed subbase will result in premature failure of the trail surface structure whether paved or unpaved. The enclosed photographs illustrate construction of VHB designed granular trail and road surfaces in the Acadia National Park Carriage Roads Restoration Project in Maine.



To minimize erosion of the soil surfaces disturbed by construction, it is recommended that erosion controls such as hay bales be installed along the limits of grading. The controls should be periodically inspected during construction and any sediment build up removed.

Construction equipment will most likely include small to medium sized road building equipment such as dump trucks, backhoes and bulldozers. To prevent damage to the existing tree canopy, it is recommended that overhanging tree limbs be selective trimmed to a height of 12 feet. The trimming should be completed under supervision of a certified arborist.



In summary, the construction sequence, limits of disturbance, construction duration and impacts are nearly identical for all the trail surface alternatives.

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## Trail Surface Durability/Maintenance Requirements

Surface maintenance and repairs are especially critical on shared-use paths as bicyclists and pedestrians are more sensitive to problems in a trail surface than motor vehicles are to surface defects on a roadway. Based on the experiences on other trails with various surface types, the hot mix asphalt surface is more durable than the unpaved alternatives. The asphalt surface is generally impermeable and thus resists rutting, shoving and displacement of surface particles caused by ponding of water on the trail surface. Regular removal of debris (leaves, etc) and periodic crack sealing are recommended maintenance needs. A reasonable design life of a HMA path surface before complete rehabilitation (resurfacing/replacement of the wearing surface) is approximately 12-15 years.

Many path users prefer an unpaved surface. The “softer” surface may be more comfortable to pedestrians. Bicycles tend to travel at lower speeds than on paved surfaces and skaters are not drawn to unpaved paths making the facility more “comfortable” to other users. Unpaved surfaces are generally more prone to erosion, rutting/potholes and other surface irregularities. These surfaces will require more frequent and regular surfacing maintenance. Unpaved surfaces usually have a shorter design life and will require substantial or complete rehabilitation within approximately 6 to 8 years.

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## Cross-Sectional Width

It is anticipated that the Minute Man West Bikepath will be used by bicyclists of various skill levels and pedestrians including walkers, joggers, skaters and pedestrians with baby carriages. Path width is a primary factor in managing conflicts

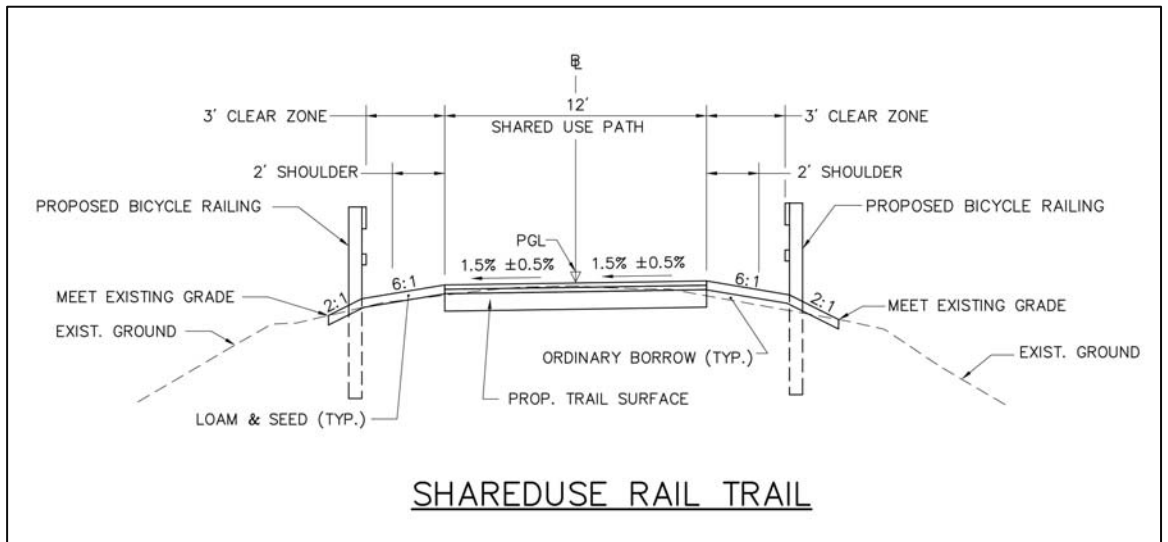
between different types of path users. For a shared-use path to accommodate a large variety and number of users, it is preferable to separate users by designating lanes or by construction parallel and separate paths. Given the right-of-way and environmental constraints of the project corridor, construction of separate parallel facilities are not feasible.

VHB Environmental staff conducted field reviews of the trail corridor to obtain the following information:

- Identify locations along the rail bed where the proposed trail cross section could be constrained by adjacent wetlands, steep slopes and/or mature trees. GPS coordinates were obtained for each location. Ten (10) locations were identified.
- Develop cross section sketch of each cross section with approximate dimensions of the width of the existing rail bed, embankment top and side slope extensions. Approximate difference in rail bed and bottom of side slopes were also obtained.
- Approximate width of existing cleared areas and limits of mature tree canopy were also obtained.

The field observations found that the width of the embankment top varied from a minimum of 10.5 feet to a maximum of over 20 feet width. The height of embankment fill varied between 2 feet to 8 feet. Vegetation has encroached into the rail bed with most of the corridor overgrown with saplings (3" diameter +/-) on the railbed and larger trees on the side slopes. The sketches, field photos and a photo log are attached. The AASHTO Guidelines and MHD Project Development & Design Guide recommend a minimum width of 10 to 12 feet for a shared -use path. A minimum cross section width of 8 feet for a shared-use path is noted in the AASHTO Guidelines and MHD Design Guide only when the anticipated volumes of bicyclists and pedestrians are low. Based on observations of the actual mix of users on the existing Minute Man Bikepath, MassHighway has recommended a minimum width of 12 feet on other proposed shared-use trails in the Metro Boston region.

Given that the Town will seek MassHighway transportation funding for construction of this trail, it is likely that the Department will require a trail surface width of 12 feet with 2 foot shoulders on each side. Thus some sections of the Minute Man West Bikepath will require widening of the embankment top width and partial clearing of existing side slopes. We anticipate this work to extend from Cross Section 1 (CS1) to CS3 (approximately 1700 feet). We also recommend the town consider utilizing the existing footpath from Railroad Avenue as the path alignment to avoid wetland impacts. See Appendix. The remainder of the Trail can be constructed on the existing embankment width with clearing of the side slopes.



Proposed Bikeway Cross Section



Existing Condition

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## General Trail Maintenance Requirements

Identification of maintenance needs and implementing good maintenance practices are key elements in providing safe facilities for bicyclists and pedestrians. Having a written operations and maintenance plan and an emergency response and community policing plan will also enable town officials to determine manpower and budgets needed to implement these plans.

For the Town of Bedford, we recommend, that the Department of Public Works coordinate with the Bedford Police and Fire Departments to review the project design, access, maintenance, enforcement and emergency response procedures. Their recommendations should be compiled into a maintenance and operations plan and presented to Town officials.

The Maintenance and Operations section in the Appendix provides guidance to the Town on the general maintenance requirements for typical shared-use trails. It includes a copy of Chapter 22 from the publication FHWA BIKESAFE: Bicycle Countermeasure Selection System regarding maintenance of bicycle facilities. Also included are copies of Resources for Trail Managers and checklists for maintenance tasks and budgets from the Rails to Trails Conservancy report Rail-Trail Maintenance and Operation.

It is recommended that the Town officials review these materials and finalize formal written operation and maintenance plans and emergency response plan for the trail.

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## Trail Operation & Rules

The Town's vision of the Minute Man West Bikepath is as a non-motorized shared-use path for use by bicyclists and pedestrians. The design should comply with accepted industry standards and criteria for a bicycles and pedestrians and encourages users to comply with uniform traffic operations and laws. Thus the signs, pavement markings and other amenities are designed to convey that message through the use of common standards of color, shape and graphics as used on typical roadway signs without "oversigning" the natural landscape.

Recent news reports have identified conflicts between types of users on the existing Minute Man Bikepath. Field review of the Bikepath reveals a substantial lack of signs and markings that clarify path rules.

Experience on other shared-use paths has shown that these conflicts can be managed by promoting adherence to standard traffic operation rules and path etiquette. Techniques for minimizing conflicts between path users include

- **Signs:** A uniform system of operating and advisory signs posted at regular intervals along the trail are a simple and effective way to manage conflicts. Standard MUTCD regulatory and warning signs should be incorporated into the trail design to alert trail users to potential conflicts and to convey regulatory messages. Signing should encourage compliance with standard traffic operation “rules of the road” including:
  - Bicycles yield to pedestrians
  - Keeping to the right side of the trail except to pass.
  - Give an audible warning before passing
  - When passing, yield to slower and on-coming traffic
  - Travel in a consistent and predictable manner.
  - Don’t block the trail. Groups should use no more than half the trail.
  - When stopping, move off the trail.

In general, uniform application of standard traffic signs, modified for use on trails as described in the MUTCD, should be utilized to the greatest extent possible to convey the rules of the road. Over signing is not recommend as too many signs decrease the sign’s effectiveness, clutter the landscape and present sign posts as fixed object hazards themselves.

It is recommended that trail use rules be posted at trail access points, as appropriate.

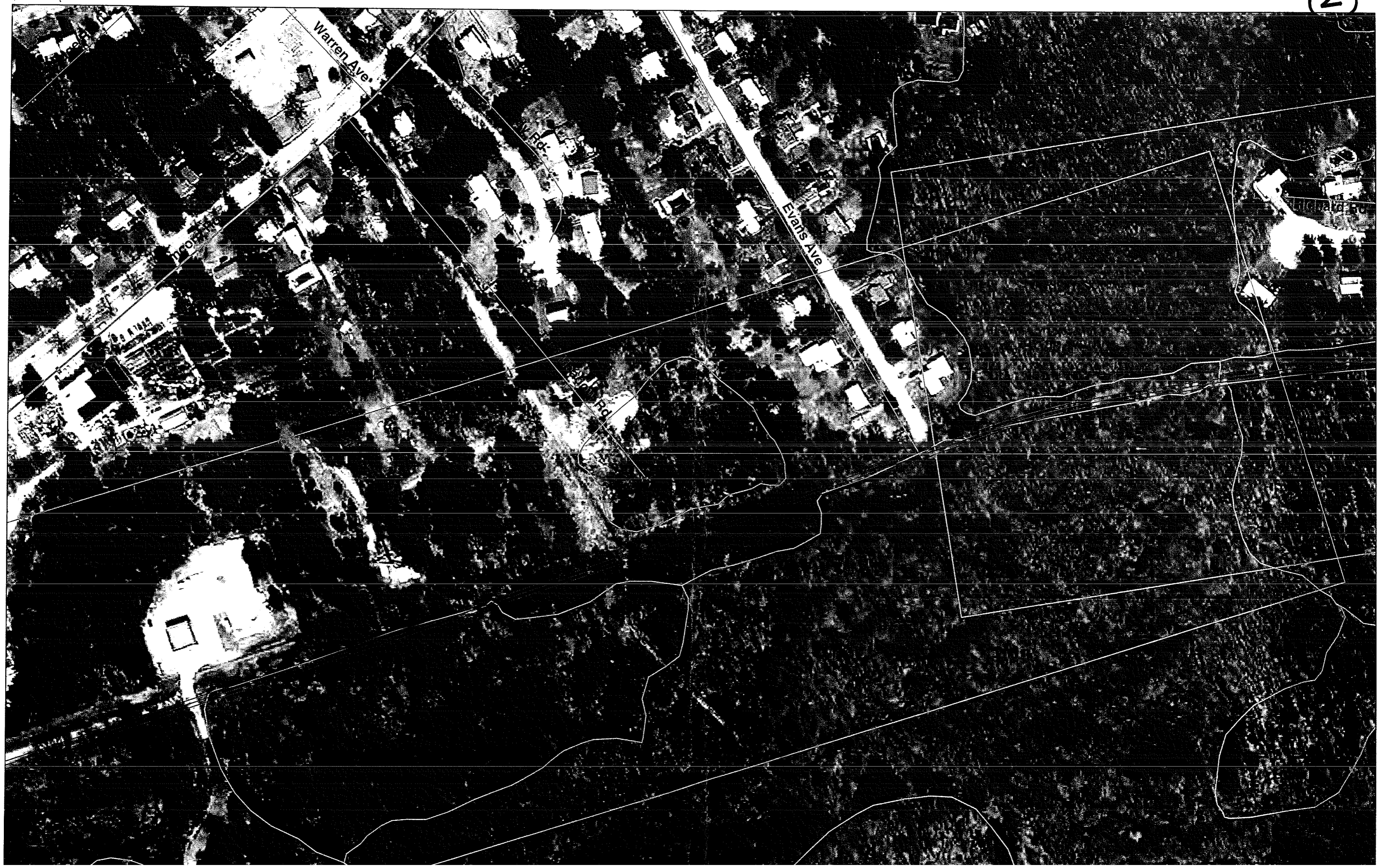
It is recommended that the town review their existing by-laws as they relate to rail trails and shared-use facilities to verify if changes or additions are needed. As an example, the Maintenance and Operations section of the Appendix contains a copy of by-laws adapted by the town of Milford, MA for regulating use on the their section of the Upper Charles River Trail.

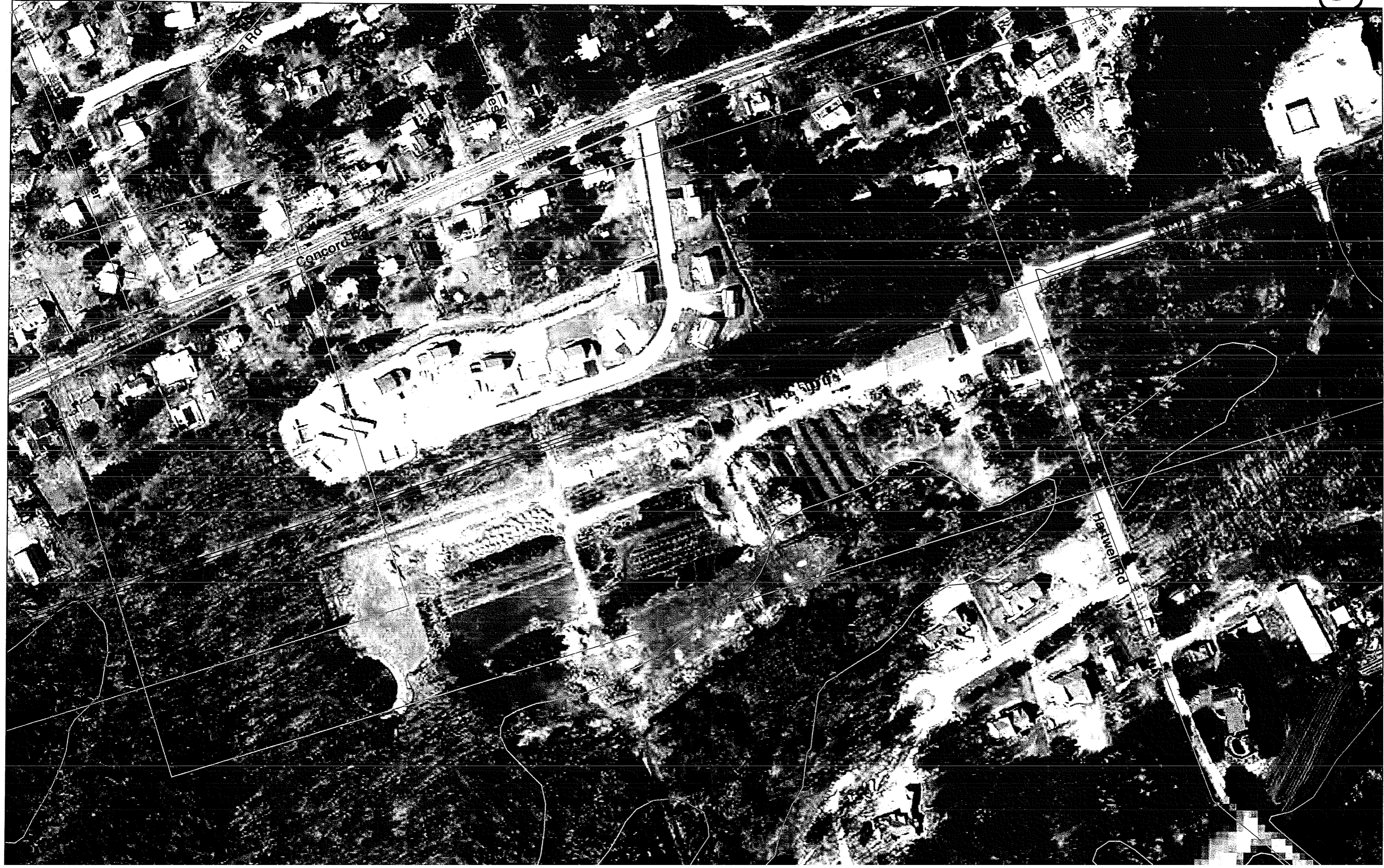


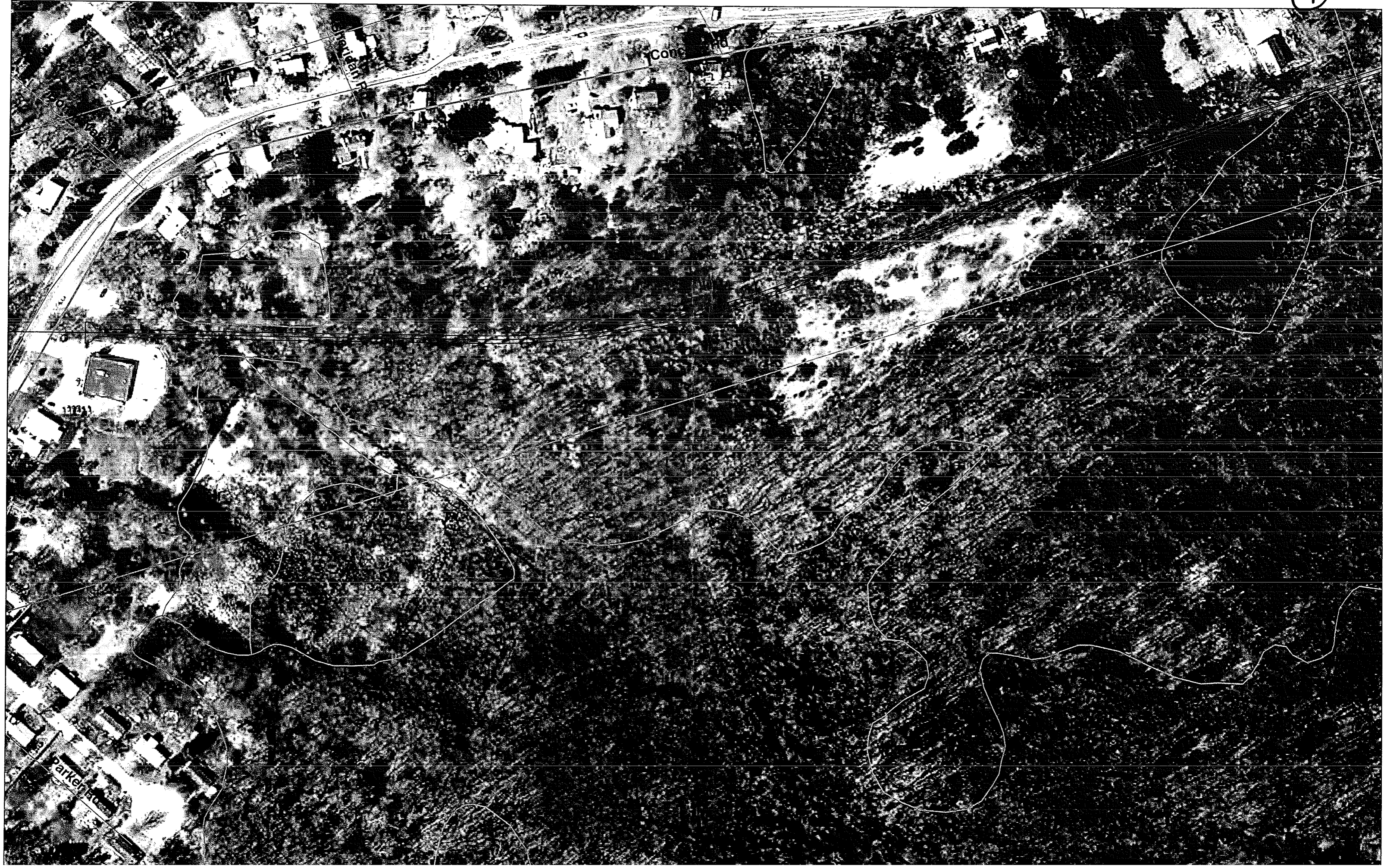
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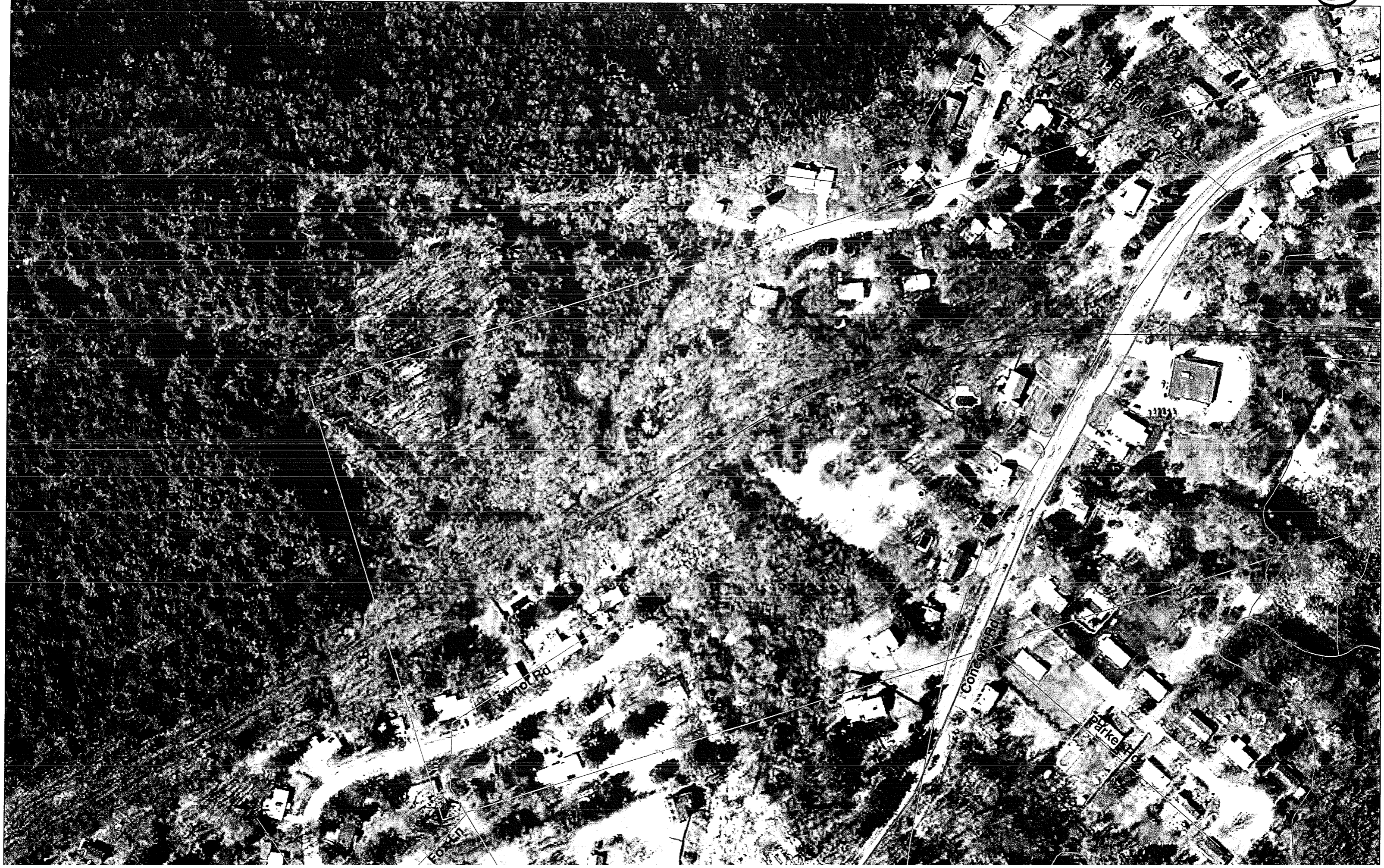
# Field Cross Sections & Locus Maps



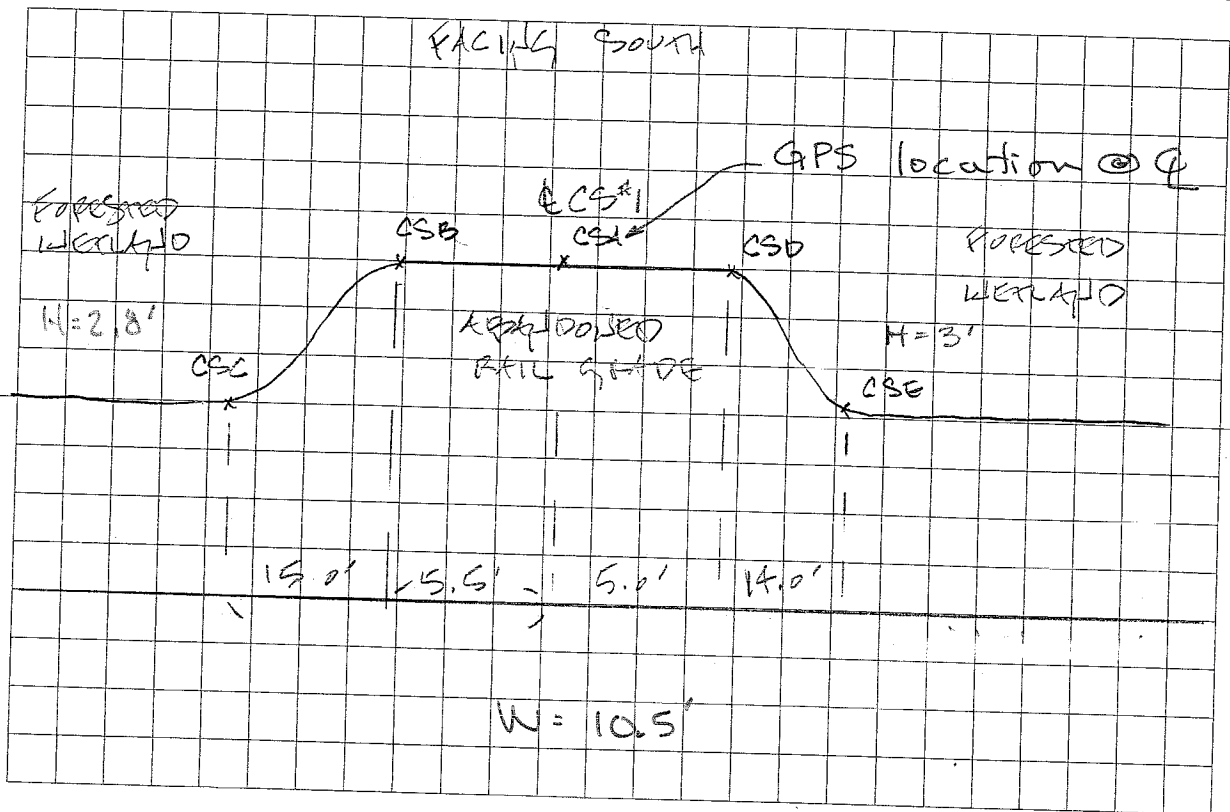






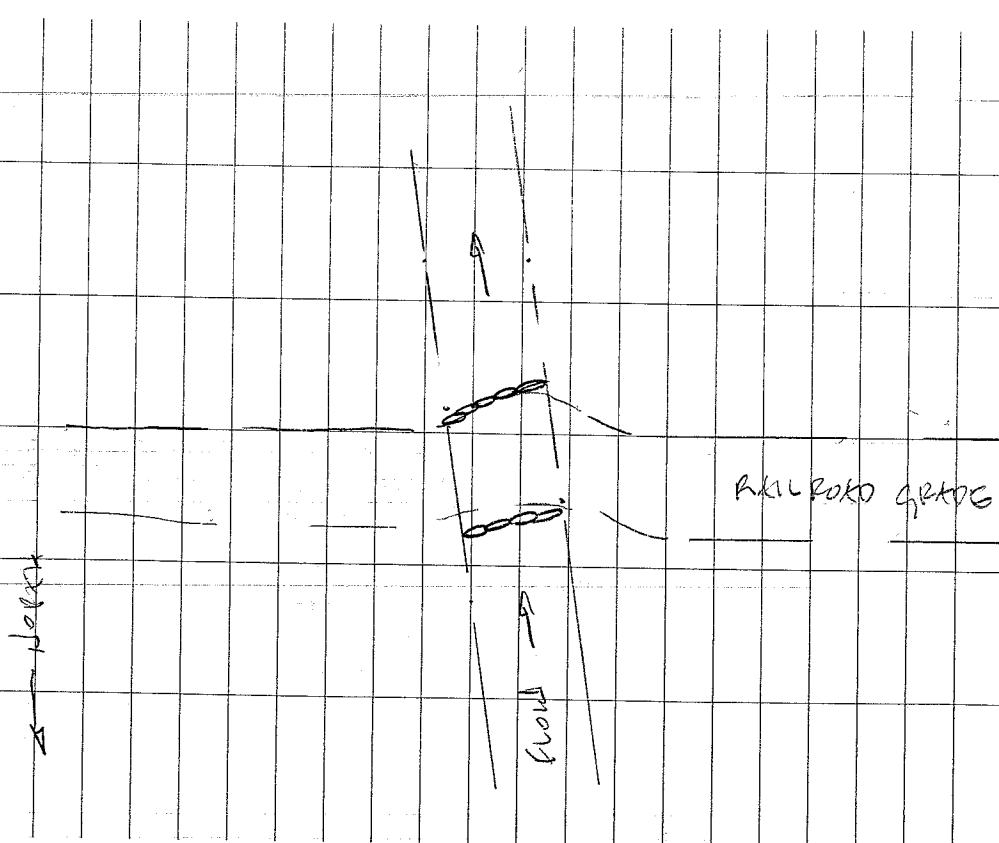
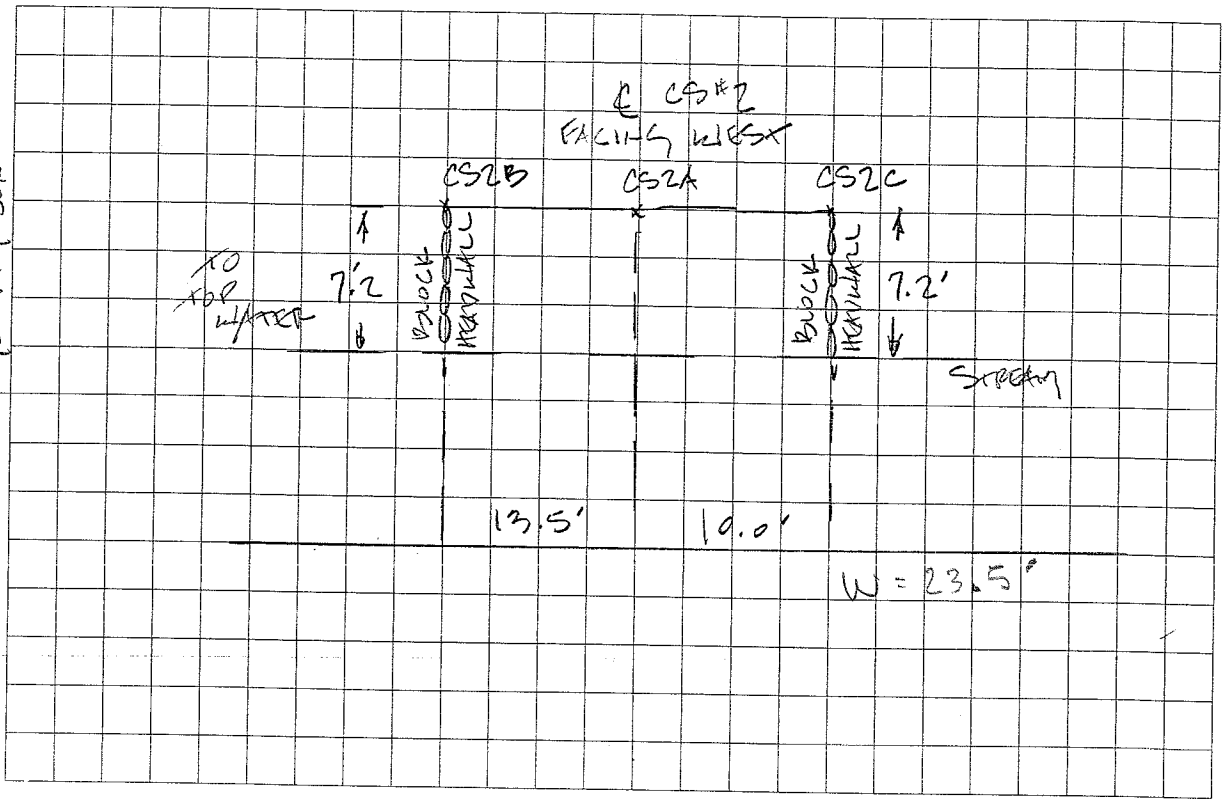






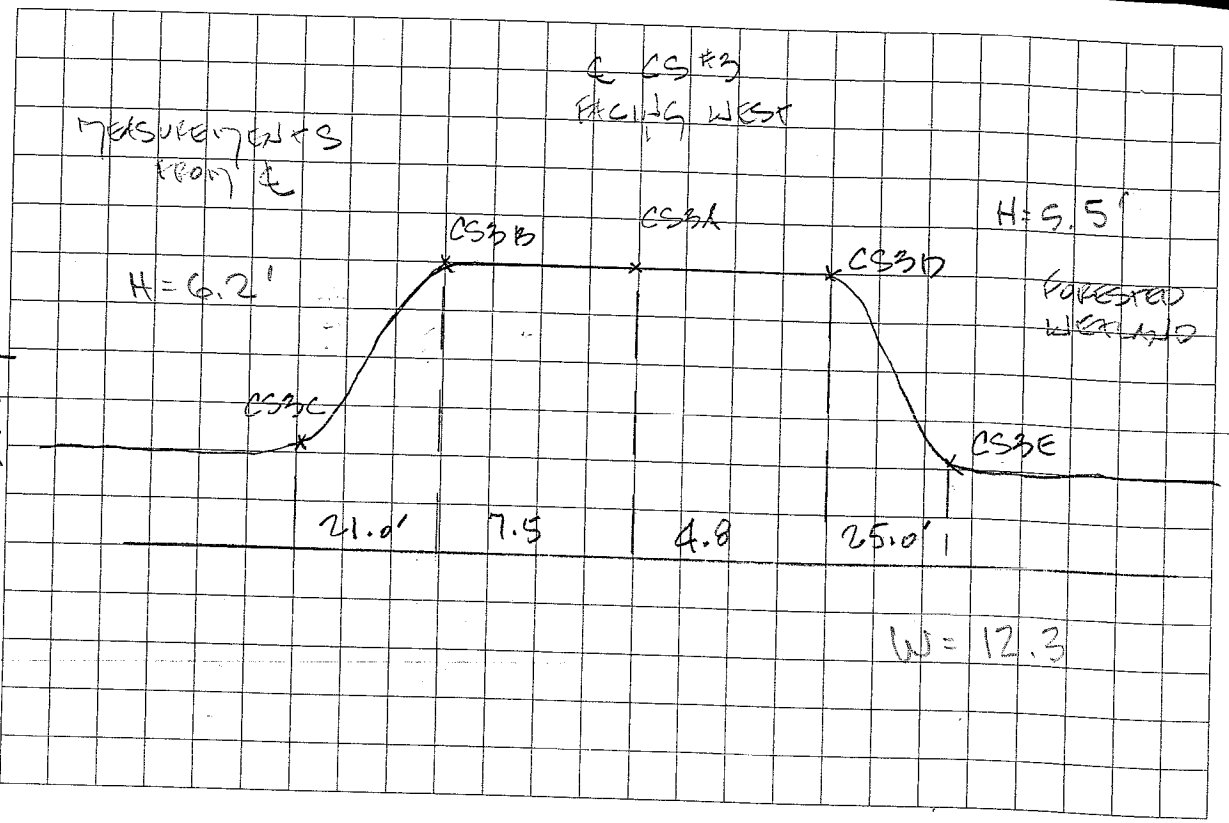
PK LY	BEARING	5/8/08 10° S 41° W	* ASSUMED ELEV.	FS	HI	ELV.	DESC.
4.92			100.00*		104.92		CSE - RAIL
4.80			100.04				CSB - TOP Slope
7.72			97.72				CSC - Railway Slope
4.97			99.95				CSO - TOP Slope
8.03			96.89				CSE - Railway Slope
7.99							CSE
4.07			(+0.01)				CSA
5.34			100.00				CS2A - RAIL
5.72			99.62				CS2B - TOP WALK
5.50			99.04				CS2C - TOP WALK
5.57			541				CS2A

5/8/00  
100 ft by 100 ft  
100 ft by 100 ft



5/21/08

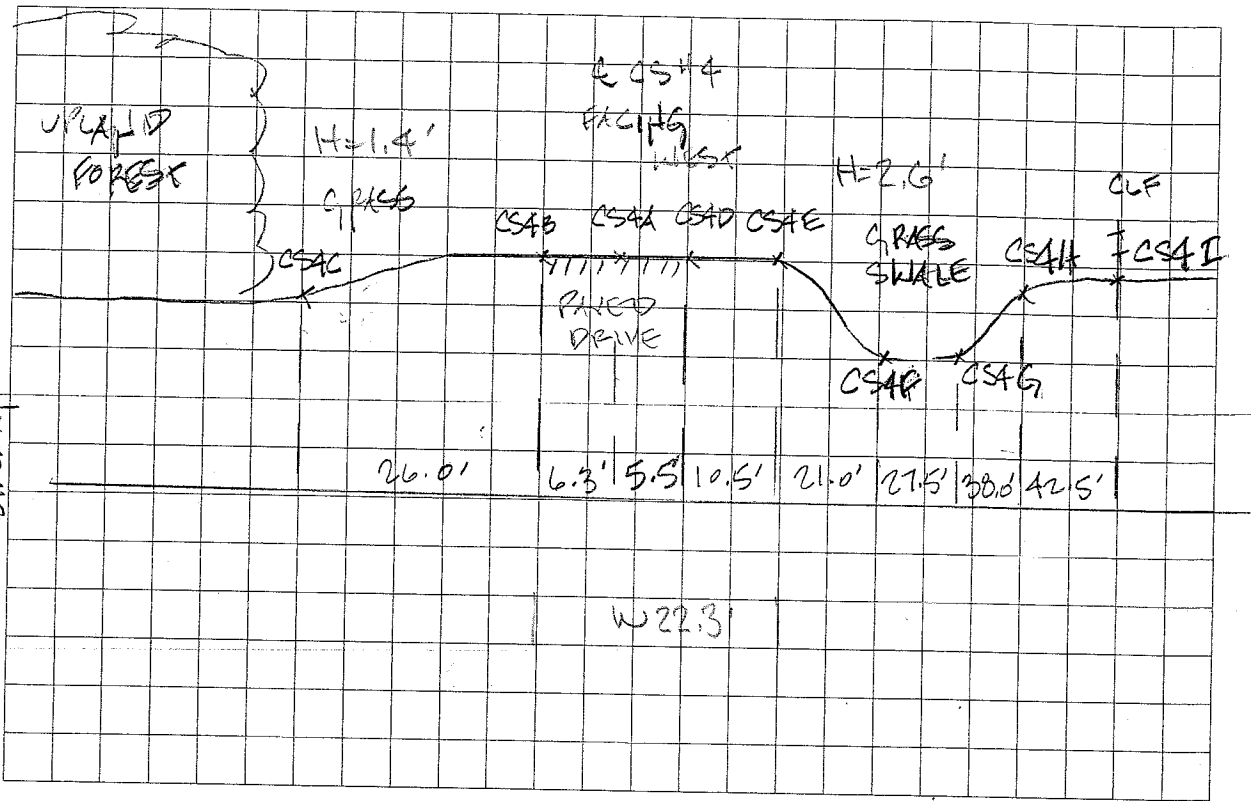
BOARD  
BIRKLEY



BS	HI	IS	ELEV	DESC
5.05	105.05		100.00	CS3A - ITRAIL
		4.81	100.24	CS3B - TOP SLOPE
		11.02	94.03	CS3C - BOARDING SLOPE
		5.07	99.90	CS3D - TOP SLOPE
		10.65	94.40	CS3E - BOTTOM CS3E
10.68		5.07 (40.0)		CS3A

5/8/00

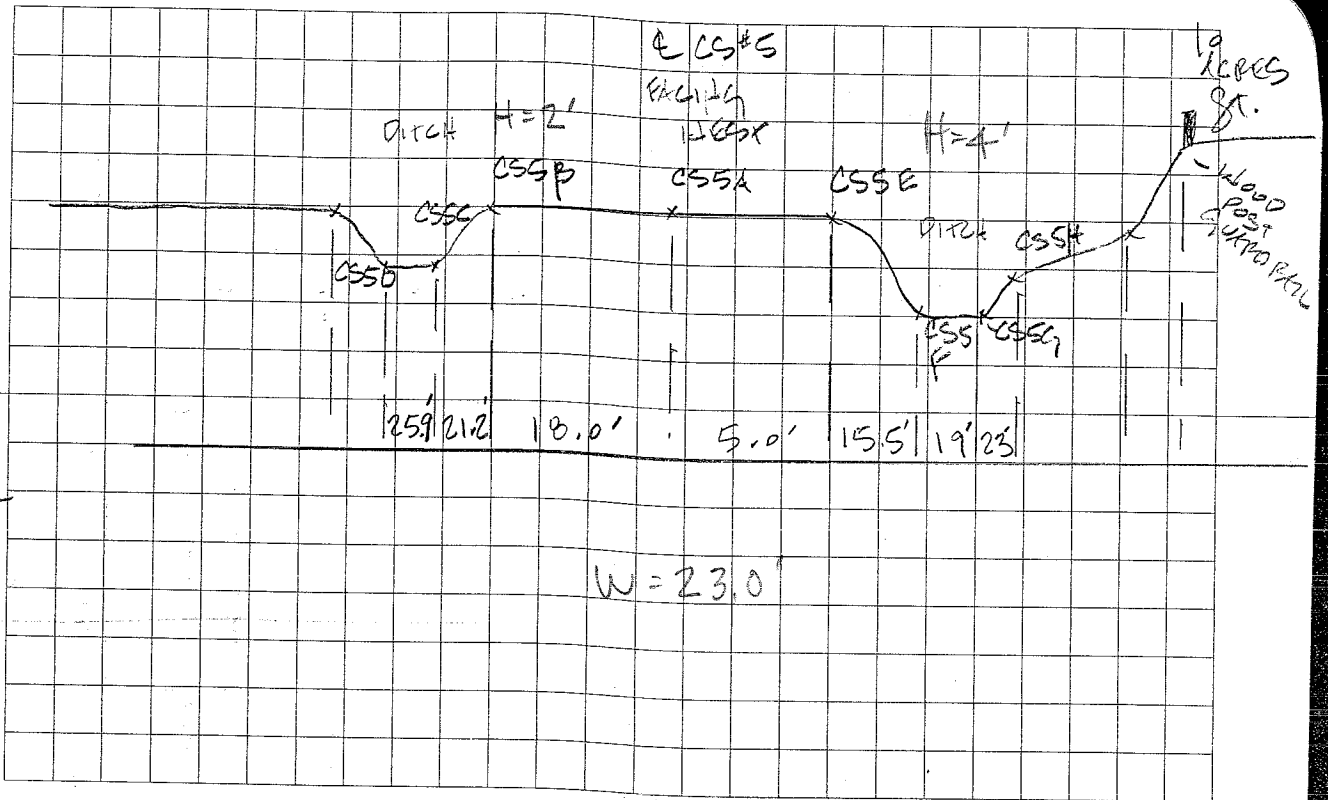
BEACON BIKELANE



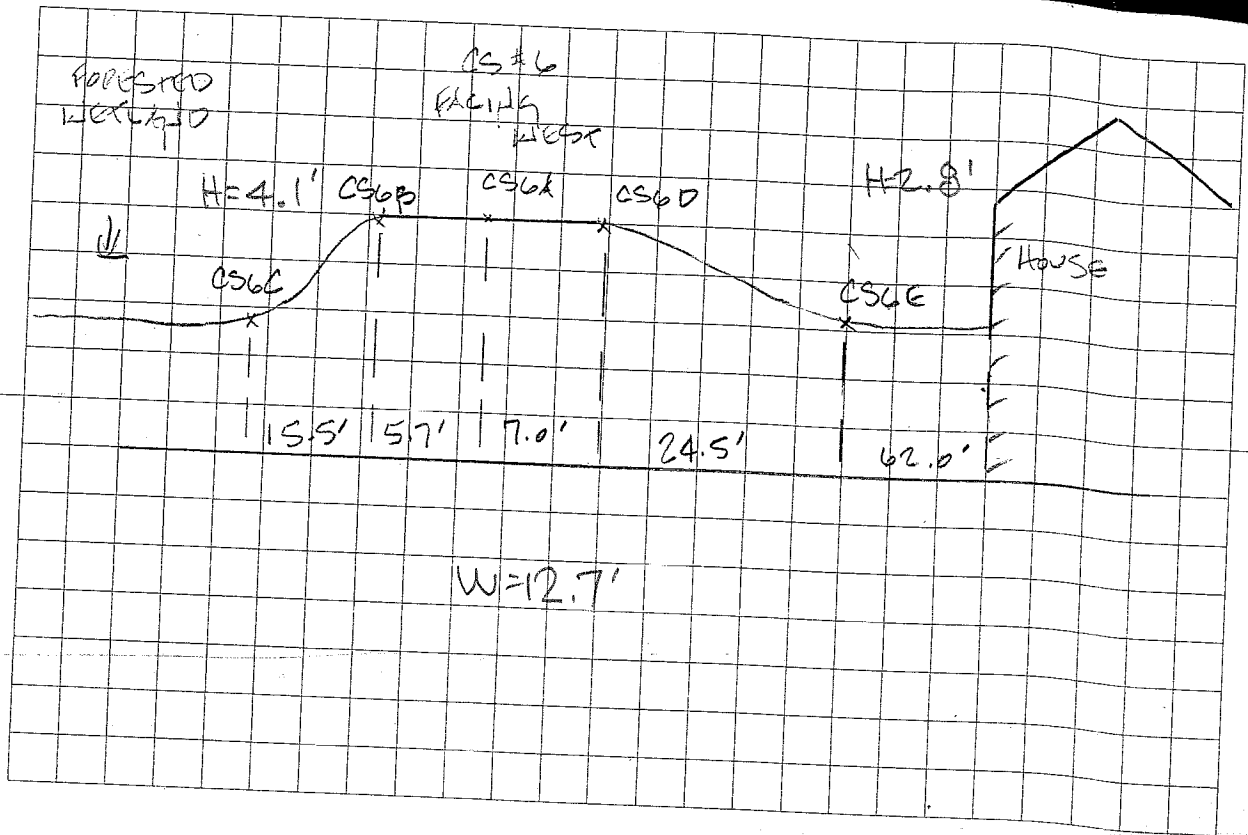
BS	HI	FS	LEN	DESC
4.39	104.39		100	CS4A - CLF ROAD
		4.55	99.84	CS4B - EF / TOP SLOPE
		5.99	90.40	CS4C - EDGE TREE / BS
		4.44	99.95	CS4D - EF
		4.85	99.54	CS4E - TOP SLOPE
		7.52	96.07	CS4F - BOT SLOPE
		7.35	97.04	CS4G - BS / EDGE DITCH
		5.41	90.90	CS4H - TOP SLOPE
		5.35	99.04	CS4I - GRADE PILE
5.21		4.24	(+0.01)	CS4A - CLF ROAD

5/10/08

BORCOPO  
BUREAU

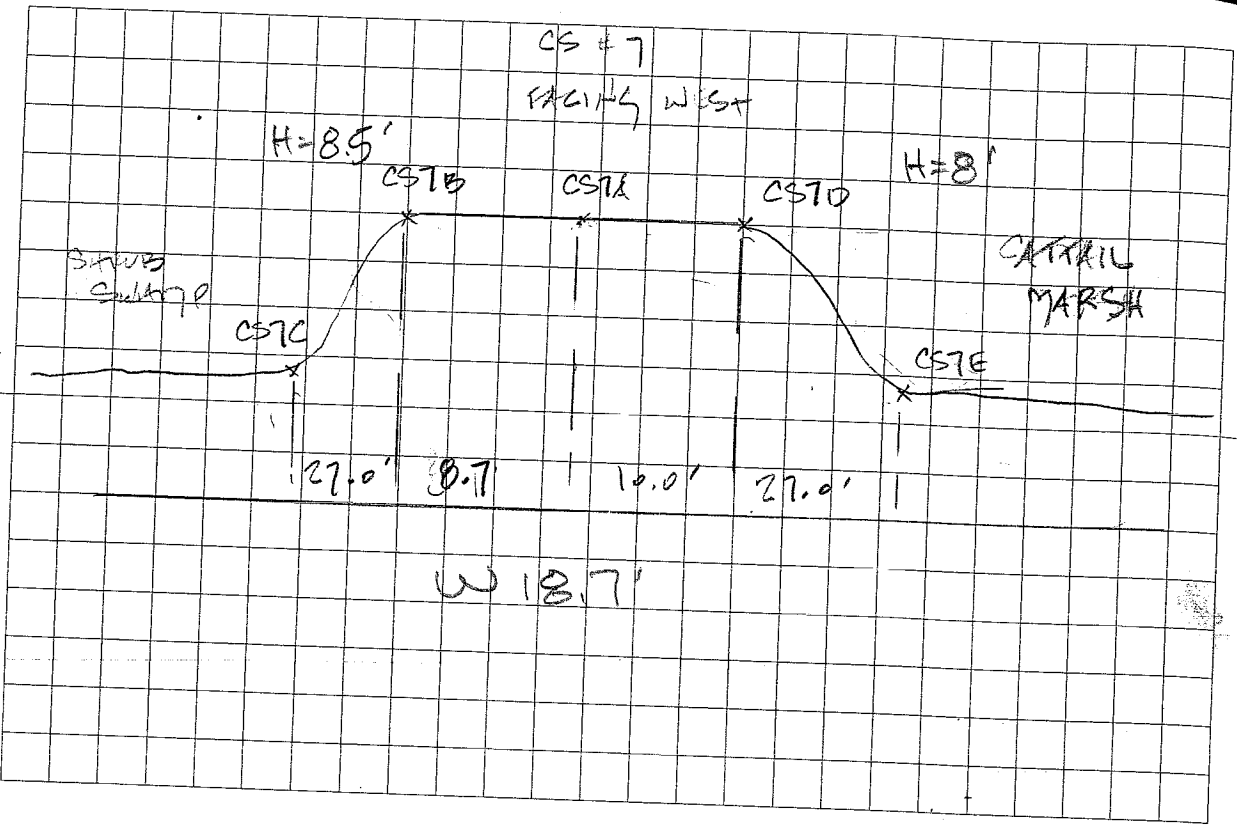


BS	HI	FS	ELEV	DESC
5.00	105.00		100.00	CSSA - & TOTAL
		6.20	98.80	CSSB - TOP SLOPE
		8.23	96.77	CSSC - BOT SLOPE
		8.32	96.60	CSSD - BOT SLOPE
		4.53	100.47	CSS E - TOP SLOPE
		8.59	96.41	CSSF
		8.50	96.50	CSSG - BOT SLOPE
		6.45	98.55	CSS H - TOP SLOPE
6.54		5.00	(100.01)	CSSA - TOTAL



BS	HI	FS	ELEV	DESC
4.85	104.85		100.00	CS6K - FINAL
		4.90	99.95	CS6P - TOP SLOPE
		9.46	95.39	CS6C - FOOT/WEDGE
		4.50	100.35	CS6D - TOP SLOPE
7.21		7.32	97.53	CS6E - FOOT SLOPE
		4.75	(-0.01)	CS6K - FINAL

5/8/00  
 BEADROD  
 BIKELANE



BS	HI	FS	ELVN	DESC
5.19	105.19		100.00	CS7A - CATTAIL
		5.333	99.06	CS7B - TOP SLOPE
		13.88	91.31	CS7C - BOT SLOPE
		4.96	100.23	CS7D - TOP SLOPE
12.96		12.95	92.24	CS7E - BOT SLOPE
		5.21	(-0.01)	CS7A - CATTAIL



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# Field Photographs & Log

Photo #	Description	Cardinal Direction
100_1449	Beginning of trail, just S of school	N
100_1450	CS 1 (Pond and wetland where they are proposing new trail entrance is off to left)	S
100_1451	View from just north of CS 1	W
100_1452	View from CS 1	W
100_1453	View of CS 2 from sewer manhole	W
100_1454	View from sewer manhole just E of CS 2	N
100_1455	View from sewer manhole just E of CS 3 -- Note narrowness of path, and dominant shrub/sapling cover.	E
100_1456	View from sewer manhole just E of CS 4	S
100_1457	Drainage area @ CS 2	S
100_1458	Drainage area @ CS 2	S
100_1459	Drainage area and overpass @ CS 2	N
100_1460	View from sewer manhole E of CS 2 -- Note shrubs/saplings immediately adjacent to path.	W
100_1461	View from sewer manhole E of CS 2 -- Note saplings immediately adjacent to path.	E
100_1462	View from CS 3 -- Note path width and heavy sapling cover.	W
100_1463	View from CS 3	E
100_1464	View from CS 3 -- Wetland impact area	S
100_1465	View from CS 3 -- Wetland impact area	N
100_1466	View from metal gate posts E of water dept. (?) building. Note openness of path.	W
100_1467	View from metal gate posts E of water dept. (?) building. Note width of path and dominant shrub/sapling layer immediately adjacent to path.	E
100_1468	View from metal gate posts E of water dept. (?) building	SW
100_1469	View of water dept. (?) building entrance	NW
100_1470	View of CS 4	N
100_1471	View of CS 5 -- Note two mature trees immediately adjacent to path.	W
100_1472	View from same location -- Note narrowness of path	E
100_1473	View CS 5 -- Perpendicular access path connecting Ten Acre Road and pungent mulch nursery to bike path runs left to right in photo. Nursery visible at right. Note several mature trees immediately adjacent to path.	E
100_1474	CS 5 -- Intersection of bike path and Ten Acre Road access path.	N
100_1475	CS 5 -- Intersection of bike path and nursery access path.	S
100_1476	CS 5 -- Wetland constraints	NW

100_1477	View from CS 6 -- Note dominant sapling growth	W
100_1478	View from CS 6 -- Note dominant shrub/sapling cover	E
	View from CS 6 -- Distance to house on Route 62/Concord	
100_1479	Road is 62 feet.	N
100_1480	View from CS 6 -- Wetland impact area	S
	View from CS 7 -- Note dominance of shrubs, one mature	
100_1481	tree at right	W
	View from CS 7 -- Note dominance of shrubs, one to two	
100_1482	mature trees in middleground	E
100_1483	View from CS 7 -- Marsh wetland impact area	N
100_1484	View from CS 7 -- Wetland impact area	S
100_1485	Hartwell Ave crossing of bikepath	E
100_1486	Hartwell Ave crossing of bikepath	E
100_1487	Hartwell Ave crossing of bikepath	W



TOWN OF BEDFORD  
HIGHTWELL ROAD

05/08/2008



TOWN OF BEDFORD  
NIGHTWELL ROAD  
No Motorcycles Allowed  
No Motorcycles Permitted, Only

05/08/2008



05/08/2008

05/08/2008





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05/08/2008

A dirt path leads through a forest of young trees. The path is covered in fallen leaves and some green moss. The trees are mostly thin and have sparse green leaves. In the distance, a sign is visible on the path.

ELM BROOK  
CONSERVATION AREA  
A MEMORIAL TO JOHN W. BROWN  
ESTABLISHED BY THE STATE OF CONNECTICUT  
1964

05/08/2008



05/08/2008



05/08/2008



05/08/2008



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# Maintenance and Operations

## MAINTENANCE

The availability of bicycle facilities is one of the components that can lead to increased riding in a community—if you build it, bicyclists will come. However, if you build it, it will also need to be maintained. Thus, maintenance needs require planning and budgeting. Sample maintenance activities include keeping roadways and bike lanes clean and free of debris, identifying and correcting roadway surface hazards, keeping signs and pavement markings in good condition, maintaining adequate sight distance, and keeping separate shared-use paths in good condition.

Maintenance is an area where planning and attention can provide significant benefits for bicyclists at relatively modest additional cost. Identification of maintenance needs for roadways and bicycle facilities and institutionalization of good maintenance practices are key elements in providing safe facilities for bicyclists. The countermeasures in this category have been divided into the following categories:

- Repetitive/Short-Term Maintenance
- Major Maintenance
- Hazard Identification Programs

The types of activities that will be carried out under each heading will be similar among communities in many cases, but should be identified, categorized, prioritized in terms of urgency and frequency, and budgeted for by each community since local conditions will dictate exact needs. For example, local flora, climate, weather, soil types, and other conditions may dictate frequent landscape maintenance and debris sweeping in some areas but be less frequently needed elsewhere. Winter snow removal may be important in northern communities but irrelevant in warmer climates.

The importance of good planning and initial design also cannot be overstated with respect to long-term maintenance needs. It is easier to obtain outside funding for facilities construction than for on-going maintenance, so plan and build correctly at the outset to reduce future maintenance problems and expense.



PHOTO BY BRIANNA LEON

Well-maintained roadway surface and bike lane free of debris and surface irregularities. (Phoenix, AZ)

## 22. REPETITIVE/SHORT-TERM MAINTENANCE

Repetitive and short-term maintenance includes activities such as sweeping, landscape maintenance, pavement markings maintenance, drain systems clearance and pothole repair that must be performed at some routine frequency, generally at least once per year, but some much more often. Such activities are crucial to maintaining safe riding surfaces, adequate sight distances and clearance, and clear and visible markings. Activities such as landscape maintenance, sweeping, graffiti removal, emergency telephone repair and general trash pick up also affect the aesthetic environment and promote bicycling through maintaining a more secure and pleasing environment. Regular inspections of structures and general surface conditions should also be performed to detect major maintenance needs.

Maintenance activities related to the safe operation of a facility should always receive top priority. The American Association of State Highway and Transportation Officials *Maintenance Manual*<sup>1</sup> identifies seven maintenance activities that should be carried out on a routine basis:

### Signs and Traffic Markings

Signs warning both the motorist and bicyclist should be inspected regularly and kept in good condition; and striping should be kept prominent.

### Sight Distance and Clearance

Sight distances on parallel roadways and trails should not be impaired leading up to crossings and curves. Trees,



PHOTO BY LIBBY THOMAS

Sight distance has been impaired due to poor landscape design and insufficient landscape maintenance.

### Purposes

- Maintain surfaces and other riding conditions in a safe and inviting condition for bicyclists.
- Identify, plan, and budget for routine maintenance activities that are critical to 1) maintaining the safety of a facility; 2) protecting the investment in a facility; and 3) protecting aesthetics and the environment.

### Considerations

- Good maintenance practices preserve the investment in facilities and keep them in safe, useable condition.
- If facilities are well-maintained for bicyclists, they are apt to be in suitable condition for all shared uses.
- Annual maintenance needs and costs should be considered at the time facilities are constructed since it is more difficult to secure outside funding specifically for maintenance.
- Institutionalizing good maintenance practices may increase bicycling and reduce government liability.
- Develop an annual budget for repetitive maintenance that reflects current and new facilities to prevent unexpected increases.

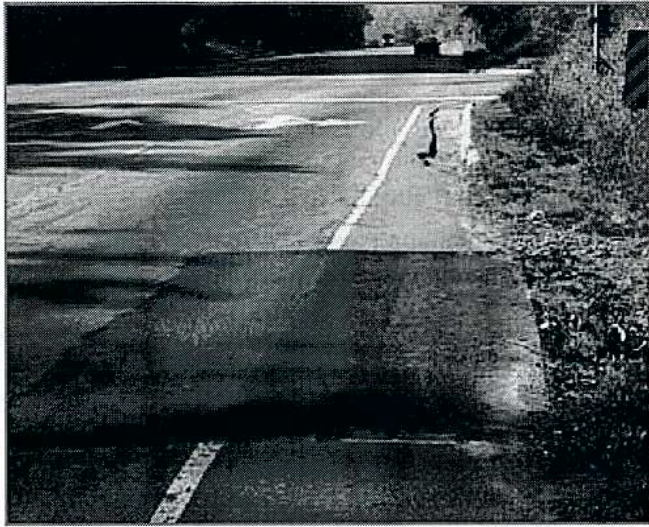
shrubs and tall grass should be regularly inspected and either removed or trimmed if they can interfere. Adequate clearances on both sides and overhead should be checked regularly. Tree branches should be trimmed to allow enough room for seasonal growth without encroaching onto the street or trail.

### Surface Repair

Streets and trails should be patched or graded on a regular basis. It is important that finished patches be flush with the existing surface. Skid resistance of the repaired area should be the same as the adjoining surface. Ruts should be removed by whatever measures are appropriate to give a satisfactory result and avoid recurrence.

### Drainage

Seasonal washout, silt or gravel washes across a street, or trail, and sinking should be watched for, and appropriate measures should be taken to prevent them. Installing culverts or building small bridges could be considered a maintenance function to achieve an immediate result and avoid the expense of contracting. Drainage grates should



Sunken pavement patch and shoulder drop-off to below-grade drainage grate contribute to bicyclist discomfort and possible hazards for bicyclists.

not have parallel openings that could catch narrow bicycle tires. Maintenance personnel should be especially instructed to ensure that grates are positioned so that openings are at angles to the bicyclist's direction.

### **Sweeping and Cleaning**

The tires of a bicycle can be easily damaged by broken glass and other sharp objects. Bicycle wheels slip easily on leaves or ice. Sand or loose gravel on an asphalt surface can cause a serious fall. When mechanically sweeping roadways, there should also be concern that material is not thrown onto a bike lane, shoulder or trail.

### **Structural Deterioration**

Structures should be inspected annually to ensure they are in good condition. Special attention should be given to wood foundations and posts to determine whether rot or termites are present.

### **Illumination**

Lighting improvements should be made at busy arterials. Once installed, the lights should be maintained to not only ensure reliable operation, but that they are kept clean and replaced as required to keep the desired luminescence.

A thorough assessment of all bicycle facilities should be performed to generate a list of repetitive and short-term required maintenance activities. Preferably such processes would occur at the design phase so maintenance activities will be budgeted and planned for in advance. Some maintenance activities may be incorporated under regular roadway and public facilities maintenance, although care should be taken to consider the special needs of bicyclists and provide appropriate standards. For example, when re-

### **Estimating Cost**

Historic costs provide the best roadmap for determining future costs. When estimating costs, there are four things to consider:

- **Frequency:** Reports of hazards on bicycle facilities are going to come in at about the same rate each year with some increase as new bicycle facilities come on line and the number of bicyclists increases. They are also likely to increase in the spring and summer when more bicycling occurs. Getting a handle on the total number is the first step in developing a budget.
- **Types of hazards:** Reported hazards should be put into basic categories such as potholes, longitudinal cracks in the pavement, debris that needs sweeping, etc.
- **Cost per incident:** Once reported hazards have been put into categories, an average cost per incident can be determined. For example, it is relatively easy to come up with an average cost for fixing a pothole.
- **Budget:** The final step is to develop a budget based on the frequency and cost per incident.

Existing maintenance budgets can often be used to cover the costs of fixing hazards. Once a budget has been determined, it may be possible to simply increase existing budgets proportionally. Some communities create separate budgets for addressing bicycle-related hazards.

pairing utility cuts, the City of Seattle requires an initial paving, then after allowing time for settling, the area is repaved to ensure that the cut area is made level with the surrounding pavement (see case study #1). Sweeping may also need to occur more frequently for bicyclists than would be necessary for motorists. Institutionalizing regular bicycle facility and shared roadway maintenance practices through scheduling, budgeting and inter-departmental cooperative agreements will ensure that the needs of bicyclists do not "slip through the cracks."

## 23. MAJOR MAINTENANCE

Activities such as repaving a trail surface, replacing bridges and fixing major drainage problems that have a frequency of two or more years will fall into the category of major maintenance. While major maintenance occurs infrequently, it should be budgeted for on an annual basis to avoid large, unexpected budgetary demands.

Once major maintenance categories have been identified, set maintenance priorities by identifying which activities are critical to the safe operation of the facility and which ones are critical to other objectives such as protecting the investment in the infrastructure, protecting the environment and protecting aesthetics. While some priorities may vary to reflect local community expectations, safe operation of the facility should never be compromised. The *AASHTO Maintenance Manual* recommends that maintenance should seek to maintain conformance with the design guidelines used to build the facility.<sup>1</sup> Where proper guidelines were not used, maintenance should include improvements to the facilities' safety and operation.

### Purposes

- Identify major maintenance activities that are critical to maintaining the safety of a facility; protect the investment in a facility; and protect the aesthetics and the environment.
- Develop an annual budget for major maintenance to avoid the periodic need for a major infusion of cash.

### Considerations

- Securing maintenance dollars is difficult. Therefore, focus on designing and constructing facilities correctly at the outset to minimize future maintenance costs. In particular, make sure all drainage issues are fully addressed at the time of construction since water is the culprit for many major maintenance problems.
- Make sure that major maintenance is reflected in an annual budget that can be carried over from year to year. By definition, the amount spent on major maintenance will vary from year to year (i.e. a new bridge on a trail is not going to occur every year). Avoid "emergencies" if possible.

### Estimating Cost

When developing a major maintenance plan for a new facility, the first step is to check current costs for maintaining an existing facility. The key is to obtain the costs for maintaining a facility that is most similar to the facility you plan to construct.

The next step in developing a maintenance budget and plan is to create a list of all possible maintenance activities. A good way to begin is to list major items included in the facilities' design. Most major items will have a measurable life expectancy. For example, asphalt pavement on a trail may have a 15-year life expectancy. Taking the total miles of asphalt trail and dividing it by 15 will give a good estimate of how much pavement needs to be replaced on an annual basis. Bridges are better handled on a case-by-case basis. Make a list of all bridges on trails, estimate their probable life, and then devise a multi-year plan for major maintenance or replacement. Listing all major maintenance items, while a lot of work, is a one-time activity that will allow you to develop a realistic budget.



PHOTO BY LIBBY THOMAS

Bridge replacement offers an opportunity to add space for bikes. (Durham County, NC)

The final major maintenance budget and plan should include a checklist of all maintenance items, the frequency of and cost for each activity, the annual cost of each activity and an indication of who will perform the activity. Priorities related to safe operation of the facility should be clearly identified and a tracking procedure clearly outlined.

## 24. HAZARD IDENTIFICATION PROGRAM

Roadways and off-road facilities can be made safer and more appealing to bicyclists by developing methods to identify hazards and repair needs and institutionalizing practices to address them. Different and combined approaches have been taken by communities but include developing bicyclist hazard reporting programs, hiring personnel to conduct regular inspections of bikeways, and providing for routine accommodation or scheduling and performance of regular activities such as sweeping, inspection and spot repairs, inspection and landscape maintenance, etc. Public hazard reporting programs typically involve developing a hazard identification reporting form such as a postcard and publicizing the program and procedures to report problems through bicycle shops, bike maps, bike clubs, and other venues. A staff coordinator (may be part-time) will be needed to administer the program, ensure that the problem is referred to the correct department and follow-through on resolution, including contacting the reporting person to advise them of the repair or other outcome.



PHOTO BY LIBBY THOMAS

Below-grade drain grates create hazards for bicyclists.



PHOTO BY LIBBY THOMAS

Short term solution of pavement marking highlights the hazard until unsafe drain grates can be replaced or repaired.

### Purposes

- Provide a regular method of identifying hazards for bicyclists.
- Provide procedures for ensuring that maintenance hazards are addressed on a timely basis.

### Considerations

- Responding to reported hazards in a timely way is critical to protecting public safety and reducing liability exposure.
- Prioritizing hazards requires a basic understanding of what problems are likely to cause crashes. For example, loose gravel on a curve is likely to cause a crash. Overgrowth that impairs sight distance at a busy intersection should be addressed immediately.
- The level of effort put into responding to bicycle-related hazards should be equal to or slightly greater than the effort put into responding to motor vehicle-related hazards. In other words, be able to demonstrate parity when developing a well-rounded program.

### Estimated Cost

Providing paid staff to perform hazard identification program activities for 26 weeks cost one around \$10,000. Setting up a volunteer bicyclist hazard reporting program with a coordinator, training and materials printing cost around the same, including a pilot test and evaluation of the program (see case study #28).

See Repetitive/Short-Term Maintenance and Major Maintenance countermeasures descriptions for procedures to establish costs of actual maintenance and repair activities.

Along with identifying problems, it is imperative that effective policies and procedures are in place to resolve them. Much routine maintenance might be accommodated through regular roadway maintenance (and the costs absorbed by, or at least shared within, the regular roadway maintenance budget). It is important that identification methods and maintenance procedures specify issues that are particular or more stringent for bicyclists, and that might otherwise not be detected or repaired to the necessary standard. Examples of issues that require particular attention are drain grates; cracked, uneven, or unswept surfaces—particularly of outside curb lanes, paved should-

ders, or bike lanes; poor drainage; and slippery surfaces such as pavement markings, railroad crossings, utility covers, damaged pavement and others.

# Appendix 1 – Resources for Trail Managers

There's a vast amount of information available for trail managers. This isn't intended to replace, supersede or duplicate any of those efforts, but merely to suggest a good direction in which to start.

Rails-to-Trails Conservancy (RTC) maintains four Web sites and a listserv:

[www.railtrails.org](http://www.railtrails.org) — General information about RTC.

[www.trailsandgreenways.org](http://www.trailsandgreenways.org) — Information for trail planners, builders and maintainers.

[www.ntec.org](http://www.ntec.org) — National Transportation Enhancements Clearinghouse.

[www.traillink.com](http://www.traillink.com) — Trail-finder service.

In addition, RTC maintains the Trails and Greenways listserv. This is an e-mail forum for the discussion of trails and greenways issues. You can ask a question and have it instantly distributed to hundreds of your colleagues across the country. It's a quick and easy way to get assistance, advice and a variety of perspectives.

You can subscribe to the listserv by sending an e-mail to [trailsandgreenways-subscribe@yahoogroups.com](mailto:trailsandgreenways-subscribe@yahoogroups.com). You will receive a welcome message with instructions on how to access listserv archives and other advanced features by registering with Yahoo, if you choose to do so.

American Trails — [www.americantrails.org](http://www.americantrails.org)

National Trails Training Partnership — [www.nttp.net](http://www.nttp.net)

American Hiking Society — [www.americanhiking.org](http://www.americanhiking.org)

National Trails Day — [www.nationaltrailsday.org](http://www.nationaltrailsday.org)

RTC, American Trails (which also hosts National Trails Training Partnership), and American Hiking Society (which also facilitates National Trails Day and the National Trails Directory) all provide numerous additional resource links.

For resources more specifically related to the region covered by this study, please visit RTC's Northeast Regional Office at [www.railtrails.org/field/northeast/default.asp](http://www.railtrails.org/field/northeast/default.asp).

# Appendix 2 – Maintenance Schedules

Twenty-five trails responded with more detailed information about when various maintenance tasks are done. Topping the list of daily tasks were patrols by police and non-police agencies, followed by cleaning of restrooms. On a weekly basis, trails often do light clean-up work on the trail and trailheads, empty trash cans, do additional restroom cleaning, and cut the grass. Trails that don't have the resources to get to these things on a weekly basis do them monthly. It is quite common, especially for all-volunteer operations, to have monthly work days. Once a year seems to be a good frequency for applying herbicides, cleaning culverts, inspecting bridges, and catching up on non-critical repairs. Hands down, "as needed" is the most common frequency for all maintenance tasks except for trash and toilets. Here is the table of responses:

**Table 16: Frequency of Common Maintenance Tasks**

Maintenance Activity	How often is it done?						
	Day	Week	Month	Quarter	Year	As Needed	Other
Repaving of asphalt trail						5	
Coating or sealing of asphalt trail						5	5 years
Pothole repair on asphalt trail						5	
Snow removal from asphalt trail						6	
Surface cleaning of asphalt trail		1	2	1		4	
Pavement markings maintenance and replacement					2	3	
Resurface non-asphalt trail						12	
Grade non-asphalt trail					2	8	
Pothole repair and other patches on non-asphalt trail				1		13	
Snow removal from non-asphalt trail						2	
Surface cleaning of non-asphalt trail				1		5	
Keep trail-side land clear of trash and debris	1	4	5		3	9	
Mowing		7	5	1	2	6	
Leaf removal			2		3	8	
Tree pruning		1	1		3	17	
Tree removal			1		1	17	
Invasive species removal			1			12	
Planting new vegetation					1	7	
Application of herbicides or pesticides					5	6	
Clearing of drainage channels and culverts					4	18	
Surface maintenance of parking areas		2		1	3	12	
General maintenance of trailheads (litter clean-up, etc.)	1	6	1		1	9	
Landscaping/gardening at trailheads		4	2	1	2	4	
Empty trash cans at trailheads		2	3	1			2

Maintenance Activity	How often is it done?						
	Day	Week	Month	Quarter	Year	As Needed	Other
Maintenance of stationary toilets at trailheads (clean, empty, etc.)	4	2				1	
Maintenance of portable toilets at trailheads (clean, empty, etc.)		6				2	
Empty trash cans along trail		4				1	
Maintenance of stationary toilets along trail (clean, empty, etc.)	1	2					
Maintenance of portable toilets along trail (clean, empty, etc.)		2					
Maintenance of informational kiosks (repairs, etc.)		1	3		1	8	
Maintenance of picnic tables, benches, etc.				1		10	
Updating information in informational kiosks		2	1	2	1	8	
Installation of signs					1	19	
Repair/maintenance of signs					3	17	
Installation of pavement markings						4	1
Maintenance of pavement markings						3	
Patrols by police agency	7	1				5	random
Patrols by non-police agency (e.g. trail watch)	5	3				1	ongoing
Recovery from illegal acts such as dumping and vandalism	3		1		1	11	
Installation of lighting						1	
Maintenance of lighting						2	
Installation of emergency call boxes							--
Maintenance of emergency call boxes							--
Installation of gates, bollards and fencing						11	
Maintenance of gates, bollards and fencing			1			16	
Bridge, tunnel, underpass and crossing inspection	1	1		1	3	6	2-3 years
Bridge redecking						14	
Paint/stain/treat bridge deck or structure					1	6	
General bridge maintenance					2	14	
Tunnel lighting maintenance							--
Tunnel open/closed status							--
Paint tunnel/underpass walls and ceiling						2	
General tunnel/underpass maintenance						4	
Railroad grade crossing maintenance					1	4	
Road grade crossing maintenance		1			1	11	

The Chester County (Pennsylvania) Parks and Recreation Department submitted this detailed maintenance schedule for the Struble Trail:

Activity	January					February					March					Total Hours
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	
Mowing													5			5
Trimming													5			5
Trash	2	2	2	2		2	2	2	2		2	2	2	2		26
Weeding													2			2
Invasive spraying																0
Bush hog																0
Signage																0
Fence repair												10				10
Pruning																0
Invasive pruning												20				20
Designated projects																0
Culverts																0
Gates																0
Bridge inspection									0.5							0.5
Grade ditches																0
Crosswalks																0
Trail surface																0
Flower bed planting																0
Storm damage																0
Vandalism																0

Activity	April					May					June					Total Hours
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	
Mowing	5		5	5		5	5	5	5	5	5	5	5	5		60
Trimming	5		5	5		5	5	5	5	5		5	5	5		60
Trash	2	2	2	2		2	2	2	2	2	2	2	2			26
Weeding				2					2					2		6
Invasive spraying						10										20
Bush hog				16												16
Signage									20							20
Fence repair												10				10
Pruning			40													40
Invasive pruning																0
Designated projects												120				120
Culverts																0
Gates	6					6										12
Bridge inspection																0
Grade ditches																0
Crosswalks	6															6
Trail surface									16							16
Flower bed planting		10														10
Storm damage																0
Vandalism																0

Activity	July					August					September					Total Hours
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	
Mowing	5		5		5	5		5	5			5	5		5	45
Trimming	5		5		5	5		5	5			5	5		5	45
Trash	2	2	2	2	2	2	2	2	2		2	2	2	2	2	28
Weeding				2					2					2		6
Invasive spraying	10					10					10					30
Bush hog											16					16
Signage								20								20
Fence repair							10									10
Pruning												40				40
Invasive pruning																0
Designated projects								120								120
Culverts																0
Gates																0
Bridge inspection																0
Grade ditches																0
Crosswalks																0
Trail surface																0
Flower bed planting																0
Storm damage																0
Vandalism																0

Activity	October					November					December					Total Hours
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	
Mowing		5		5												10
Trimming		5		5												10
Trash	2	2	2	2		2	2	2	2	2	2	2	2	2		26
Weeding																0
Invasive spraying			10													10
Bush hog																0
Signage																0
Fence repair				10												10
Pruning																0
Invasive pruning							20									20
Designated projects																0
Culverts							8									8
Gates																0
Bridge inspection																0
Grade ditches						16										16
Crosswalks																0
Flower bed planting																0
Trail surface																0
Storm damage																0
Vandalism																0

# Appendix 3 — Budgets

As discussed in the narrative and demonstrated in the maintenance schedules in Appendix 2, trail maintenance is very much an ad-hoc/business. Maintenance is done "as needed" and as funds present themselves — an approach that does not lend itself to meticulous budgeting. A couple of trails were kind enough to submit detailed budgets, and those follow.

The Chester County (Pennsylvania) Parks and Recreation Department submitted this detailed budget for the Struble Trail:

Activity	Times	Man Hours	Wages	Equipment Hours	Equipment Costs	Materials Costs	Transportation Costs	Total
Mowing	24	120	\$1,957	96	\$499	\$0	\$408	\$2,864
Trimming	24	120	\$1,380	96	\$86	\$0	\$0	\$1,466
Trash	52	110	\$743	0	\$0	\$30	\$884	\$1,657
Weeding	7	14	\$133	0	\$48	\$30	\$0	\$211
Invasive Spraying	6	60	\$682	0	\$40	\$60	\$102	\$884
Bush Hog	2	32	\$431	30	\$252	\$0	\$36	\$719
Signage	2	40	\$540	0	\$20	\$200	\$34	\$794
Fence Repair	4	40	\$454	0	\$20	\$300	\$68	\$842
Pruning	2	80	\$1,271	40	\$80	\$0	\$34	\$1,385
Invasive Pruning	2	40	\$540	20	\$40	\$0	\$34	\$614
Designated Projects	2	240	\$3,814	80	\$672	\$1,400	\$136	\$6,022
Gates	2	12	\$162	0	\$10	\$10	\$0	\$182
Culverts	1	8	\$91	0	\$10	\$20	\$17	\$138
Bridge Inspection	1	0.5	\$10	0	\$0	\$0	\$0	\$10
Grade ditches	1	16	\$182	0	\$10	\$10	\$17	\$219
Crosswalks	1	6	\$69	0	\$4	\$10	\$17	\$100
Trail Surface	1	16	\$182	0	\$5	\$30	\$17	\$234
Flower Bed Planting	1	10	\$95	0	\$5	\$120	\$17	\$237
Storm Damage	4	30	\$341	10	\$21	\$50	\$68	\$480
Vandalism	3	20	\$318	0	\$10	\$240	\$51	\$619
<b>Grand Total</b>								<b>\$19,677</b>

The following was submitted for the Heritage Rail Trail County Park in York, Pennsylvania. The trail was developed by the York County Rail-Trail Authority, the only entity of its kind devoted exclusively to rail-trail development. The trail is now maintained by the York County Parks and Recreation Department.

Maintenance Activity	Approximate annual labor cost	Approximate value of donated services	Approximate annual equipment & material cost	Total annual cost
Resurface non-asphalt trail	\$70,000			\$70,000
Grade non-asphalt trail				\$0
Pothole repair and other patches on non-asphalt trail	\$1,000			\$1,000
Snow removal from non-asphalt trail				\$0
Surface cleaning of non-asphalt trail				\$0
Keep trail-side land clear of trash and debris	\$5,200	\$5,200		\$10,400
Mowing	\$25,000		\$9,320	\$34,320
Leaf removal	\$1,000			\$1,000
Tree pruning	\$3,200		\$1,800	\$5,000
Tree removal				\$0
Invasive species removal				\$0
Planting new vegetation				\$0
Application of herbicides or pesticides	\$4,000			\$4,000
Clearing of drainage channels and culverts	\$3 000			\$3 000
Surface maintenance of parking areas				\$0
General maintenance of trailheads (litter clean-up, etc.)	\$1,500	\$1,500		\$3,000
Landscaping / gardening at trailheads	\$4,000		\$4,000	
Empty trash cans at trailheads	\$1,500			\$1,500
Maintenance of stationary toilets at trailheads (clean, empty, etc.)	\$9,000		\$1,000	\$10,000
Maintenance of portable toilets at trailheads (clean, empty, etc.)	\$2,400			\$2,400
Empty trash cans along trail				\$0
Maintenance of stationary toilets along trail (clean, empty, etc.)				\$0
Maintenance of portable toilets along trail (clean, empty, etc.)				\$0
Maintenance of informational kiosks (repairs, etc.)	\$1,000			\$1,000

Maintenance Activity	Approximate annual labor cost	Approximate value of donated services	Approximate annual equipment & material cost	Total annual cost
Maintenance of picnic tables, benches, etc.	\$250		\$250	\$500
Updating information in informational kiosks	\$500			\$500
Installation of signs	\$3,000		\$1,200	\$4,200
Repair/maintenance of signs	\$1,000			\$1,000
Installation of pavement markings	\$3,300		\$4,500	\$7,800
Maintenance of pavement markings	\$700		\$700	\$1,400
Patrols by police agency	\$20,000		\$12,000	\$32,000
Patrols by non-police agency (e.g. trail watch)		\$3,000		\$3,000
Recovery from illegal acts such as dumping and vandalism				\$0
Installation of lighting				\$0
Maintenance of lighting				\$0
Installation of emergency call boxes				\$0
Maintenance of emergency call boxes				\$0
Installation of gates, bollards and fencing				\$0
Maintenance of gates, bollards and fencing	\$3,500		\$1,400	\$4,900
Bridge, tunnel, underpass and crossing inspection	\$2,500			\$2,500
Bridge redecking				\$0
Paint/stain/treat bridge deck or structure				\$0
General bridge maintenance	\$50,000			\$50,000
Tunnel lighting maintenance				\$0
Tunnel open/closed status				\$0
Paint tunnel/underpass walls and ceiling				\$0
General tunnel/underpass maintenance				\$0
Railroad grade crossing maintenance	\$3,000			\$3,000
Road grade crossing maintenance	\$2,200			\$2,200
<b>Totals</b>	<b>\$146,750</b>	<b>\$13,700</b>	<b>\$32,170</b>	<b>\$192,620</b>

The following budget was submitted for the Capital Area Greenbelt in Harrisburg, Pennsylvania.

Maintenance Activity	Labor cost	Donated services	Equipment & material cost materials	Donated equipment & cost for activity	Approximate total annual
Resurface non-asphalt trail		\$2,000	\$2,000	\$3,500	\$7,500
Grade non-asphalt trail					\$0
Pothole repair and other patches on non-asphalt trail		\$1,000	\$500	\$1,500	\$3,000
Snow removal from non-asphalt trail					\$0
Surface cleaning of non-asphalt trail					\$0
Keep trailside land clear of trash and debris		\$1,000	\$1,000		\$2,000
Mowing		\$2,000	\$1,000	\$2,000	\$5,000
Leaf removal					\$0
Tree pruning					\$0
Tree removal	\$500	\$800	\$200	\$1,000	\$2,500
Invasive species removal		\$1,000	\$500	\$800	\$2,300
Planting new vegetation		\$3,000	\$2,000	\$3,000	\$8,000
Application of herbicides or pesticides		\$1,000	\$300	\$1,000	\$2,300
Clearing of drainage channels and culverts		\$500	\$200	\$500	\$1,200
Surface maintenance of parking areas	\$2,000	\$1,000	\$300	\$1,000	\$4,300
General maintenance of trailheads (litter clean-up, etc.)		\$200	\$100	\$500	\$800
Landscaping / gardening at trailheads		\$3,000	\$2,000	\$3,000	\$8,000
Empty trash cans at trailheads	\$1,500		\$2,000	\$2,000	\$5,500
Maintenance of stationary toilets at trailheads (clean, empty, etc.)					\$0
Maintenance of portable toilets at trailheads (clean, empty, etc.)					\$0
Empty trash cans along trail					\$0
Maintenance of stationary toilets along trail (clean, empty, etc.)					\$0
Maintenance of portable toilets along trail (clean, empty, etc.)					\$0
Maintenance of informational kiosks (repairs, etc.)					\$0

Maintenance Activity	Labor cost	Donated services	Equipment & material cost materials	Donated equipment & cost for activity	Approximate total annual
Maintenance of picnic tables, benches, etc.					\$0
Updating information in informational kiosks		\$300	\$100	\$200	\$600
Installation of signs		\$200	\$300	\$500	\$1,000
Repair/maintenance of signs		\$200	\$300	\$500	\$1,000
Installation of pavement markings					\$0
Maintenance of pavement markings					\$0
Patrols by police agency	\$30,000				\$30,000
Patrols by non-police agency (e.g. trail watch)					\$0
Recovery from illegal acts such as dumping and vandalism					\$0
Installation of lighting	\$100		\$100		\$200
Maintenance of lighting	\$200		\$500		\$700
Installation of emergency call boxes					\$0
Maintenance of emergency call boxes					\$0
Installation of gates, bollards and fencing	\$1,000	\$200	\$100	\$20,000	\$21,300
Maintenance of gates, bollards and fencing	\$300	\$10,000	\$200	\$15,000	\$25,500
Bridge, tunnel, underpass and crossing inspection	\$50	\$50	\$50	\$50	\$200
Bridge redecking					\$0
Paint/stain/treat bridge deck or structure	\$300	\$600	\$300	\$1,000	\$2,200
General bridge maintenance	\$100	\$500	\$1,000	\$1,000	\$2,600
Tunnel lighting maintenance					\$0
Tunnel open/closed status					\$0
Paint tunnel/underpass walls and ceiling					\$0
General tunnel/underpass maintenance					\$0
Railroad grade crossing maintenance					\$0
Road grade crossing maintenance					\$0
<b>Totals</b>	<b>\$36,550</b>	<b>\$28,550</b>	<b>\$16,050</b>	<b>\$58,050</b>	<b>\$139,200</b>

**BY LAW:**  
**REGULATING USE OF TOWN OF MILFORD BICYCLE PATHS,  
TRAILS AND ASSOCIATED AREAS**  
**(Town Meeting Approved 10/18/04, Article 1)**  
**(As revised per the Attorney General January 7, 2005)**

**Section 1. DEFINITIONS**

All-Terrain Vehicle (ATV) or Off-Road Vehicle (ORV)- Any motor powered vehicle for Off-Road or All-Terrain use, whether designed or modified for cross country travel without benefit of a road or trail, on or over land, snow, ice, wetland or other natural terrain. This definition includes but is not limited to tracked or three or four wheeled vehicles, motorcycles or related two wheeled vehicles, amphibious machines, air cushion vehicles or any other means of transportation deriving motive power from a source other than the use or exertion of the human muscle or a natural source such as the wind.

Bicycle - A non-motorized vehicle, powered by peddling or other human exertion, consisting of a frame mounted on a wheel or wheels and generally having a seat, handlebar for steering and pedals for human propulsion.

Bicycle Path - Any way designated or constructed by the Town of Milford specifically for non-motorized bicycle use for public recreation and transportation. Bicycle Paths are typically paved, signed, and have structures (gates, bollards, etc.) to control or exclude motorized vehicular access.

Handicap or HP Vehicle - A vehicle or device utilized to provide mobility to a person who would otherwise be prohibited from access because their physical ability of movement would otherwise be challenged or impaired.

Motor Vehicle - Any motorized vehicle as defined in G.L. c. 90 s. 1, or any motorized vehicle or vehicle capable of motorized operation, not so defined by G.L. c. 90 s. 1, to include, but not be limited to, automobiles, trucks, motorcycles, snow vehicles, mopeds, scooters, mini-bikes, pocket-bikes, ORV's, or ATV's.

Mountain Bicycle - A two wheel non-motorized bicycle designed to be used both on and off paved surfaces or over unimproved terrain.

Operate - To ride in or on, and be in actual physical control or the operation of a vehicle.

Official Traffic Control Devices - All signs, signals, markings, and devices placed or erected by the Town of Milford for the purposes of guiding, directing, warning or regulating use of the Bicycle Paths and related areas.

Pedestrian - A person who is walking, jogging, or running.

Person - Any individual, firm, partnership, corporation, company, association, or body politic, or any combination of individuals, including any agent, trustee, executor, receiver, assignee, or other representative of any kind, except the United States, the Commonwealth of Massachusetts, the Town of Milford or other City or Town body politic, and the agents, representatives, or employees or said governmental units.

Rail Trail - Any former railroad right-of-way utilized by the Town of Milford for public recreation and transportation. Rail Trails are typically paved, signed, and have structures (gates, bollards, etc.) to control motorized vehicular access.

Snow Vehicle - A motor powered vehicle designed to travel over snow or ice, supported in whole or in part by skis, belts, cleats or tracks.

Traffic - Pedestrians, ridden or herded or walked animals, bicycles, vehicles, buses and other conveyances either singularly or together while using any way for the purpose of travel.

Vehicle - Every device in, upon or by which any person or property is or may be transported or drawn upon a way.

## **Section 2. GENERAL PROVISIONS**

The provisions of this By-Law shall be liberally construed to permit the Town of Milford and designated law enforcement officers to ensure and enforce the proper use of the bicycle paths and trails in accordance with these regulations and the intended use of said paths and trails.

## **Section 3. REGULATIONS FOR USE OF BICYCLE PATHS AND RAIL TRAILS, AND ASSOCIATED AREAS**

a. No person, shall use or operate a motorized vehicle or device of any kind, or a device or vehicle capable of motorized operation, except Authorized maintenance vehicles, Emergency vehicles of the Police Department, Fire Department, Emergency Medical Services, or other emergency service upon or within the Town of Milford Bicycle Path or Trail, or associated areas, to include but not be limited to an automobile, truck, motorcycle, snow vehicle, moped, scooter, mini-bike, pocket-bike, ORV, or ATV, unless said area is specifically designated for the parking, placement or operation of motorized vehicles.

Motorized vehicles of any kind or type shall not be operated or placed upon or within a Town of Milford Bicycle Path or Trail, except if said vehicle or device is being utilized to provide mobility to a handicapped person who would otherwise be prohibited from access because their physical ability of movement would otherwise be challenged or impaired and provided further that said vehicle or device is not an automobile, truck, motorcycle, snow vehicle, moped, scooter, mini-bike, pocket-bike, ORV, or ATV.

b. Any motorized vehicle, as defined in G.L. c. 90 s. 1, found in or upon a Town of Milford Bicycle Path or Rail Trail, or associated areas, unless specifically authorized, shall be subject to towing and storage upon the order and direction of a law enforcement officer in accordance with the provisions of G.L. c. 266 s. 120D. Any motorized vehicle, or vehicle capable of motorized operation, not so defined by G.L. c. 90 s. 1, shall be subject to removal by a law enforcement officer by towing and storage in a convenient location. Neither the town, nor its chief of police or his designee, shall be liable for any damages incurred during the removal or storage of any such vehicle removed under this section or in accordance with G.L. c. 266 s. 120D.

c. No person shall utilize the Town of Milford Bicycle Path or Trail, or associated areas, for horseback riding or any purpose other than for recreational or transportation purposes via bicycle riding, roller skating, rollerblading, walking, jogging, running, snow shoeing, or cross country skiing, all of which may only be accomplished by human propulsion. Said users may ride, at a maximum, two-abreast only when it is safe to do so.

d. Bicycle Path and Trail users shall keep to the right; and when stopping, shall not block the path or trail.

- e. Authorized vehicles shall not exceed the posted speed limit, as established and posted by the Town of Milford, except that emergency vehicles may be operated at a speed in excess of the applicable speed limit provided that the operator exercises caution and due regard under the circumstances for the safety of persons and property, and said vehicle may be driven through an intersection of ways contrary to any traffic signs or signals regulating traffic at such intersection provided the operator first brings such vehicle to a full stop and then proceeds with caution and due regard for the safety of persons and property, unless otherwise directed by a police officer regulating traffic at such intersection.
- f. When approaching a walker, jogger, or runner, the operator of a bicycle or mountain bicycle shall immediately slow their vehicle to a minimum safe operating speed, shall give such pedestrian the right of way, shall not pass until there is a reasonable distance of not less than 50 feet from such person. Bicycle operators shall stop their vehicle, when necessary, to yield the right of way or to prevent an accident. Wherever possible, pedestrians and bicyclists shall keep to the right side of the Bicycle Path or Trail. When passing, Bicycle Path and Rail Trail users shall alert others with an audible signal (voice, bell or horn), and shall pass to the left only when it is safe to do so.
- g. Bicycle Path and Rail Trail users shall stop at intersections and obey all regulatory signs and pavement markings.
- h. All users of Town of Milford Bicycle Paths and Trails, or areas associated therewith, shall yield the right of way to police, fire, emergency medical services or other emergency vehicles.
- i. Town of Milford Bicycle Paths and Trails may be used after dark for transportation and commuting purposes provided that the vehicle is equipped with a white light to the front and a red light to the rear that are visible for at least five hundred (500) feet. Pedestrians must have reflectorized material on their outer garments.
- j. No person shall engage in disorderly conduct including rough play, pushing, shoving and fighting or use obscene language or fighting words while within the confines of a Town of Milford Bicycle Path.
- k. No person shall engage in games which, due to the location or nature of the activity, may cause or tend to cause discomfort, fear or injury to any person, or property, while within the confines of a Town of Milford Bicycle Path or Trail.
- l. No person shall promote, sponsor or engage in any race, rally or organized trials event on or within a Town of Milford Bicycle Path or Trail, or associated areas, except upon compliance with all By-Laws of the Town of Milford and permission and licensing by said Town.
- m. No person shall consume or possess an open container of alcoholic beverages while within the confines of a Town of Milford Bicycle Path or Trail, or any area associated therewith.
- n. No person shall leave, place or dispose of in any manner, trash, litter, refuse, garbage, sewerage or other material upon said Town of Milford Bicycle Path or Trail, or associated areas, except trash materials designated to be placed within designated trash receptacles.
- o. No person shall solicit, sell, rent, advertise or offer to sell, rent, hawk, peddle, display or distribute any goods, wares, tangible or intangible property, merchandise, liquids or edibles, or services for hire, or render any services for hire, upon any Town of Milford Bicycle Path or Trail, or associated areas, except upon compliance with all By-Laws of the Town of Milford and permission

and licensing by said Town. No person shall distribute, erect, or fix any handbill, circular, pamphlet, placard, sign, notice, billboard, poster or any printed matter in or upon any Town of Milford Bicycle Path or Trail, or associated area, except upon compliance with all By-Laws of the Town of Milford and permission and licensing by said Town. Upon approval, licensing and compliance with the By-Laws of the Town of Milford, the licensed or approved person shall be responsible for removal of all displays and any trash, litter, refuse, garbage, sewerage or other material resulting from said licensing or permission.

p. No person shall enter upon private property from a Town of Milford Bicycle Path or Trail, or any area related thereto, except upon authorization of the owner or person having control of said property.

q. All laws, by-laws, ordinances, regulations, pertaining to public places shall apply to all paths, trails and areas related to Town of Milford Bicycle Paths.

#### **Section 4. ENFORCEMENT; VIOLATIONS; ARRESTS; PENALTIES**

a. Whoever is found not to be in conformance with the requirements of Section Three, shall be in violation of the Town of Milford By-Laws.

b. Violations shall be punished by a fine of one hundred dollars for the first offense and two hundred fifty-dollars for each subsequent offense.

c. Whoever violates the provisions of this By-Law may be arrested by a police officer authorized to serve criminal process in the Town of Milford, and may be kept in custody in a convenient place, not more than twenty-four hours; Saturday, Sunday, and Legal Holidays excepted, until they can be taken before a court so that a complaint can be made against them for the offense and then be taken upon a warrant issued upon such a complaint.

In addition to any other penalty provided by law, the registered owner of a vehicle towed and/or stored in compliance with this section or G.L. c. 266 s. 120D, shall be liable for charges for the removal and storage of such vehicle; provided, however, that the liability so imposed for the towing and storage is in conformance with the provisions of G.L. c. 159B s. 6B. However, the tow operator may, at his discretion, if the owner appears before the towing is completed, charge said owner one half of the fee usually charged for such towing.

#### **Section 5. COMPLIANCE WITH GENERAL LAWS, BY-LAWS, AND REGULATIONS:**

In addition to the provisions of the Town of Milford By-Law concerned with Regulating Use of Town of Milford Bicycle Paths, Trails and Associated Areas, said persons shall comply with all other by-laws and regulations of the Town of Milford and General Laws of the Commonwealth of Massachusetts.