Summit County Non-Motorized Trails Master Plan Update

Produced: March 17, 1993

Produced for: Summit County Commission

Produced by: Summit County Trails Master Plan Update Committee with technical assistance from Mountainland Association of Governments.
# Table of Contents

## Section I. Objectives and Policy Section

- **Introduction** 3
- **Assumptions** 3
- **Methodology** 4
- **Objectives** 4

### Policy Statements

1. A trail system is an asset to the Summit County community 6
2. Development of a comprehensive trail network 7
3. Liability 8
4. Development of a safe multiple-use trail system 10
5. Trail user courtesy 11
6. Environmental sensitivity 11
7. Trail standards and Summit County character 12
8. Trail-user and Community Needs 12
9. Long-Term Maintenance Policies and Standards 13
10. Special events 13

## Section II. Trail Construction and Construction Standards Section

- **Introduction** 17

### General Standards and Guidelines

1. Trail sitting 17
2. Trail separation 18
3. Trail along existing development streets 18
4. Security for trail improvements 18
5. Trail easements 18
6. Phasing of trail improvements 18
7. Temporary trail easements and/or improvements 19

### Environmental Sensitivity

1. Guidelines for environmentally sensitive sites 19
2. Guidelines for environmental hazards 21
3. Guidelines for micro climate trail use opportunities 21

### Utilities

1. Placement 21
2. Site disturbance
3. Access

Access For The Disabled

Trail Types
1. Paved Multiple Use
2. Unpaved Multiple Use High Volume
3. Unpaved Multiple Use
4. Back Country Multiple Use
5. Painted Lane

Construction Standards
1. Trail types guidelines
2. Clearance guidelines
3. Trail surfacing guidelines
4. Drainage
5. Water bar
6. Permanent slope stabilization
7. Cut and fill slopes
8. Slope stabilization
9. Re-vegetation
10. Gabions
11. Switchbacks
12. Bollards and barriers
13. Bicycle safe drainage grates
14. Fencing
15. Stairways
16. Boardwalks
17. Root barriers
18. Signs

Section III. Maintenance and Operation Section

Introduction

Summary of Policy Statements

Maintenance Guidelines
1. County maintained trails
2. Paved Multiple Use
3. Unpaved Multiple Use
4. Back Country Multiple Use
5. Painted Lane
Long-Term Maintenance Standards
   1. Maintenance Assumptions
   2. Paved Multiple Use
   3. Unpaved Multiple Use
   4. Back Country Multiple Use
   5. Painted Lane

Construction Guidelines To Reduce Maintenance and Environmental Impacts
   1. Trail location and construction
   2. Snow removal
   3. Sensitive areas

Appendices
   A. Public Input
   B. Construction Standards
   C. Sign Standards
   D. Federal Highway Administration Supplement for Bicycle Traffic Management
   E. Park City Corporation 1992 Trails Cost Estimation
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Objectives and Policy Section

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Introduction

This section Summit County Trails Master Plan Update is intended as a supplement to the Summit County General Master plan. It was produced for decision makers and advisory boards, such as: the County Board of Commissioners, Mayors, Recreation oriented Task Forces, County Planning Department, Snyderville Basin Recreation District Board, Home Owners Associations and trail oriented groups. The Trails Master Plan Update is intended to facilitate the development of a recreation and alternative transportation system for all non-motorized forms of transportation. This plan is primarily a document for planning and securing a county-wide trail system. It is not intended to set forth strict standards, but to present sound guidelines for the location, policies, type, and construction of trails.

This master plan may additionally be used to set policy for staff regarding trail acquisition, development and maintenance; give direction regarding priorities for trail funding; provide ideas and options for trail funding; and set policy guidelines for special events. Policy regarding trail implementation priorities, and direction on special projects such as: community volunteer projects, community information materials, user information materials, and user conflicts management, are also included.

The trails master plan is divided into three sections plus several appendices including: Objectives and Policy Section, Trail Construction and Construction Standards Section and a Maintenance and Operation Section. Appendices: A. Public Input, B. Construction Standards Drawings, C. Sign Standards Drawings, D. Federal Highway Administration Traffic Control For Bicycle Facilities E. Park City Corporation Trails Master Plan Cost Estimation for installation; short term; and long term maintenance. This complement known as the Summit County Non-Motorized Trails Master Plan update is designed to meet the needs of the County Commission, Planning Staff, County Engineer, and Building Department. The Planning Staff is responsible for interpreting the master plan document.

This document is not intended to regulate the use, maintenance or development of any privately owned or operated trails or existing trails or old roads located on private property that are not part of a county system.

Assumptions

Summit County trail use has increased dramatically in recent years. As Summit County grows and as development is constructed there is an increasing demand for multi-use trails to provide safe access for children commuting to schools, provide/retain recreational opportunities, and create an alternative transportation system.

There is a desire in the community to better identify and preserve existing trails, and there is support for trail development. Mountainland Association of Governments, in a recreation needs assessment identified trails as the county-wide number one need. Other entities have
expressed an interest in trail planning including: the Rails-to-Trails Committee, the Chamber Bureau, utility companies servicing Summit County and the Park City Fire District has expressed an interest in developing joint utility, fire access, and trail corridors.

The Summit County Trails Master Plan document and maps are designed to supersede the 1983 Snyderville Basin trails Master plan.

Methodology

A planning process/schedule was drafted and adopted by the task force for the development and submittal of a final set of maps and a final document that would be a credible and publicly defendable document.

The 27 member task force met on several occasions to develop a first draft of the document. The Document was distributed and presented to the planning commission, Board of County Commission and the Planning Staff. The task force met several times to document known trail connections and trail corridor concepts. The task force then conducted two public hearings in both the Snyderville Basin and in Coalville City for trail alignment input from the general population. An inventory of trails was developed for each of the three planning districts, North Summit, South Summit and the Snyderville Basin planning district. The draft plans were then subjected to the analysis and scrutiny of several focus group meetings of invited trail users including a mountain bike/cross county ski group, an equestrian group and a hiking group. At the focus group meetings the participants were asked to consider the cost of operation and maintenance of a county trail system and also the policy and objectives section of the plan which encourages a trail system to making connections with: community parks, schools, resorts, the Great Western Trail, High Uinta's high line trail, Historic Union Pacific Rail Trail, The Mormon Pioneer Trail, the Winter Sports Park Trail, trails in Jordanelle, Rockport and Echo Reservoirs, dedicated public open space, subdivisions, communities, and incorporated cities.

The result of the focus group analysis was then interpreted in terms of trail type (dirt/ asphault) and the optimal trail alignment based on the available information. After analysis the documents were presented to the task force for final comment and critique. The task force decided that all the inventoried trails should be documented along with the focus group analysis for future planning efforts. The finalized maps and document was then presented to the planning commission and planning staff for their recommendation.

Objectives

The objectives of the Summit County Trails Master Plan Update are as follows:

1. To develop policies, standards, and an updated trails plan which will provide direction for the community to develop an area-wide trails network.
2. To provide the following benefits and opportunities to the Summit County Community:
   a. Improve the general quality of life in the community.
   b. Provide a more aesthetic and multiple-use experience than traditional sidewalks.
   c. Provide non-motorized routes for pedestrians, equestrians, and bicyclists.
   d. Provide handicap access in portions where access is appropriate and reasonable.
   e. Anticipate and design an interconnecting trail system.
   f. Preserve access to existing trails within and outside of the county limits.
   g. Tie to present and future trails in Wasatch, Utah, Morgan and Salt Lake Counties.
   h. Trail use is split between residents, destination visitors, and day visitors from the Salt Lake City metropolitan area. Various user activities include: hiking, walking, bicycling, jogging, roller blading, horseback riding, etc. The trail system should accommodate these multiple-uses and users.
   i. Plan for the future- The trail system should design a non-motorized commuter system to lessen vehicular traffic in Summit County
   j. Consider school bus stops when developing the trails master plan map with the notion of developing improved pedestrian access to these areas.
   
   K. Connect important open space and recreation oriented landscape parcels.

3. To address existing or anticipated problems:
   a. Provide information about liability to landowners regarding the granting of public access onto existing roads and trails.
   b. Currently there is no county department prepared to provide substantially increased maintenance of new or existing trails within the community. This document will provide options and recommendations for long-term maintenance of trail systems.
   c. Provide opportunities for public access to historically used trails on private
lands.

d. Provide recommendations to increase user compatibility between various user groups.

Policy Statements

Following are several general policy statements. Each is further elaborated with goal and objective statements to implement individual policies. These are intended to provide some specific direction to the policy statements. As the community grows and changes and as user preferences change over time the specific recommendations may also change. However, the more general policy statements and goals should remain the same.

1. A trail system is an asset to the Summit County community - Trails are an asset to the Summit County community. As the county grows, trails can mitigate other aspects of development. The Summit County trail system should be aesthetically pleasing and contribute to the general quality of life in the community.

The Summit County trail system should connect public and private recreational amenities. Amenities to consider are: community parks, schools, resorts, Great Western Trail, High Uinta’s high line trail, Historic Union Pacific Rail Trail, The Mormon Pioneer Trail, the Winter Sports Park Trail, trails in Jordanelle, Rockport and Echo Reservoirs, dedicated open space parcels, golf courses, and other private recreational facilities.

Where feasible, trails should be separated from motorized transportation corridors as snow removal and general maintenance are less costly, users are generally safer, and recreational experiences are enhanced on paths which are separate from roads.

As various portions of the trail system are developed, uniform materials, surfacing, and signs should be installed. For examples, refer to standard construction details.

The county trail system should provide opportunities for trail users to observe historic and ecological features which comprise Summit County’s alpine environment. Stream corridors, wet land edges, edges along forested areas, and drainage swells are often good areas for trail locations and wildlife interpretation. Trails within historic districts and historic mining areas, such as the Union Pacific Rail Trail should provide interpretation of these features.

As new development occurs, trails should be developed as green ways and located to take advantage of Summit County’s environmental qualities, including: views, natural vegetation, wildlife, geology and water features. Developed green ways should be aesthetically pleasing and provide a pleasant recreational experience. On steep slopes and highly vegetated areas, trail locations should be based upon trail user, topography and visual compatibility rather than along convenient property boundaries.
The Summit County trail system should help to mitigate growth and development, by providing open space corridors, green ways, and supporting the concept of no net loss of amenities.

2. Development of a comprehensive trail network - Summit County desires to develop a comprehensive network of trails for public access, connecting various parts of the community, preserving historic trails, and coordinating existing and future trail connections within and outside the legal limits of the County.

The Summit County trail system should provide safe non-motorized access: to schools for children, for recreation and fitness purposes, and along key transportation corridors. Trails should be constructed to accommodate year round pedestrian and bicycle access to schools, throughout the community and especially in areas within the school district which do not have school bus service.

Summit County should acquire and develop trail corridors in existing developed areas, according to identified priorities. Summit County should work with landowners in order to obtain public access to important existing and desired trail corridors.

New residential and commercial development should be required to develop trail connections and public easements as shown on the master plan maps. The developer should meet with county planning staff to interpret the county trails master plan and the plans relationship to the proposed development. This includes the consideration and possible connection of any trail concepts within the proposed development to the county trail system.

Future needs generated by new residential and commercial development may not be anticipated in the Plan. The Master Plan Map should be updated as new development occurs. Trails should be developed according to the master plan’s specified standards. Public access should be guaranteed through the dedication of public trail easements. In general trails should be required along all through streets within already developed parts of the county. New residential and commercial developments should incorporate trail systems. Wherever practical separated trail easements are preferred.

Trails should be planned and constructed according to anticipated uses. Trails which are serving or expected to serve multiple uses in the future should be constructed to accommodate those uses. For example, trails serving school children should be paved to allow for winter snow removal. The Trail Types part of the Policies and Guidelines for Trail Construction, Construction Standards and Maps section of this master plan provides specific information.

Summit County should examine alternatives for the acquisition of trail corridors according to the adopted trails master plan. Trail easement acquisition and development can be accomplished in a variety of ways including: purchase, donation, or condemnation of fee
title, prescriptive use, easements, leases or other possessory interests. Summit County should explore a variety of funding sources and mechanisms for the development of trails. Grants, special districts, transportation funds, joint-funding with other jurisdictions or agencies, exactions, and various taxing mechanisms are a few of the funding mechanisms which are available.

3. Liability - The Summit County Trails Master Plan should provide liability information to private landowners regarding the granting of public access to existing roads and trails, use of private property for public recreation purposes, and the intent of the Utah landowner liability act.

The Summit County Trails Master Plan is being implemented, in part, by requiring developers and landowners to include trails internal to and connecting through their property as part of the development review process. Developers, ski resort owners, and owners of undeveloped property adjacent to trail development have voiced concerns about landowner's liability. No activity is entirely free from exposure to liability, but the dedication, construction and operation of public trails can be at the low end of the landowner liability spectrum.

Utah has adopted the Landowner's Liability Act. The Utah version of this Act states,

"the purpose of this Act is to encourage public and private owners of land to make land and water areas available to the public for recreational purposes by limiting their liability towards persons entering thereon for those purposes." The Act further provides that "the owner of the land owes no duty of care to keep the premises safe for entry or use by any person using the premises for any recreational purpose, or to give any warning of a dangerous condition, use, structure or activity on those premises to those persons."

The Act also provides further protection for landowners, including limitations on representations as to safety of the premises, limitations on the duty of care owed to visitors and limitations on liability for injuries caused by the acts of visitors while on the premises.

The Utah Landowner Liability Act was construed by the Utah Supreme Court in Crawford v. Tilley, 780 P.2d 1248 (1989). The court in Crawford v. Tilley found the landowner not to be protected by the Utah Act because the premises on which the injuries occurred were not open to the public and were, in fact, posted "No Trespassing".

An annotation in American Law Reports suggests that counsel representing a landowner should consider, in advance of any litigation, the nature and number of warning signs that the landowner could place on his property so as to best take advantage of the protection from liability afforded by a recreational use statute. The annotation also suggests that counsel
should advise his client to post signs that warn of the danger but do not bar entry, such as 
one advising entering "At your own risk" (47 A.L.R. 4th 262).

In addition to the Utah Landowner Liability Act, the Summit County Board of 
Commissioners has passed Ordinance 196 An ordinance regulating recreational biking and 
hiking on designated trails in summit county:

"WHEREAS, the Summit County Commission recognizes landowners within 
Summit County who make their land or designated portions thereof available for 
public recreational purposes and afford themselves the liability protection 
contemplated by the Utah Landowner Liability Act (UCA 57-14-1, et seq.,) and,

WHEREAS, the Summit County Commission encourages development of 
designated recreation trails within the County and wishes to regulate the use of said 
trails in a manner which will safeguard and promote the health, safety, and welfare of 
trail users as well as landowners who directly or indirectly permit public use of their 
land for recreational purposes;

NOW THEREFORE BE IT ORDAINED BY THE BOARD OF 
COMMISSIONERS OF SUMMIT COUNTY, UTAH:

Section 1. It shall be unlawful for any person, for the purpose of 
biking, hiking, or other recreational activity, to willfully go upon any land 
area designated and posted unsafe or closed to recreational use by landowner, 
County Sheriff, Forest Service, or National Park Service.

Section 2. "Posted", as used in this Ordinance means:

(a) any personal communication by the landowner, representative of 
the owner, the Sheriff, the Forest Service, or National Park 
Service, or,

(b) fencing or other enclosures or barriers obviously designed to 
prevent unintentional access to an area; or,

(c) posting of signs reasonably likely to come to the attention of 
persons engaged in recreational use of another’s land.

Section 3. It shall be unlawful for any person for the purpose of 
biking, hiking, or other recreational activity to willfully leave the boundaries 
of any designated public recreational trail across privately owned lands without 
the consent of the landowner.

Section 4. Any person violating the provisions of this Ordinance shall 
be guilty of a Class C Misdemeanor, and be punished by a fine not to exceed 
$750.00 and/or confinement in the Summit County Jail for not more than 
ninety days.

ADOPTED AND PASSED by the Board of Summit County 
Commissioners this 28th day of January, 1992."
There are a variety of solutions to the liability concerns raised by private landowners when asked to allow public access on their properties for recreation purposes. The first, of course, is reliance on the applicable landowners' liability statute and posting of appropriate warning signs. Another alternative includes the leasing of trail and recreational use areas to the city or other governmental entity desiring public use. The more traditional method would be to convey or dedicate the trail or recreation use area to the county or other governmental entity in fee, thereby removing any status liability of the former landowner.

This is not to suggest that construction and operation of a public trails system is without liability whatsoever, but such activities probably expose landowners and sponsoring governmental agencies to much lower levels of liability for damage claims than most other activities. In fact, attempts by landowners to prevent public recreational access to their properties may actually remove the protection offered by the Act.

The Summit County Trail System should be located in new developments, in existing developed areas, and in undeveloped areas; landowner liability concerns should be addressed in each of these cases. To help address these concerns, an educational pamphlet describing different trail dedication possibilities and landowner responsibilities should be developed. In cases where public easements are dedicated or lease agreements are negotiated for public use with private landowners, the County should assume general liability responsibility in the same manner as for streets and other public areas.

4. Development of a safe multiple-use trail system - The design, development and implementation of the Summit County Trails Master Plan should consider safe multiple-use throughout the trail system.

Trail construction standards should include such things as: width, surface materials, slopes, appropriate sight distances, sign, and trail curvature, to provide a safe multiple-use trail system. Trail use types are identified on the Trails Master Plan Map. Different standards for various trail use types are delineated. See Trails Matrix for further guidelines.

Trails may have signs at trail heads and significant access points specifying allowed uses and user etiquette. Generally trails should be open to hikers, joggers, pedestrians and bicycles. Trails allowing equestrian access should be specifically designated. Some trails should be designated as pedestrian trails only, excluding mountain bike and equestrian access. Additional trails should be designated for cross country skiing and horse drawn sleighs or carriages as appropriate. Trails accommodating school children should be constructed for year round access. Roller blades and skateboards should be allowed only on designated trails. Trails should allow access for the physically impaired where appropriate and reasonable. Trails should not permit motorized vehicles except for emergency or maintenance purposes. Pet owners should manage pets in accordance with municipal and county laws.
5. **Trail user courtesy** - *Trail user courtesy shall be promoted and encouraged throughout the Summit County trail system.*

Summit County should encourage peer enforcement of trail rules and user courtesy on the trail system. Rules to consider that would promote user courtesy include:

a. All users should yield to horses.

b. Bicyclists should dismount when encountering horses on steep slopes.

c. Bicyclists should reduce speeds in areas of limited visibility and high volume multiple-use areas.

d. Bicyclists should alert other trail users with a bell, or some other audible signal when approaching from behind, or in locations with limited visibility.

e. All users should respect private property by staying on designated trails.

f. All users should avoid damaging activity patterns such as any activity that would accelerate erosion along a trail corridor, etc.

Community service in the form of trail maintenance could be implemented for trail rules violators.

The County should work with various organizations and participate in the development of educational materials as funding is available which promotes trail user safety and courtesy. Schools, bike shops and rental facilities and various user groups and organizations could work together to develop educational materials such as maps, brochures, tours, and handlebar fliers. Signs should be installed at trail heads and significant access points indicating; yield hierarchy, trail etiquette, and proper trail uses in an educational manner, (example: Please refrain from cross-cutting switchbacks, because it causes soils erosion).

6. **Environmental sensitivity** - *the trail system should be designed and constructed in an environmentally sensitive manner.*

In visually or environmentally sensitive areas, special location and/or construction methods should be used which protect the site from environmental or visual impact. Examples of visually or environmentally sensitive sites might include: wet lands, highly visible hillsides, areas with significant vegetation, highly erodible soils, unstable and/or steep slopes and ridge lines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines, site specific construction practices should be implemented to minimize environmental, visual or construction impacts. See the Construction Standards section of this document for specific environmental requirements.
Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards. See the Construction Standards section of this document for further details.

7. Trail standards and Summit County character - Summit County should develop a trail system which is functional and conforms to national standards, where applicable, while preserving the unique character of Summit County.

National standards are important when considering trail user safety, and the potential liability to the county. Due to the mountainous terrain and dynamic nature of outdoor recreation, national standards are not always practical for our county or available by any nationally recognized organization. Where practical and available, national standards should be followed.

Summit County’s unique mountain/recreation character is a valued quality. Trails should reflect that character in siting and materials. Wherever possible, materials indigenous to the site should be used during construction. Where the use of indigenous materials is not possible, use of historic materials should be considered.

8. Trail-user and Community Needs - Summit County intends to develop a trail network providing for the needs of residents, destination visitors, and day-use visitors.

Trail guides and/or maps provide greater access to trails for visitors to the area as well as enriching recreational and educational experiences for all trail users. Summit County encourages the development of trail guides and maps for trail users. Maps and guides might include:

a. Locations of trails, trail heads and a description of trail steepness.

b. Location of public and private facilities such as: drinking water, rest rooms, restaurants, parking, lodging, rental facilities and sports shops.

c. Public transportation routes.

d. Interpretive information.

The trail network should connect neighborhoods with important resident and visitor destinations. Important destinations in the county which should be considered include: cities, resorts, shopping areas, bus stops, schools, equipment rental facilities, libraries, convention facilities, parks and other land management agencies.

As new trails are developed, reasonable measures shall be taken to assure adjacent landowner
privacy. Fencing, landscaping and physical separation are several suggested ways to preserve adjacent landowner privacy.

As new trails are constructed and where funding allows, directional, safety, informational, and orientation signing should be installed along the major corridors of the trail system. Specific location of signs needs to be evaluated on a case by case basis. Placement guidelines are listed in the Construction Standards section of this document. The guidelines are intended to provide examples, general direction for signs, and placement. Final signing may not be possible until trails are constructed.

9. Long-Term Maintenance Policies and Standards - The long-term maintenance of trails is integral to the ultimate success of the trail system.

At the time of this writing the county had no clear-cut policy as to the maintenance of trails throughout the community. In general, the adjacent landowner or homeowner’s association is responsible for maintenance of dedicated trails adjoining or passing through their property. A variety of optional maintenance programs are set forth in the Maintenance and Operation Guidelines section of this document to provide decision-makers with comparable unit costs for various levels of county maintenance.

County maintenance levels are dependent on funding. It is expected that in the future the county may assume maintenance responsibility for specific trails. It is recommended that when street improvements are made, sidewalks and trails be installed at the same time in order to reduce costs and inconvenience. It is also recommended that higher volume multiple-use corridors be given priority over lower volume single-use trails, unless specific conditions warrant otherwise. Several maintenance guidelines are described in detail in the Maintenance and operation section of this Update plan.

10. Special events - Special events on parts of the trail system need to be accommodated and planned for, where possible, during the initial design phase.

The Summit County Trails Master Plan map should identify where special events are likely to occur. Locations of special events may include: historical locations, resort centers, new facilities, the rail-trail and where adequate facilities are available. In order to accommodate Summit County’s changing needs in the future, new special event locations should be evaluated and meet the following requirements:

a. Landowners adjacent to proposed special events locations should be notified

b. The planning department should review special event location compatibility and make recommendations to the Board of Commissioners regarding approval. Prior to approval, the Board of Commissioners may request review and comment from advisory boards or commissions.
A Special Events Policy and permitting requirements for trail events should be developed as part of Summit County's Large Public assembly licensing ordinance. It is recommended that any event which is publicly advertised and promoted for open public participation, or for private events for 50 or more persons, including spectators, should be required to obtain a permit from the County. Large public assembly licensing ordinance permitting procedure should consider the following: the number of rest rooms necessary to accommodate special events, insurance, trash clean-up, traffic control, security and parking.
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Trail Construction and Construction Standards Section

Produced: March 17, 1993

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Produced by: Summit County Trails Master Plan Update Committee with technical assistance from Mountainland Association of Governments.
Introduction

This section of the Trails Master Plan Update has been written to assist the Summit County Planning Department and the County Engineer throughout the trails planning, dedication and construction process. It is anticipated that the Planning Department will use these documents to: interpret trails policies for developers, determine specific trail alignment and tracking of trail locations, coordinate with the Engineer concerning trail construction and dedication for trail requirements, provide recommendations to the Planning Commission and Board of Commissioners regarding trail improvements and dedications. It is expected that the County Engineer will use this document to: coordinate with various utilities for joint use of trail corridors, manage and apply construction standards, inspect trails which are constructed as development requirements, review and approve trail easements and dedications. This document provides detailed specification information where operations are specific to trails. Refer to the current editions of the Uniform Building Code for operations which are not specified in this document.

Two other sections of this document: The Objectives and Policy Section and the Maintenance and Operations section, address the needs of the Board of Commissioners, trails oriented community groups and the Community Development Department. The above mentioned sections should be referenced for additional reference and detail information.

The Planning Staff is to be responsible for interpreting this section of the documents.

General Standards and Guidelines

As various portions of the trail system are developed, uniform materials, surfacing, and uniform signs should be installed.

1. Trail sitting

   a. Trails should be located and constructed in such a manner to reduce or minimize maintenance.

   b. Trails should follow the contours where possible and respect natural land forms.

   c. Drainage features such as water bars should be constructed where appropriate to reduce erosion.

   d. Trails should have a minimum 2% cross slope to allow drainage.

   e. Trail slopes should match expected user volumes and types. The Trails Matrix located in appendix B. provides specific guidelines for different trail
types.

2. Trail separation - Where feasible, trails should be separated from motorized transportation corridors. Snow removal and general maintenance are less costly when trails are separated from roads and parking lots. Users are generally safer on separated paths. Recreational experiences are enhanced on paths separate from roads. The amount of separation depends upon highway speeds and the size of parking areas.

   a. Minimum separation between trails and low speed streets or small parking lots is 10’.

   b. Minimum separation between trails and high speed streets or large parking lots may need to be as much as 50’.

   c. Along existing developed road easements and street rights-of-way separated trails may not be feasible. As much separation as possible is recommended.

3. Trail along existing developed streets

   a. Sidewalks should be required on through streets.

   b. Sidewalks in Cul-de-Sacs may not be necessary unless they provide necessary pedestrian connections.

4. Security for trail improvements - Where trails are required as part of a development project, a security shall be posted for the full cost of the trail improvements is required prior to the issuance of any occupancy permits or recordation of plats.

5. Trail easements - All trails which are open to the general public should be located on publicly dedicated property. There are a variety of mechanisms for this to occur. Within the public street rights of way and dedicated easements are the most common and acceptable forms of access rights. In special circumstances some other form may want to be considered. For example, a temporary easement across property which is not yet developed may be appropriate if the final location is likely to change in the future. The Trails Matrix provides recommended easement widths for the various trail types.

6. Phasing of trail improvements - When trails are part of a phased project the phasing of various trail segments shall follow a logical sequence for trail users. For example, trail construction may be required through an entire project to provide completed trail connections at an early phase in the project. At a minimum, trails shall be completed within each phase of a project at the time of the development of that phase so that trails are not constructed after a phase is completed. If the
ultimate trail type is not required at initial approval, at a minimum the ultimate easement width and some trail physical improvements should be required.

7. Temporary trail easements and/or improvements - In specific cases temporary trail easements and installations may be required. An example of such a need, might be on a large phased project where an trail exists but is slated to be relocated and dedicated in a future phase. In this case, a temporary trail easement is needed to access the existing trail until the future phase is constructed. Another example requiring a temporary trail easement would involve a landowner who has property they wish to develop in the future, have no specific development plans and are willing to allow trail access on an interim basis until such time as they decide to develop their property. A temporary easement could be granted to the County for trail purposes.

Environmental sensitivity

In visually or environmentally sensitive areas, special location and/or construction methods should be used which protect the site from environmental or visual impact. Examples of visually or environmentally sensitive sites might include: wet lands, highly visible hillsides, areas with significant vegetation, highly erodible soils, unstable and/or steep slopes and ridge lines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines and site specific construction practices should be implemented to minimize environmental, visual or construction impacts.

Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards. Various specific construction details and techniques are provided under specific construction standards.

1. Guidelines for sensitive sites.

   a. Limits of disturbance should be implemented to minimize construction impacts. Construction limits should be as small as practical to construct the trail. Significant vegetation and it’s root zone should be considered when locating the trail and establishing construction limits.

   b. Erosion control methods should be employed to protect areas adjacent to the trail from impacts during and after construction. Siltation fences, straw bales, detention basins, re-vegetation protection such as excelsior matting and slope protection methods are all examples of erosion control which may be required on specific sites.

   c. Indigenous materials should be used when constructing trail surfaces, retaining walls, bridges, and barriers wherever possible.
d. Native and/or self-sustaining plant materials should be used for re-vegetation of all disturbed areas where trails pass through native or non-irrigated sites. If plants are not self-sustaining, a permanent irrigation system shall be installed at the time of trail construction. Re-vegetation of natural areas should match the vegetation patterns of the tract surrounding the area to be re-vegetated.

e. Special location or construction methods may be necessary to reduce impacts and/or minimize disturbance. Rerouting a trail to avoid a hazard, narrowing the trail section through a limited area to preserve significant vegetation or exceeding recommended minimums or maximums in selected areas to reduce cut or fill slopes are examples of special locations of trails to reduce impacts. Examples of construction methods which could reduce impacts might include installing retaining walls to reduce cut and fill slopes on a visually prominent hillside, hand construction of the trail, stabilizing a mine hazard which is located within or adjacent to a trail corridor or installing a tree well around a significant tree to be preserved. The above examples are just that. Specific trail proposals through environmentally and visually sites shall be considered on a case by case basis.

f. Where significant wildlife or other natural features exist, special trail routing, construction and trail use should be considered.

g. Existing significant vegetation should be preserved wherever possible. Trees, riparian vegetation, scrub oak and rare plants are considered significant. Root zones as well as above ground vegetation require protection when preserving plants. In general, the area within the drip line of trees, especially on the down slope side of the vegetation, is sensitive to disturbance. If root zones are impacted or grades changed significantly, temporary irrigation may be necessary.

h. Trails which cross or are located adjacent to wet lands should be designed for minimal impact. Wooden boardwalks or other techniques may be necessary to impose minimal construction impacts. Wildlife needs should also be considered when sitting trails near wet lands.

i. Visually sensitive areas may require reduced cut and fill slopes, hand-construction, and low retaining walls to minimize site disturbance and visual intrusion.

j. Re-vegetation to provide screening, construction techniques to preserve vegetation, and trail routing techniques should be used to minimize visual intrusion.
k. In steeply sloped and highly vegetated areas, trails should be located for trail user compatibility rather than along convenient property boundaries.

2. Guidelines for environmental hazards.
   a. Where environmental hazards are present, special trail construction techniques or locations should be used to mitigate the hazard.
   b. Mine tailings should be stabilized, top soiled and re-vegetated.
   c. Trails should be located away from lightning prone areas, avalanche areas and raptor nesting sites, or should be closed seasonally when hazardous conditions are a problem.

3. Guidelines for micro climatic trail use opportunities.

Locate the trails for both summer and winter activities, where possible, given the terrain and climatic considerations. Identify snow retention areas for possible cross-country ski trails. In open areas, place trail alignment to take advantage of opportunities for shade and wind protection.

Utilities

The routing of utilities within trail corridors is generally encouraged. Locations which are visually or environmentally sensitive may restrict or preclude sharing utilities with trails. The following guidelines for placement, disturbance and access should be followed. See the Operations and Maintenance Guidelines for recommendations on maintenance and access agreements for utilities.

1. Placement

Utility lines that run parallel to the trail should be placed under the trail bed where possible to minimize site disturbance. Utility lines that are perpendicular to the trail and lateral lines should be located to minimize site disturbance and removal of significant vegetation. Physical obstructions such as utility pedestals, transformers and the like should be located so they are not a hazard to trail users. Access points which are not a physical obstruction, such as manhole covers should be located flush with the trail surface and where they do not pose a hazard to trail users.

2. Site disturbance

Construction of utility lines within naturally vegetated areas should minimize site disturbance wherever possible. All disturbance should be re-vegetated as per the re-vegetation requirements for trail construction. When disturbance is required after the trail is
constructed and operating, trail cut permits are required from the County Engineer. Bonding for this work may be required at the discretion of the County Engineer.

3. Access

Access for utility maintenance vehicles shall be evaluated on a case by case basis and provided for as part of the trail construction. Visually or environmentally sensitive sites may preclude full access to trail/utility corridors.

Access for the Disabled

At the time of this writing, the Americans with Disabilities Act of 1992 (ADA) had just been passed. Specific rules for the Act in general were not yet written and little information for required compliance for trails was available from national organizations. While it is clearly not practical for all types of trails in a alpine environment to be fully accessible to the disabled, the County will make every effort to comply with the standards set forth in this law where reasonably appropriate. Until such time as more definitive standards are set forth, this section of the master plan will provide a policy as to what trails are required to comply with this law and how the County will approach county improved trails. Actual compliance with ADA requirements will be determined by the County Building Division.

1. Trails Required to Comply with ADA. - All new trails which provide access between new parking lots and new public facilities such as recreation or institutional facilities, club houses, resort facilities, commercial or business facilities, etc. All new trails providing access to new public, private and institutional transportation facilities. Trail renovation or new trails which are located in existing developed areas of the community which meet the above access criteria shall comply with the ADA standards where reasonable and practical.

2. Trails Not Required to Comply with ADA - All soft surface trails.

Trail Types

1. Paved Multiple-Use
   8’ asphalt
   2’ dirt
   12 easement

   a. Where parallel and adjacent hard and soft surfaces are installed, the finish grade of the soft surface should be slightly below the hard surface so the hard surfacing helps to contain any loose soft surfacing material.

   b. Surface drainage should be prohibited from washing fines onto hard surfaced trails and creating a potential hazard to trail users.
c. Multi-use trails should be separated from streets or parking facilities wherever possible.

2. Un-Paved Multiple-Use High Volume
   8’ crushed rock
   10’ easement
   
   a. Surface drainage across soft surfaced trails should be designed to minimize erosion of the trail surface and edges.

3. Un-paved Multiple Use
   4’ crushed rock
   10’ easement
   
   a. Surface drainage across soft surfaced trails should be designed to minimize erosion of the trail surface and edges.

4. Back country Multiple-Use
   2’ dirt single track
   6’ easement
   
   a. Location - This trail types is intended for low volume recreational use and is anticipated and to be utilized to access rural/natural areas.
   
   b. Surface drainage across soft surfaced trails should be designed to minimize erosion of the trail surface and edges.

5. Painted Lane
   
   a. Uses - Painted bike lanes located within the street are intended for use by bicyclists only. They should not be used for other uses unless other elements prohibit the development of other facilities elsewhere.
   
   b. The following standards are recommended in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Standards for Bicycle Facilities Manual.

       1. Bicycle only lanes within a curb and gutter street should be a minimum of 5’ wide, one-way, and installed on either side of major collectors and arterial.

       2. Two-way bicycle lanes on one side of the street are not recommended.
c. Bike lanes should be installed at the same time that streets are paved. Installation of bike lanes on existing streets should be considered when an asphalt overlay is done.

d. Width of bike lanes shall be measured as a single integral surface. For example, a rolled concrete gutter shall not be included within the bike lane width nor shall a ravelled asphalt road edge.

e. Where street width allows, bicycle lanes can be installed between curbside parking and the travel lane. In this case, the minimum width for a one way bicycle lane is 4’.

f. Refer to appendix D. for all layout and intersection standards.

Construction Standards

1. Trail Types Guidelines

a. Anticipated Uses and Locations of Multiple Use paved trail.

Uses include all types of non-motorized use including: bicycles (road and mountain), pedestrians (walking, jogging, hiking), baby strollers, skate boards, roller blades, and horses (if soft surface is provided). Locations generally connect major areas, destinations and recreation facilities.

b. General Guidelines for Paved Paths with Bicycle Use

The following standards are recommended in accordance with the American Association of State Highway and Transportation Officials Standards for Bicycle Facilities Manual for separated bicycle facilities.

1. Minimum trail width of 8’ on asphalt surfaces.

2. A 2’ minimum horizontal clearance on either side of trail is recommended.

3. 10’ vertical clearance from the trail surface is recommended.

4. Bicycle path intersections and approaches should be on relatively flat grades. Sight and stopping distances at intersections should be adequate for the expected speed of trail users.

5. A 4" wide yellow non-skid center stripe should be painted on high volume asphalt trails to separate direction of travel or uses.
2. Clearance Guidelines (Horizontal & Vertical)

Trails which are used for cross country skiing and are steeper than 8% should have an increased minimum horizontal clearance of 8'. This increased width does not need to be cleared of all vegetation but should allow for skiers to snowplow when the trail is snow covered.

3. Trail Surfacing Guidelines

Weed or root barriers may be necessary where invasive vegetation is located adjacent to the trail or where one side of the trail is irrigated and the other side is not and where woody vegetation may seek water on the irrigated side of the trail. See the section on Weed Barriers for more specific information.

Asphalt, concrete and base specifications shall meet those set forth in this document. The 6' crushed rock trail surface may be substituted with a compacted 2" dolomitic limestone material meeting the following specification.

- Passing 1/2" screen - 100%
- Passing 3/8" screen - 97-99%
- Passing #4 screen - 75-80%
- Passing #8 screen - 50-55%
- Passing #16 screen - 30-35%
- Passing #30 screen - 20-25%
- Passing #50 screen - 17-20%
- Passing #100 screen - 13-17%
- Passing #200 screen - 12-15%
- Maximum water absorption - less than 3%

A compacted road base sub grade may be necessary under the dirt surface in areas with a high water table or poorly draining sub grade material.

If a wood or other edging material is used along any of the trail surfaces, care shall be taken to assure trail surface drainage. An edging is not recommended along soft surface trails. As the soft surface changes over time, the hard edge impedes drainage.

4. Drainage (Planning Guidelines)

Careful study of topography adjacent to the trail may yield insight to maximize protection of the trail, while minimizing trail structures. In general drainage should be studied every lineal 50' with provision made to protect the trail.

Drainage swells or culverts should be installed on trails at locations where normal cross slope will not allow for adequate drainage. Drainage swells are not permitted on paved trails.
Drains are best located at low points or bends in the trail along already existing natural drainage ways. Wherever water is concentrated into new locations or in heavier concentrations, erosion protection needs to be evaluated and installed if necessary. Native stone rip rap is the preferred material.

5. Water bar

Water bars will likely need to be installed at regular intervals on soft surface trails which are steeper than a 5% gradient for more than 5 vertical feet. Rubber water bars should be used since they are safest for multiple use trails, also construction is more economical, faster and easier than other construction methods. Detailed instructions and construction information are included. See Appendix B.

6. Permanent Slope Stabilization

Permanent slope stabilization includes native stacked rock or wood retaining walls, rock filled gabions, wattling, and slope serration. Re-vegetation is contained under a separate section. Following are some guidelines for when various techniques are used. All uninterrupted cut or fill slopes shall not exceed 6 vertical feet unless site specific analysis is performed to justify otherwise. Some method of permanent slope stabilization is required for all slopes in excess of two horizontal to one vertical unless site specific soils analysis is performed to justify otherwise.

a. Retaining Walls Should be installed where necessary for safety, to prevent erosion of cut or fill slopes, to reduce cut and fill slopes, or to minimize disturbance on environmentally or aesthetically sensitive sites. Retaining walls should be constructed of indigenous or natural materials. Walls located on visually sensitive sites should be designed to blend with the natural surroundings. Materials, texture, color and height all affect the visual prominence of a retaining wall. Walls exceeding a height of 4 feet must conform to the requirements set forth in the Uniform Building Code. See Appendix B.

b. Wattling is bundles of branches used to both stabilize and re-vegetate slopes which are nearly stable but continue to erode. This method is only recommended after initial methods have failed and where the unstable areas are minor.

c. Slope Serration These are small steps or indentations in the slope face which are useful for providing small favorable sites for vegetation establishment. This technique should be used only on soils which are fairly cohesive. Site which have a severe exposure to heat and/or sun, are windy, or are excessively steep will likely benefit the most from this method.
7. Cut and Fill Slopes

Combined cut and fill slopes should not exceed twelve vertical feet and individual cut or fill slopes should not exceed six vertical feet, less in environmentally and visually sensitive areas. Slopes which exceed this should consider low retaining walls or alternate routing of the trail to a more acceptable location.

Cut or fill finish grades should not exceed 2 horizontal to one vertical unless a site specific soil analysis is performed to justify the stability of steeper slopes.

All cut and fill slopes shall be stabilized and re-vegetated as per the re-vegetation and slope stabilization guidelines.

8. Slope Stabilization

All disturbed areas shall be stabilized and re-vegetated as part of the trail construction process.

a. Existing Vegetation Protection - Existing significant vegetation which is to be saved shall be protected with temporary fencing along the limits of disturbance. Trees which are to be saved should not be disturbed within the drip line of the tree if possible and the protective fencing should extend to the drip line. Where this is not possible, all work within the drip line should be done by hand and mechanical equipment should not be allowed within the drip line. If filling is necessary above the root zone, perforated pipe along the drip line and vertical air wells should be installed. If cutting of roots or interception of natural drainage to the root zone is necessary, temporary irrigation may be required to compensate for the disturbance.

b. Temporary Runoff Management - During construction and establishment of re-vegetation temporary erosion control and runoff measures and slope stabilization techniques may be necessary. Techniques such as hydro mulching, straw mulch, jute matting, wood excelsior matting, tackifiers, straw bales, siltation fences, matting in drainage channels and stone mulching are all examples of temporary runoff management. The following guidelines provide some direction for the use of these measures. All are temporary measures and are intended to last from one to two years until such time as permanent stabilization techniques are effective.

1. Hydro mulching - This is a mechanized, rapid method for mulching large areas and is generally used with seeding to re-vegetate disturbed areas. Use may be limited on sites where equipment access is limited. Only 100% wood fiber mulch shall be used and applied at a rate of 3000 pounds per acre.

2. Straw Mulching - This method can be used over small areas where it is applied by hand or on large sites where it is installed mechanically. It is
generally used in combination with seeding to re-vegetate disturbed sites. Straw must be held in place by matting, crimping or other method. Apply at a rate of 2 tons per acre or a uniform depth of 2-3”.

3. Jute Matting - This can be used alone or in combination with hydro mulching or straw mulching for erosion control and slope stabilization. It is generally used in combination with seeding to re-vegetate disturbed areas. Apply up and down the slope, never along the slope. Overlap edges a minimum of 4” and use wire staples which are a minimum of 6” long and spaced approximately 5’ apart down the sides and middle of the role. Extend the mat a minimum of 3’ beyond the top and bottom of the slope and bury the mat end in an 8” deep trench at the top of the slope. Uniform contact of the mat to the slope underneath is critical.

4. Wood Excelsior Matting - This is used for erosion control generally in combination with re-vegetation. Care must be taken during installation to prevent concentrated flows under the mat. Apply up and down the slope, never along the slope. Edges should butt snugly together and held down with wire staples, a minimum of 8” long spaced approximately 2’ along the edges and 4 down the center. Extend the mat a minimum of 3’ beyond the top and bottom of the slope and bury the mat end in an 8” deep trench at the top of the slope.

5. Tackifiers - Generally mixed with mulches to provide better adhesion to steep and/or windy slopes. Tackifier should be applied at a rate of 80 pounds per acre dry ingredients or 200 gallons wet ingredients per acre.

6. Straw Bales - Can be used in a variety of ways to protect areas from impact, reduce uninterrupted flow in low and intermittent flow channels, and provide a siltation device for slopes or gullies until re-vegetation establishment. When installing, anchor in place with steel rebar stakes driven a minimum of 12” into the sub-grade and placed in a 6” deep trench which has soil tamped firmly along the uphill side.

7. Siltation Fences - Are used to protect down slope undisturbed areas from upslope erosion.

8. Matting in Drainage Channels - Generally jute matting or fiberglass roving is installed in open drainage channels for temporary erosion control. Use this technique only where flow velocities do not exceed 2 feet per second. Apply from the top and overlap edged a minimum of 4. Secure the top and bottom ends in an 8” deep trench secured with steel staples every 12”. Edged should be stapled every 2

9. Stone Mulching - May be used during construction to control erosion, mud
or dust.

9. Re-vegetation

Re-vegetation consists of seeding and planting operations. Seed and plant species and application rates shall be submitted and approved with the construction plans. In general the re-vegetation of natural sites shall match that of the undisturbed areas in species, density and vegetation patterns. Seeding can be used for grasses and forbes but container stock should be used for all trees and shrubs. Re-vegetation shall be accomplished as soon as grading work is completed and weather permits. Unless the site is irrigated, native plant species shall be used which are indigenous to the site. All re-vegetation work on non-irrigated sites shall be done between April 15th and October 15th unless approval is granted otherwise. Sites which are re-vegetated between June 1st and September 1st will require temporary irrigation.

a. Seed bed Preparation - Sub grade soils should be scarified to a depth of 3-4” and topsoil placed to a minimum depth of 4”.

b. Seeding - Seed shall be broadcast or hydro seeded and raked into topsoil prior to the application of mulch, matting or other surface stabilization materials.

c. Planting - Planting of container grown materials on non-irrigated sites shall be confined to tubling stock unless there is sufficient natural moisture present to sustain larger plants.

d. Maintenance - Re-vegetated sites shall be maintained until sufficient establishment has occurred to reasonably stabilize the site. Security shall be posted for all re-vegetation work for a minimum of 1 year at which time it will be reviewed and released if it meets the above requirements. 11. Gabions

10. Gabions

Gabions are rock filled wire baskets used to retain steep slopes or stabilize drainage ways. They may be preferable to stacked rock walls where the native rock is too small or too rounded for effective stacking. They are particularly effective seepage is anticipated. Installation - Empty gabions are placed in position, wired together and filled with rock which ia a minimum of 4-6” in diameter. When used as a retaining wall the bottom basket should be buried a minimum of 6” at the toe. Gabions should be keyed into the slope and laid back at a maximum of 6 vertical to 1 horizontal.

11. Switchbacks

Switchbacks are often necessary when steep slopes are encountered. Sensitive alignment and
construction methods are required. If switchbacks are required, they should be designed to discourage crosscutting and subsequent erosion. See the Trails Matrix in Appendix B. for minimum turning radii and sight distances for switchbacks.

locating switchbacks where natural barriers exist, installing physical or visual barriers, staggering them or providing sufficient separation between switchbacks all help to discourage crosscutting.

If crosscutting cannot be discouraged through design or construction then the installation of stairs or relocation of the trail should be considered.

12. Bollards and Barriers

Barriers should be installed at trail heads to control access of prohibited uses. They should serve to obstruct motor vehicle or other prohibited access. They can also be used along the trail to direct trail users and/or protect users from steep or hazardous areas along the trail.

Three types of barriers are generally anticipated; large boulders, timber barriers and wood bollards. Placement and spacing of barriers is dependent upon physical site characteristics and trail use requirements. For additional requirements see Appendix B. for construction details.

13. Bicycle Safe Drainage Grates

Drainage grates should be installed where necessary to allow drainage and safe passage for bicycles. Bicycle or trail user safe grates should be used wherever trail user access is feasible. See Appendix B.

14. Fencing

Fencing should be installed only where physical separation is necessary for safety and/or to preserve adjacent landowner privacy. Fences should not create a narrow corridor effect for long stretches along the trail. Where possible fencing should be located only on one side of the trail at a time. See Appendix B for construction standards.

Fences should be no closer than 5’ from the trail edge. Where fences are necessary along both sides of a trail, the minimum width should be 20’.

Where gates are required for trail which cross stock grazing area, they shall be a self-closing lever latch type gate as manufactured by Powder River or a manufacture with similar design characteristics see Appendix B.

15. Stairways

Trails in excess of the slopes indicated on the Trails Matrix should consider stairways.
Stairways may be required to conform to the requirements set forth in the Uniform Building Code.

All wooden stairways shall be constructed of pressure treated or an approved rot resistant timber. See Appendix B. for construction details.

16. Boardwalks

All wood used in boardwalk construction shall be pressure treated or an approved rot resistant timber. See Appendix B. for construction details.

17. Root Barriers

Root Barriers should be installed along the edges of trails where riparian or aggressively suckering vegetation is present. Willows, Gamble’s oak, aspens and cottonwoods are examples of aggressively spreading plants. Trails where irrigated land is on one side of the trail and non-irrigated land is on the other may cause water seeking vegetation in the non-irrigated side to send roots to the irrigated side. In this case, a root barrier should be installed.

Weed or root barriers may be necessary where invasive vegetation is located adjacent to the trail or where one side of the trail is irrigated and the other side is not and where woody vegetation may seek water on the irrigated side of the trail.

18. Signs

Specific location of signs needs to be evaluated on a case by case basis. The following guidelines are intended to provide general direction for signs and their placement. Signs should be posted only where necessary to avoid visual pollution. See Appendix B. for construction details and design specifications. Signs along trails which are constructed by private parties shall be supplied by Summit County, paid for and installed by the private party constructing the trail. The Building Department should maintain a stock of commonly used signs. Contractors should notify the Building Department a minimum of 30 days prior to trail completion to assure the signs they need are available.

a. Informational signs

1. Signs indicating allowed uses should be posted at trail heads.

2. Trail courtesy signs should be posted at trail heads and access points.

3. At high volume multiple-use trail heads, informational signs indicating user etiquette should be posted.
4. At trail access points, a shortened user courtesy sign should be installed.

b. Regulatory signs

1. Stop signs should be placed at all road crossings along major trail corridors unless traffic is required to stop at trail intersections.

2. Speed limit and slow signs should be installed where trails approach maximum slopes and areas with limited sight distance.

3. Curve signs should be placed at curves which have a smaller than recommended travel radius and/or limited sight distance. Curve signs should be posted at points along the trail where travel at a moderate rate would cause a trail user to leave their lane.

4. Dismount signs should be posted in areas where slope exceeds recommended standards and where trail width is less than recommended standards.

5. School zone signs should be posted near schools.

c. Sign Bollards - To be located at all trail access points. Style “A” or “B” to be located at trail head facilities. “A” is for all named trails such as the Historic Union Pacific Rail Trail or the designated access to the Great Western Trail. “C” is for all other access points. Style “C” can be used in conjunction with plain bollards where motorized access is restricted. The individual symbols are 3” square, reflective decals that can be ordered from Caronite International. They should be mounted on heavy gauge aluminum plate, routed into the post a minimum of 1/2” and epoxied into place. All bollards shall be constructed of pressure treated doug. fir. See Appendix C. for additional information.

d. Sign Posts - Post location shall conform to the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities. Sign posts shall be 4x4 pressure treated Doug. fir embedded into the ground a minimum of 24" unless other materials are specifically approved.

e. Attachment Systems - Signs should be attached to wood posts with 1/2” diameter galvanized carriage bolts in a minimum of 2 locations per post.

f. Yield Hierarchy Sign

Sign Placement - This sign should be placed at all major access points of multiple use trails. It should be located where it is clearly visible and where it does not impede trail use or
present a hazard to trail users. See Appendix C.

g. Trail Courtesy Brochure

An example of what another community has done to encourage safe and courteous multiple use of their trail facilities is located in Appendix C. Any maps, guides, other trail related literature, or trail user education or orientation programs should contain similar information.

h. Trail User Information Sign

Sign Placement - This sign should be placed at all major trail head facilities and city parks where trails are accessed. It should be located where it is clearly visible and where it does not impede trail use or present a hazard to trail users. See Appendix C.

I. Trail Courtesy Sign

Sign Placement - This sign should be placed on the same post as the Yield Hierarchy sign wherever the Trail User Information sign is not located also Stop and Private Property Signs. See Appendix C.

j. Stop signs and private property signs

Stop signs shall be installed wherever paved multiple use trails cross public streets or other potentially hazardous areas.

Private Property - This sign should be located on an as needed basis.

k. Regulatory Signs

Requirements for the use and placement shall follow the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities and apply to all multi-use paved trails. See Appendix C.

l. Intersection Signs

Requirements for the use and placement shall follow the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities and apply to paved trails. See Appendix C. and D.
Summit County Non-Motorized Trails Master Plan Update

Maintenance and Operation Section

Produced: March 17, 1993

Produced for: Summit County Commission

Produced by: Summit County Trails Master Plan Update Committee with technical assistance from Mountainland Association of Governments.
Introduction

This section of the document has been designed to address the needs of the Summit County Commission and Building department. It provides policies, guidelines and standards for trails maintenance, policy guidelines for special events, gives direction regarding priorities for trail funding and provides cost estimates for trail maintenance, operation and installation.

Two other sections of this document: the Objectives and Policies Section and the Trail Construction and Construction Standards Section address the needs of the Board of Commissioners, trail oriented community groups, the Summit County Planning department, and the County Engineer. They provide general goals, objectives and policies for trail development and specific standards for trail construction. Refer to the above mentioned sections for additional information.

Summary of Policy Statements

The following statements provide the basis for the maintenance and operation guidelines set forth later in this document. More specific policies directly related to maintenance and operation of the trail system are also included with the Objective and Policy Section and the Trail Construction and Construction Standard Section.

1. A trail system is an asset to Summit County - Trails are an asset to the community. As the county grows, trails can mitigate other aspects of development. The Summit County trail system should be aesthetically pleasing and contribute to the general quality of life in the community.

Where feasible, trails should be separated from motorized transportation corridors as snow removal and general maintenance are less costly, users are generally safer, and recreational experiences are enhanced on paths which are separate from roads.

As various portions of the trail system are developed, as new sections are added and old sections repaired uniform materials, surfacing and signs should be installed.

2. Development of a comprehensive trail network - Summit County desires to develop a comprehensive network of trails for public access, connecting various parts of the community, preserving historic trails, and coordinating existing and future trail connections outside the legal limits of the county.

Summit County should acquire and develop trail corridors in existing developed areas, according to identified priorities. Summit County should work with landowners in order to obtain public access to important existing and desired trail corridors.
Summit County should explore a variety of funding sources and mechanisms for the development of trails. Grants, special districts, transportation funds, joint funding with other jurisdictions or agencies, exactions and various taxing mechanisms are a few of the funding sources which are available.

3. Liability - *The Summit County Trails Master Plan should provide liability information to private landowners regarding the granting of public access to existing roads and trails, and explain the intent of the Utah landowner liability act.*

4. Development of a safe multiple-use trail system - *The design, development and implementation of the Summit County Trails Master Plan should consider safe multiple-use throughout the trail system.*

Trails should have signs at trail heads and significant access points specifying allowed uses and user etiquette. Generally trail are open to hikers, joggers and mountain bikers. Trails allowing equestrian access should be specifically designated. Specific trails should be designated for cross country skiing and horse drawn sleighs or carriages as appropriate. Trails accommodating school children should be constructed for year round access. Trails should allow access for the physically impaired where appropriate and reasonable. Trails should not permit motorized vehicles except for emergency or maintenance purposes. Pet owners should manage pets in accordance with municipal and county laws.

5. Trail user courtesy - *Trail user courtesy shall be promoted and encouraged throughout the Summit County trail system.*

Summit County should encourage peer enforcement of trail rules and user courtesy on the trail system.

6. Environmental sensitivity - *The trail system should be designed and constructed in an environmentally sensitive manner.*

Both new construction and maintenance practices should consider visual and environmental sensitivity.

7. Trail standards and Summit County character - *Summit County should develop a trail system which is functional and conforms to national standards, where applicable, while preserving the unique character of the Summit County environment.*

Summit County’s unique alpine character is a valued quality. Trails should reflect that character in siting and materials. Wherever possible, materials indigenous to the site should be used during construction and maintenance. When the use of indigenous materials is not possible, use of historic materials should be considered.

8. Trail-user needs - *Summit County intends to develop a trail network providing for*
the needs of residents, destination visitors, and day use visitors.

9. Special events - Special events on parts of the trail system need to be accommodated and planned for, where possible, during the initial design phase.

As new locations for special events are considered, the following requirements should be weighed: input from adjacent landowners and the planning department’s evaluation of compatibility.

A Special Events Policy and permitting requirements for trail events should be developed as part of the Large Public Assembly licensing ordinance. County departments that host a trail event should follow the guidelines set forth in this ordinance.

10. Long term maintenance policies and standards - The long term maintenance of trails is integral to the ultimate success of the trail system.

At the time of this writing the county has no clear-cut policy as to the maintenance of trails throughout the community. In general, the adjacent landowner or homeowner’s association is responsible for maintenance of trails adjoining or passing through their property. An example of optional maintenance programs are set forth in this document to provide future decision-makers with relative costs for various levels of county maintenance.

County maintenance levels are dependent on funding. It is expected that in the future the County may assume maintenance responsibility for specific trails. It is recommended that when street improvements are made, sidewalks and trails should be installed at the same time in order to reduce costs and inconvenience. It is also recommended that higher volume multiple-use corridors be given priority over lower volume trails, unless specific conditions warrant otherwise. Following is a series of recommended maintenance guidelines.

Maintenance Guidelines

1. County maintained trails - A program needs to be established for the future maintenance of County maintained trails. Snow removal; litter pick-up; installation of root barriers; resurfacing of paved trails; installation of signs, crosswalks, bollards, and centerline striping; vegetation trimming and trail sweeping all need to be considered as part of this program.

2. Paved multiple-use trails - It is expected that this type of trail would become a county maintained trail when it is constructed and/or dedicated to the county. As new trails are added to the system snow removal, inspection, litter pick-up, sweeping, sign maintenance, paint striping, resurfacing, and soil replacement all need to be programmed into a maintenance schedule.

3. Unpaved multiple-use trails - It is expected this type of trail would be dedicated
to and maintained by the county. The following county obligations are recommended. Summer maintenance only with inspection, litter pick-up, grading, spot patching of gravel, sign maintenance and no snow removal.

4. Back country multiple-use trails - It is expected that this type of trail would be dedicated to the county and generally maintained by the adjacent landowner or homeowner's association unless a special maintenance circumstances exist. The following county obligations are recommended. No winter maintenance, periodic inspection with report to responsible maintaining party and coordination with volunteer groups who offer trail and sign maintenance or other improvement services.

5. Painted lanes - It is expected that this type of trail would be within the County street or the State of Utah right of ways and therefore maintained by the county. If bike lanes are required within private streets then maintenance would be by whomever is responsible for maintaining the street. Within county owned streets the following maintenance obligations are recommended. Paint striping, sign maintenance, sweeping and additional spring clean-up.

Long-Term Maintenance Standards

A detailed example of maintenance and installation costs is provided later in this document. This section describes general maintenance assumptions, standards and composite costs.

1. Maintenance assumptions - no trails have trash receptacles, rest rooms, drinking water facilities or lighting; cross country skiing track setting, signs and management should be contracted.

2. Paved multiple-use trails - Snow removal, weekly year-round inspection and litter pick-up, sweeping 2 times per year, sign maintenance, center stripe repainted every year, resurfacing: asphalt every 15 years, seal coat asphalt every 3 years, spot soil replacement yearly.

3. Unpaved multiple-use trails - Summer maintenance only: weekly inspection, and litter pick-up, yearly grading and spot patching of gravel, sign maintenance, no snow removal.

4. Back country multiple-use trails - No winter maintenance. Yearly inspection with yearly report to responsible maintaining party and yearly coordination with volunteer groups who offer trail and sign maintenance or other improvement services.

5. Painted lanes - Yearly striping, sign maintenance, and monthly sweeping with additional spring clean-up.
Construction Guidelines to Reduce Maintenance and Environmental Impacts.

For more detail, see the Objectives and Policies Section and the Trail Construction and Construction Standards Sections. The following guidelines provide specific recommendations for how trails should be routed and/or constructed to reduce maintenance and environmental impacts.

1. Trail location and construction

   a. Trails crossing steep sites should flow with the landform.

   b. Drainage structures should be constructed in natural drainage areas where possible, in order to reduce erosion.

   c. Trails should have a minimum 2% cross slope to allow drainage.

   d. Maximum trail slopes should match user volume and types of usage.

2. Snow removal

   a. The amount of separation depends upon highway speeds and parking lot size.

      1. Minimum separation between trails and small parking lots or low speed streets is 10’.

      2. Minimum separation between trails and large parking lots or high speed streets may need to be as much as 50’.

3. Sensitive areas

Examples of visually or environmentally sensitive sites might include: wet lands, highly visible hillsides, areas with significant vegetation, highly erodible soils, unstable and/or steep slopes and ridge lines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines, site specific construction practices should be implemented to minimize environmental, visual or construction impacts.

Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards.

   a. Limits of disturbance should be implemented to minimize construction
impacts. Construction limits should be as small as practical to construct the trail. Significant vegetation and its root zone should be considered when establishing construction limits.

b. Erosion control methods should be employed to protect areas adjacent to the trail from impacts during or after construction. Siltation fences, straw bales, detention basins, re-vegetation protection such as excelsior matting and slope protection methods are all examples of erosion control which may be required on specific sites.

c. Indigenous materials should be used when constructing trail surfaces, retaining walls, bridges, and barriers.

d. Native and/or self-sustaining plant materials should be used for re-vegetation of all disturbed areas where trails pass through native or non-irrigated sites. If plants are not self-sustaining, a permanent irrigation system shall be installed at the time of trail construction. Re-vegetation of natural areas should match the vegetation patterns of the tract surrounding the area to be re-vegetated.

e. Special location or construction methods may be necessary to reduce impacts and/or minimize disturbance. Rerouting a trail to avoid a hazard, narrowing the trail section through a limited area to preserve significant vegetation or exceeding recommended minimums or maximums in selected areas to reduce cut or fill slopes are examples of special locations of trails to reduce impacts. Examples of construction methods which could reduce impacts might include installing retaining walls to reduce cut and fill slopes on a visually prominent hillside, stabilizing a mine hazard which is located within or adjacent to a trail corridor or installing a tree well around a significant tree to be preserved. Specific trail proposals through environmentally and visually sites shall be considered on a case by case basis.

f. Where significant wildlife or other natural features exist, special trail routing, construction and trail use should be considered.

g. Existing significant vegetation should be preserved wherever possible. Trees, riparian vegetation, scrub oak and rare plants are considered significant. Root zones as well as above ground vegetation require protection when preserving plants. In general, the area within the drip line of trees, especially on the down slope side, is sensitive to disturbance. If root zones are impacted or grades changed significantly, temporary irrigation may be necessary.

h. Trails which cross or are located adjacent to wet lands should be designed for minimal impact. Wooden boardwalks or other techniques may be
necessary to impose minimal construction impacts. Wildlife needs should also be considered when siting trails near wetlands.

i. In visually sensitive areas may require reduced cut and fill slopes, hand-construction, and low retaining walls to minimize site disturbance and visual intrusion.

j. Re-vegetation to provide screening, construction techniques to preserve vegetation, and trail routing techniques should be used to minimize visual intrusion.

k. In steeply sloped and highly vegetated areas, trails should be located for trail user compatibility rather than along convenient property boundaries.

l. Where environmental hazards are present, special trail construction techniques or locations should be used.

m. Mine tailings should be stabilized, top soiled and re-vegetated.

n. Trails should be located away from lightning prone areas, avalanche areas and raptor nesting sites, or should be closed seasonally when hazardous conditions are a problem.

o. Locate the trails for both summer and winter activities, where possible, given the terrain and climatic considerations. Identify snow retention areas for possible cross-country ski trails. In open areas, place trail alignment to take advantage of opportunities for shade and wind protection.
Appendix A.

Public Input
Public Input:

In public meetings held with landowners and Non-motorized trail users a number of positive and negative issues were raised regarding trail use on or near private property as well as possible solutions.

Landowner concerns include: Land use change request - will the public interest be forced on to the private individuals, weather or not trails do serve a common good, maintenance and operation responsibilities of adjacent property owners, reduced access to currant land use oriented maintenance requirements - like irrigation systems, design access for emergency vehicles on as many trails as possible, potential high cost of liability insurance coverage, property damage due to newly created erosion, litter, vandalism and non-authorized trail cutting, lack of local knowledge by out of town visitors and a perceived lack of respect for private landowner rights, lack of correct trail information, and excessive parking on or near private property adjacent to trail heads.

Positive aspects of trail development identified in public meetings include: Utilizing trails to direct/control traffic away from undesirable areas, potential positive impact on property value, opportunity to plan and mitigate new development, informed trail users can often help reduce vandalism, mountain biking in the Summit County area has the potential to become destination tourism attraction, and trail users are a potential resource to construct new trails.

Some of the suggestions which were offered to address landowner concerns include: passing additional legislation to limit liability, share liability costs among those who benefit, require mountain bikes to be licensed, designate a percentage of the money used to promote Summit County in the summer, use Summit County resources to resolve land owners concerns, encourage user courtesy and respect of private property rights by signage at trail heads and other access points, develop and promote trails at various skill levels, promote user self-regulation, and explore a variety of public/private partnership opportunity.

Attached are several examples of the type of public input solicited during the creation of the master plan document and the trail maps.
PUBLIC NOTICE

SUMMIT COUNTY NON-MOTORIZED TRAILS MASTERPLAN COMMITTEE TRAIL USERS MEETING

Public notice is hereby given that the Summit County Non-Motorized Trails Masterplan Committee will be holding two work sessions for trail users on Wednesday, September 2, 1992 beginning at 7:00 p.m. at the Marsac Building, 445 Marsac Ave., Park City, Utah, and Wednesday, September 9, 1992 beginning at 7:00 p.m. at the Oakley Town Hall, 960 West Center Street, Oakley, Utah.

The purpose of these meetings is to collect ideas from trail users, and encourage their participation in the planning process for a county wide trail system. The Trails Masterplan Committee will be discussing trail maps, standards, trail concepts, and public input regarding trail user interests.

For further information contact the Summit County Planning Division at 60 North Main, Coalville, Utah 84017 or call (801)336-4451 or 645-9161.

Posted: August 24, 1992
Mailed: August 24, 1992
Published: August 27, 1992, and September 3, 1992
Park Record
Summit County Bee
PUBLIC MEETING

COMMUNITY INPUT FOR SUMMIT COUNTY NON-MOTORIZED TRAILS MASTER PLAN

Public notice is hereby given that the Summit County Non-Motorized Trails Master Plan Committee will be holding a community input meeting on Monday, September 14, 1992 beginning at 7:00 p.m. at the District Courtroom, Coalville Courthouse, 60 North Main, Coalville, Utah.

The purpose of this meeting is to present the trails master plan to the community and receive public input on the trails map, standards, and trail concepts. The trails master plan committee will be using this input to make a final Summit County Trails Master Plan to present to the Summit County Board of County Commissioners.

For further information contact the Summit County Planning Division at 60 North Main, Coalville, Utah 84017 or call (301) 336-4451 or 645-9161.

Posted: September 2, 1992
Published: Legal Notice
                                   September 10, 1992
                                   The Park Record
                                   Summit County Bee
NOTICE IS HEREBY GIVEN THAT THE SUMMIT COUNTY PLANNING COMMISSION WILL HOLD ITS REGULAR MEETING ON SEPTEMBER 22, 1992

AGENDA

7:00 p.m. Regular Meeting in the Burns' Fire Station, 730 West Rasmussen Road, Park City, Utah.

REGULAR ITEMS:

-1 Approval of Minutes - September 8, 1992, Regular Meeting; April 21, 1992, Study Session

-2 Consultant Update, Transportation Study, Snyderville Basin, Versar A & E

-3 Consultant Update, Corridor Study, Snyderville Basin, Kelleco

-4 Consultant Update, Open Space Study, Landmark Design

-5 Update, Summit County Trails Master Plan, Shawn Seager

-6 Public Hearing 9:15 p.m. - Compatibility Recommendation, Summit County Animal Shelter, Silver Creek Junction, Glen Thompson

-7 Small Subdivision, Chalk Creek, Ed Ames

CHAIRMAN AND COMMISSION ITEMS:

DIRECTOR'S ITEMS:

ADJOURN:

Posted: September 14, 1992
Published: September 17, 1992
Park Record
Summit County Bee
LIVE LANDS
ANCE

Notice is hereby given that the Summit County Planning Commission will hold a public meeting to discuss the proposed Western Expansion Project, on September 8, 1992 at 7:00 p.m. at the Courthouse, County House, 60 North Main, Salt Lake City, Utah.

The proposed development is on 80,000 acres of land in the Western Expansion to the Utah Westen Facility. The project parcel is in the Silver Creek Center, U.S. Highway 70 near the City of Coalville, Details of the project will be available at the public meeting.

An additional public meeting will be held on the 22nd day of August, 1992, at the Summit County Planning Division, 60 North Main, Salt Lake City. The purpose of the meeting is to comment on the proposed plan and to determine if there is any conflict with the proposed development. The meeting is open to the public and is scheduled for the Class II permit.

Summit County, Utah.
Published in the Park Record August 27, 1992.

Public Hearing
Planning Commission

Notice is hereby given that the Planning commission of Park City, at its meeting on September 9, 1992 will hold a public meeting and take action on the following items:
1) Silver Lake Inn MPD, 7720 Royal Street East, Request for modification to add a private restaurant in connection with the Night Club operation and ownership- Deer Valley Club.
2) E Cheepo, 255 Main Street, Request for modification of the Conditional Use Permit to allow outdoor speakers-M. Martin

Published in the Park Record August 27, 1992.

LEGAL NOTICE

The Park City Fire Service District will make adjustments to the current 1992 budgets at the Administrative Council Board meeting on Wednesday, September 2, 1992 at 6:30 p.m. at the Burns Fire Station, 730 W. Rasmussen Road.

Published in the Park Record August 20th and 27th, 1992.

Public Hearing
Planning Commission

Notice is hereby given that the Planning commission of Park City, at its meeting on September 9, 1992 will hold a public meeting and take action on the following items:
1) New Town Lift Project, Phase I, Request for Final Plat Approval-McIntosh Mill.
2) Town Lift Project, Phase I, Request for Final Plat Approval-McIntosh Mill.

The meeting will be held at 8:00 a.m. at the Summit Municipal Building, 445 Marsac Avenue and the public is encouraged to attend. A Work Session will begin at 6:00 P.M. and this item may be discussed.

Published in the Park Record August 27, 1992.

Consider Appeals
Board of Adjustment

Notice is hereby given that the Park City Utah Board of Adjustment will consider the following appeals with respect to the enforcement of the zoning code:

Published in the Park Record August 27 and September 3, 1992.

Notice of Bonds

Bonds of Collection/Distrribution Box
The project is to be completed in 20 working days.
A contractor's license is required prior to bidding.

Specifications, proposal forms, plans, and plans may be obtained at the Department Office at 445 Marsac Avenue and the public is encouraged to attend.

Published in the Park Record on August 27, 1992.

Advertise for Bids

Sealed bids for the construction of the Near-Term Improvements Project will be received by the Snyderville Basin Sewer Improvement District at the Snyderville Basin Sewer Improvement District Office of the General Manager, 3060 West Rasmussen Road, Park City, Utah 84060, until 2:00 P.M., September 25, 1992, and then at said office publicly opened and read aloud. The work consists of the following major items:
1) Modifications to the aerobic digester at the East Canyon Wastewater Treatment Plant, including installation of control, piping, and electrical and control work, and installation of Owner-furnished equipment.
2) Construction of an aerated sludge equalization tank at the Silver Creek Wastewater Treatment Plant. Construction shall include earthwork, utility modification, location, tankage, equipment building, yard and process piping, and electrical and control work, and installation of Owner-furnished equipment.

Copies of the Bid Documents may be obtained from Eckhoff, Watson and Preator Engineering, Building C-100, Salt Lake City, Utah 84124, (801)261-0090. All questions related to the bidding and construction of the Near-Term Improvements Project, prior to the bid receipt date, shall be directed to: R. Conover or Jim Olson at the above mentioned office of the Engineer beginning September 4, 1992. The Bid Documents may also be examined at the following locations:
Snyderville Basin Sewer Improvement District
3060 West Rasmussen Road
Park City, Utah 84060
Intermountain Contractors Plan Room
Appendix B.

Construction Standards
### TRAIL TYPE MATRIX

<table>
<thead>
<tr>
<th>TRAIL TYPE</th>
<th>WIDTH*</th>
<th>SURFACE</th>
<th>SLOPES**</th>
<th>MINIMUM RADIUS***</th>
<th>SIGHT DISTANCES</th>
<th>EASEMENT WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paved Multiple Use</td>
<td>8’ Asphalt 2’ Dirt</td>
<td>Asphalt/Dirt</td>
<td>&lt;15%</td>
<td>Turning Traveling Horses 8' 20' 12'</td>
<td>75’ Minimum</td>
<td>12'</td>
</tr>
<tr>
<td>2. Un-Paved Multiple Use, High Volume</td>
<td>8’</td>
<td>Crushed Rock</td>
<td>&lt;15%</td>
<td>Turning Traveling Horses 8' 15' 10'</td>
<td>75’</td>
<td>10’</td>
</tr>
<tr>
<td>3. Un-Paved Multiple Use</td>
<td>4’</td>
<td>Crushed Rock</td>
<td>&lt;30%</td>
<td>Turning Traveling Horses 8' 15' 10'</td>
<td>75’</td>
<td>10’</td>
</tr>
<tr>
<td>4. Back Country Multiple Use</td>
<td>2’</td>
<td>Dirt</td>
<td>&lt;30%</td>
<td></td>
<td>50’</td>
<td>6’</td>
</tr>
<tr>
<td>5. Painted Lane</td>
<td>5’</td>
<td>Asphalt</td>
<td>N.A.</td>
<td>8’</td>
<td>100’</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

* 2% cross slope minimum where possible.
** Slopes in excess should consider stairway construction.
*** Turning at intersection, travel at 10 mph.
1. Paved Multiple-Use

NOTE: ALLOWS FOR WINTER SNOW REMOVAL.

2. Un-Paved Multiple-Use High Volume

NOTE: DOES NOT ALLOW FOR SNOW REMOVAL ALLOWS FOR X-COUNTRY SKI ACCESS.
3. Un-paved Multiple Use

NOTE: DOES NOT ALLOW FOR WINTER SNOW REMOVAL. ALLOWS FOR X-COUNTRY SKI ACCESS IN AREAS WITH GENTLE TERRAIN UNLESS ADDITIONAL CLEARANCE IS MADE.

4. Back country Multiple-Use

NOTE: DOES NOT ALLOW FOR WINTER SNOW REMOVAL. ALLOWS FOR X-COUNTRY SKI ACCESS IN AREAS OF GENTLE TERRAIN UNLESS ADDITIONAL CLEARANCE IS MADE.
5. Painted Lane

NOTE: ALLOWS FOR WINTER SNOW REMOVAL
12" MIN. 36" PREFERRED CLEARANCE EITHER SIDE OF TREAD

24" PREFERRED CLEARANCE EITHER SIDE OF TREAD

18" MIN. 10" PREFERRED

6" MAXIMUM VERTICAL OBSTRUCTION AT EDGE OF TREAD
1. Paved Multiple Use

2. Unpaved Multiple Use High Volume
3. Unpaved Multiple Use

NOTE: THE CRUSHED ROCK SURFACING MAY BE SUBSTITUTED WITH 2" OF COMPACTED DOLOMITIC LIMESTONE AS PER THE SPECIFICATION.

4. Back Country Multiple Use
COBBLE DRAIN: Use where intermittent flow is expected such as in pronounced gullies or established drainage ways. Do not use where continuous flow is expected such as at seeps, springs or streams. Cobble's shall be 2-3" stones stock piled during trail construction.

ADD ROCK SPILLWAY FOR SLOPES GREATER THAN 4:1

TRAIL DRAIN: Use where trail construction requires drainage such as along long and/or steep vertical ascents. Do not use where established drainage ways exist. These are best if located at low points or bends in trail. Transition from trail to drain may require 6'. At low points, 6' transition will be required up to normal trail.

UNPAVED BACKCOUNTRY TRAILS
PLAN VIEW

DIMENSION VARIES WITH TRAIL WIDTH

PROFILE VIEW

2 x 6"

3/8" THICKNESS CONTINUOUS RUBBER BELTING

END VIEW

301 GALVANIZED NAILS

PRESERVATIVE TYPE CCA
MIN. NET RETENTION 0.4 LB./CU. FT.
USE 301 GALVANIZED NAILS
4" NAILING PATTERN, IN 2 ROWS, STAGGERED

EXTEND STRUCTURE INTO CUTOFF BANK 15" MIN.
SKUW STRUCTURE 45-60°

TRAIL

OUTSIDE EDGE

DOWNHILL

PLAN VIEW

2 1/2" TO 3 1/2" OUTSIDE EDGE

PROFILE VIEW

WATER BAR DETAIL
THE TRAIL FORUM

This feature of the TRAIL FORUM focuses on use and installation of Rubber Belt Waterbars as used by Jefferson County Open Space and the U.S. Forest Service. We also describe various volunteer groups and work programs available for performing trail construction and maintenance. You may want to consider these alternative workforces for some of your future trail projects.

RUBBER BELT WATERBARS

Rubber Water Deflectors: Alternative Erosion Control Technique For Multiple Use Trails
--By Sharon Kolarik

Since 1972, Jefferson County Open Space (JCOS) has acquired over 17,000 acres of land and developed 79 miles of natural surface trails. Situated in the foothills west of the Denver metropolitan area, these trails accommodate hiking, jogging, mountain biking, horseback riding, and cross country skiing. Increased use, especially from mountain bikes has caused various impacts. Users tend to avoid log, rock and soil waterbars, which widens treads, increases erosion, and accelerates deterioration of waterbars.

During a 1989 trail seminar at Red Rocks Community College, a Forest Service employee introduced surface water deflectors used on logging roads. They consist of two 2”x10” boards nailed together with a piece of 1/2”x13” rubber in between, and installed like a water bar. We felt this technique might be an alternative or complement to our existing erosion control devices on natural surface trails. To test these water deflectors, we selected several trail sections with heavy traffic and areas with shortcutting, braided trails, steep grades, wide, concave, and eroded tread, and on service roads.

Several types of deflectors were constructed so that different designs could be tested. Water deflectors are easily made by bolting a piece of conveyor belt rubber between two pieces of lumber. Treated logs can also be used, but they proved unstable in the trail tread and were difficult to bolt together because the natural grain twists them. After trying various types of lumber, we concluded that 2”x6” and 4”x4” dimensional lumber worked best. Discarded conveyor belts, obtained free from a local gravel pit, provided the rubber. The rubber should extend 3” to 6” above the base lumber. The time involved for assembly will vary depending on the design, but we averaged 20-30 minutes each.

During the first few months, the effectiveness of the deflectors was minimal because many trail users indicated the black rubber gave the appearance of rigid metal. As they became accustomed to the new water deflectors, they were accepted quite well. The deflectors are functioning as designed; braided trails are becoming one trail, widened trails are now three feet wide again, and overall tread stability and appearance is improving. The results from establishing service road deflectors are still pending due to recent installation. The rubber pieces seem to be flexible and durable. No problems with the rubber tearing or pulling out of the base wood has been apparent. This ongoing project is still in the experimental stage and new designs and test sites will be evaluated in the near future. Consideration may be given to this type of design when developing barrier free types of trails. For additional information regarding this topic, please contact Open Space at (303) 278-5925.

Use of Rubber Waterbars on the Grand Mesa, Uncompahgre & Gunnison National Forest

During the summer of 1990, we let a contract to reconstruct the West Bench Trail No. 501 on the Colbran District of the Grand Mesa National Forest. The trail extends from Mesa Lakes Recreation Area to the top of Lift #2 of the Powderhorn Ski Area and receives very high use from hikers, mountain bikes and horses.

As part of our evaluation process a Trail Management Decision Worksheet was completed. Design features specified reconstruction to an “Easiest” difficulty level, 24” minimum tread width, with a minimum of tread breaks or obstructions. Since the trail passes through sections of very rocky terrain, construction methods to minimize earth movement for drainage structures were seriously considered.

I saw an article on Rubber Belting Waterbars in the “Engineering Field Notes,” a Forest Service engineering publication, and felt they would meet the criteria needed for this project. They can be installed with a minimum of grade and tread disturbance, are more easily installed in rocky areas compared to conventional
waterbars while providing a fairly maintenance-free structure. I made some changes in the design, drew two typical installation sheets (see drawings on next page), and added the pay item to the proposed contract.

When the bids were opened, the successful contractor bid the water bars at $50.00 each, which included labor and contractor furnished materials except for rubber belting. I chose to provide the rubber belting to ensure the quality of material. In government contracts, all new materials are required, so we purchased new materials from Colorado Rubber and Supply in Denver. The cost of the new 3/8" thick solid rubber belting was $2.90/lin. ft. and it was cut in 12" x 16" lengths. The solid rubber was chosen over belting with fabric laminations to prevent moisture from working down the seam and separating the layers.

Construction: Many advantages came to light during construction. The installation of the rubber belting waterbars proved to be considerably faster and easier than more traditional methods, as only an 8" x 12" trench was excavated at a 45 to 60 degree skew to the tread. Since the tread grade was not changed, much less material was excavated. Typically, only a small ditch was required to remove the water if the tread was entrenched. In areas where there were multiple treads, the belting could be used in 16 foot lengths to cover the full width of the ROW. In areas where cross slope was available to restrict tread width, a 6 to 8 foot length was used. We did determine that height of the exposed rubber should be maintained at 2 1/2" to 3" to prevent the rubber from taking a "memory".

Material delivery from the staging area to the installation location proved to be considerably easier. The Contractor used only horses to transport all materials. The treated 2"x6"x8" boards used to sandwich the belting were packed in, usually in groups of 6, and belting was carried in panniers, as many rolls as would fit. If the Contractor used ATVs to transport materials, the process could have been even easier.

Conclusion: Rubber belting waterbars have thus far proven a viable alternative for any trail where a mix of users is expected. The reaction has been mostly positive. Most cyclists, when first encountering the structures, get off and kick the rubber to make sure it is not a solid obstruction. After that, they ride over them as if nothing were there. Horses have shown any fear, and hikers seem to have no problem stepping on them to see if they bend. The installations have not caused the past problem of wheeled users riding up the cut slope to avoid the bump. This has also helped eliminate the problem of multiple treads in areas of little cross slope.

Maintenance of rock or log waterbars and rolling dips in the past involved cleaning a large transition area and most times an outlet ditch, something which crews tended to neglect. With rubber waterbars, the area to be cleaned is much less, speed operation and lowering costs. Wheels sliding on wet logs when struck at a skew have also been eliminated.

The results of this last year's contract were very pleasing to me and the District, and we plan to use the waterbars on ATV and mountain bike trails and a portion of a stock driveway. They really have endless possibilities as use increases on trails and low volume roads. In addition, increased labor costs makes the ease and speed of these installation more attractive. Future options will include investigating earth tone colors and laminated belting with an edge seal. For more information, contact Doug Marah, Engineering Trails Coordinator, Grand Mesa, Uncompahgre and Gunnison National Forest, at (303) 874-7691.

ALTERNATIVE WORKFORCES

Trail Building by International Work Camps

International Work Camps is a volunteer service provided by the Council on International Education Exchange (CIEE). CIEE recruits the volunteers from the U.S. and other countries and selects a crew leader from the U.S. to work on various types of projects, including trail construction and reconstruction. In addition to the value of work provided by the volunteers, this program allows for cultural interaction among the volunteers. The National Park Service, the U.S. Forest Service and other government agencies have used the crews in projects across the country. The sponsoring agency food, lodging and insurance coverage for an average 12 person crew, and transportation for the crew leader. As a ball-park figure, costs total $1500 to $2000. For more information on how to apply for a work camp project contact: Brenda Dean, Coordinator for Volunteer Services, Council on International Educational Exchange, 205 E. 42nd Street, New York, NY 10017, phone (212) 661-1414. Work camps are also organized by Peter Coldwell, Director, Volunteers for Peace, 43 Tiffany RD, Belmont, VT 05720.

Jefferson County Open Space Youth Work Program

The Youth Work Program annually employs county youth ages 14 to 18. Participants are selected through a public random-drawing process. The program runs 6-8 weeks, with five eight-hour days per week. Normally 50-100 participants are selected; crews with eight laborers and one crew leader each are established. The work conducted by the crews includes trail maintenance and construction, park cleanup, and building maintenance. The Youth Work Program has been active since 1974. For more information contact Open Space at 278-5925.
GUIDELINES:

Cut and fill slopes should be a maximum of 2:1 unless site specific soil analysis is performed to justify stability of steeper slopes.

A maximum of 4 vertical feet of cut or fill is allowed. Environmentally or visually sensitive areas may be less.

Areas which require steeper cut or fill slopes than the allowable shall use retaining walls as shown in these details.

All disturbed areas shall be revegetated. Species for revegetation shall be appropriate and wherever possible shall match the surrounding species. See the revegetation guidelines for additional specifications.
NOTES: WALL SHALL BE 2' WIDE OR ½ THE WALL HEIGHT, WHICHER IS GREATER.
REVEGETATE ALL DISTURBED AREAS.

DOWNHILL WALL

WALL GUIDELINES

USE STONE WHICH IS NATIVE TO THE SITE WHEREVER POSSIBLE.

TO STABILIZE THE TRAIL IN LESS THAN ADEQUATE SITUATIONS.

TO WIDEN A TRAIL THAT OTHERWISE WOULD BE TOO NARROW.

TO TAPER UP OR DOWN IN AREAS WHERE TYPICAL TREAD CONSTRUCTION WILL NOT WORK.

WALLS SHOULD BE BUILT IN AREAS WHERE ADEQUATE FOOTINGS CAN BE DUG.

ALL STONES SHOULD BE ANGULAR, FREE FROM DEFECTS, PROJECTIONS AND IMPRESSIONS.

APPROXIMATELY 25-33½ % OF WALL SHOULD BE TIE STONES.

MAXIMUM HEIGHT OF WALL SHOULD BE 4'-0".

PLACE LARGE ROCKS FOR OUTSIDE TOP COURSE

Prepare footing in earth or solid rock. Use largest rocks on bottom.

USE WHEREVER NATURAL TREES OR OTHERWISE SIGNIFICANT VEGETATION CAN BE SAVED WITH THE USE OF WALLS.

UNIFORMLY DISTRIBUTE SIZES AND SHAPES OVER THE ENTIRE FACE OF THE WALL.

SHAPE STONES FOR BEST FIT. USE A 4" HAMMER IF AVAILABLE.

ALL WALLS MUST BE BATTERED: 3 IN 12 THROUGH 12 IN 12 ARE ACCEPTABLE.

TRENCH SHOULD SLOPE INWARD AS SHOWN, AND DRAIN TO DAYLIGHT. THE STONES SHALL COMPLETELY PENETRATE WALL. MISCELLANEOUS BACKFILL MUST BE FREE FROM ORGANIC MATTER. SELECT BACKFILL LESS THAN ½" MAXIMUM DIMENSION, 4" DEPTH OPTIMUM.

WALLS WHICH ARE GREATER THAN 4'-0" IN HEIGHT SHALL BE ENGINEERED.

USE WHERE EITHER CUT OR FILL SLOPES FOR TRAIL CONSTRUCTION EXCEED 4 VERTICAL FEET.
NOTE: ADD BRUSH CUTTINGS TO REVEGETATED AREAS - A ROCK OR LOG BARRIER AT POTENTIAL ACCESS POINTS.

4' TO 6''

NATIVE PLANTING

4''-6'' OF TOPSOIL

PIT RUN FILL

TYPICAL TRAIL REVEGETATION

TRAIL REVEGETATION GUIDELINE USE WHERE EXISTING TRAILS WILL BE RELOCATED.

ADDITIONAL EROSION CONTROL TECHNIQUES MAY BE NECESSARY WHERE STEEP SLOPES OR EASILY ERODED SOILS ARE ENCOUNTERED.

FOR USE IN NATURAL AREAS MORE FORMALLY LANDSCAPED OR IRRIGATED, SITES WILL REQUIRE A DIFFERENT TREATMENT.
*MINIMUM RADIUS TO INSIDE EDGE:
  MULTIPLE USE UNPAVED, 4'-0" WIDE:
    PEDESTRIAN  3'-0"
    EQUESTRIAN  12'-0"
    BICYCLISTS  6'-0"
MULTIPLE USE BACKCOUNTRY DIRT Z'-WIDE:
ALL USER TYPES  6'-0"

NOTE: RP EQUALS RADIUS POINT

EXISTING SLOPE

STONE WALL AS NECESSARY.

SECTION VIEW

LOWER LEG

UPPER LEG

DITCH

SECTION

LANDING

DITCH

PLAN VIEW

STONE WALL
GUIDELINES:
USE WHERE MOTORIZED ACCESS COULD BE A PROBLEM SUCH AS AT TRAILHEADS, WHERE TRAILS INTERSECT OR CROSS STREETS AND WHERE TRAILS PARALLEL ROADS AT POINTS WHERE ACCESS IS LIKELY.
BOLLARDS ARE USED WITHIN THE TRAIL SURFACE TO PROHIBIT OR LIMIT ACCESS.
ROCK BARRIER

STONES SHALL HAVE A FLAT BASE AND SET SECURELY IN PLACE.

TRAILHEAD WIDENED 1/8-1/16

STEEL ROD USED TO PIN BARRIER STONES TO TRAIL BED SHALL BE 3/4" Ø BY 30" MILD STEEL ROD OR NO. 6 REINFORCING BAR.

20"-24"

GUIDELINES FOR USE

USE ALONG TRAIL WHERE DOWNSLOPE GRADES ARE STEEP AND HAZARDOUS.

USE ALONG OUTSIDE EDGE OF TRAIL CURVES WHERE SLOPES ARE STEEP AND EXPOSED.

USE WHERE SWITCHBACK CUTTING COUL BE A PROBLEM.

USE AT TRAIL HEADS OR ROAD CROSSINGS TO DISCOURAGE OR PROHIBIT MOTORIZED ACCESS.

USE TO INDIRECT TRAIL USERS TO SITUATIONS WHERE SWITCHBACKS COULD BE A PROBLEM.
GUIDELINES FOR USE

USE FOR ALL SURFACE DRAINAGE GRATES IN PUBLIC STREETS, PRIVATE ROADS, PARKING LOTS, ETC.
WHERE BICYCLE TRAFFIC IS POSSIBLE.

SECTION BB

SECTION AA

BICYCLE-SAFE GRATING & FRAME
3 RAIL SPLIT FENCE OFcedar- or other wood suitable for below grade installation.

Posts to have a min. dia. of 6”.
Pails to have a min. dia. of 4”.

Guidelines for use:
This is the typical fence along the U224 Entry Corridor.
Any new developments along the entry should use this same design. Use where trail separation is needed from adjacent landowners.
OPTIONAL 2'-0" EXTENSION FOR EQUESTRIAN USE
1/4" x 12" STRAP HINGE

BOMMER SPRING
MODEL NO.
2400-ID 11"  

ELEVATION

2'-0"  6'-6"  15' MAX.

METAL TEE-TYPE POSTS
2 STRANDS BARBED WIRE

2' FIELD FENCE

NOTE:
USE SELF CLOSING GATE WHERE TRAIL PASSES THROUGH UNFENCED GRAZING PROPERTIES.

SET POST SLIGHTLY OUT OF PLUMB IN THIS DIRECTION SO GATE CLOSES BY GRAVITY

TILT

GATE SHOULD SWING TOWARD CATTLE SIDE.

PLAN

SELF CLOSING GATE
GUIDELINES FOR STAIRS
Stone stairs can be used where trail grades exceed the maximum allowable slopes and where grade must be gained quickly. Stairs should not be used on trails which are used by horses, road bikes or the disabled. This detail is included for reference only. Stone stairs should be built with the intent that intensive use should not impact the stairs the slightest.

Choose stones with a good shape for stairs. Minimum sizes are shown. Start at the bottom and work up. Use the biggest stones possible to span the trail. One stone would be the best, two are fine, and three is maximum.

Completely cross the trail; route the trail so people will stay on the trail and stairs.

Build to the dimensions shown and make each set of stairs uniform.

Keep the height of each step and the distance between steps as uniform as possible within each set of stairs.

Maximum grade at top and bottom of stairs as well as between stairs should be 8%.

Walk your staircase to ensure it is smooth and uniform.
NOTE:
WHERE STAIRCASES ARE LOCATED IN DEVELOPED AREAS OF THE COMMUNITY, COMPLIANCE WITH THE UNIFORM BUILDING CODE IS REQUIRED.

PLANK STAIRWAY

FOUR 8" SPIKES PER PLANK (3/8" Ø)
FOUR 8" SPIKES PER SILL (3/8" Ø)

4" THICK NOTCHED CARLLIAKE

6" MAX.

TWO 8" SPIKES PER POST (3/8" Ø)

MIN. TRAIL WIDTH

12" MIN. 24" MIN.

MIN. TRAIL WIDTH

12" MAX.

MIN. 8" X 8" PRESSURE TREATED TIMBER

SECTION AA

PINNED STAIRWAY

TREADS TO BE DUG INTO THE SLOPE AND SET INTO PLACE.

DRILL HOLES THROUGH EACH TREAD FOR EACH REBAR STAKE.

DRIVE REBAR STAKES THROUGH TREADS AND INTO GROUND BELOW.
BOARDWALK GUIDELINES
FOR USE IN WETLANDS OR
OTHER LOCATIONS WHERE
CONVENTIONAL PAVEMENT
IS NOT PRACTICAL OR
APPROPRIATE:
DO NOT USE WHERE MOTORIZED
VEHICLES OR HORSES
ARE EXPECTED.

BOARDWALK DETAIL - A

BOARDWALK DETAIL - B
4" x 4" Curb Redwood or Treated Wood
2" x 10" Redwood or Treated Wood Decking
3" x 8" Treated Doug Fir Stringer
Stirrup
8" φ Concrete Pier
12" φ Pier Excavation & Compacted Backfill
4 EA. #4 Rebar - 2" Clear
12" φ Footing
12" Compacted Aggregate

Boardwalk Detail - C
Appendix C.

Sign Standards
TYPICAL SIGNING - TRAIL CROSSING AT MID-BLOCK

TYPICAL SIGNING - TRAIL CROSSING AT INTERSECTION

TYPICAL SIGNING - ON STREET BIKE ROUTE CROSSING
SOLID COLOR SYMBOLS, LETTERING & BORDER. DARK BROWN ON WHITE BACKGROUND.

4X4 REDWOOD OR TREATED WOOD POST

YIELD HIERARCHY SIGN
WELCOME TO PARK CITY TRAIL SYSTEM
TRAIL USER INFORMATION:

ALL VISITORS:

Respect the privacy of landowners along the trail system. Please leave no trace of your passage, pack out all trash. Respect trail closures implemented to protect visitors and natural resources.

HIKERS AND PEDESTRIANS:

Be aware that you are sharing the trails with cyclists and equestrians. Please yield to equestrians, and allow ample space for their passage.

CYCLISTS AND OTHER FORMS OF HUMAN - POWERED TRANSPORTATION:

Yield to hikers and equestrians. Please dismount when encountering equestrians on steep slopes, or in areas with limited sight distance. Alert other trail users with a bell, or other audible signal when approaching from behind. Please use a helmet and gloves. Ride at a safe and controlled speed.
REMEMBER TRAIL COURTESY

1. IF IN DOUBT YIELD
2. RESPECT HORSES
3. RIDE SAFELY AND AWARE
4. ALERT OTHERS WHEN APPROACHING
5. LEAVE NO TRACE
Examples of other signs available. Copy and graphics can be altered to fit your needs and size.
A second honored design by the Hanlon Group of Boulder, Colorado, is this system of signs designed for bicycle riders. Initiated first for the University of Colorado, which needed help in resolving the separation of bike, pedestrian, and car traffic on its campus, the program was later expanded for use in similar areas throughout the Boulder area. Unlike most traffic signs that are 8 ft high, meant to be read from a car or truck, these signs are 5 ft high, a height calculated as eye level for bike riders. Graphics tell riders what they are allowed to do, where they are allowed to ride, where they should dismount. "Before this system," the designers say, "riders felt as though they were being punished for bike riding. Now they feel that they have rights." A consistency in appearance makes the signs easily identifiable: on a brown background, there are white symbols, blue letters for standard messages, and red letters for regulatory messages. Sign faces are 14 in. x 17 in.
Be Predictable.
Travel in a consistent and predictable manner. Always glance behind before changing position on the trail.

Do Not Block The Trail.
When in a group or with a pet, use no more than half the trail. Do not block the flow of other users. Pets should be on a leash.

Keep Right.
Stays near the right side of the trail as it helps ensure when to pass,

Pass On The Left.
Look ahead to be sure the lane is clear. Move into the lane of travel to pass. Do not coast or speed up.

Slower Traffic Has The Right-of-Way.
Faster traffic is responsible for yielding to slower and on-coming traffic.

Let Other Users Know You Are About To Pass.
Using your voice, a bell or even give a clear warning signal. such as “passing on your left.”

Yield When Entering or Crossing Trails.
At uncontrolled points yield traffic.

Keep The Trail Clean.
Use litter baskets, and your personal trash bag. Keep the trail clean.
**Hikers/Joggers**

- Be alert and aware of the needs of other users. Pass equestrians with caution.
- Stay on the trail.

**Bicyclists**

- Ride single file when meeting or being passed.
- Yield right-of-way to all trail users.
- Obey all trail signs.
- Control your speed. Travel is under 15 miles per hour.
- Stay on the trail and maintain traction. Slogging damages trails.
- Do not ride in the mud or upslope trails where ruts are created by your tires.

For more information on South Suburban’s Trail System, Call 795-6631.

This information made available by Metro Trail System Committee.
Appendix D.

Federal Highway Administration Supplement for Bicycle Traffic Management
Part IX. TRAFFIC CONTROLS FOR BICYCLE FACILITIES

A. GENERAL

9A-1 Requirements for Bicyclist Traffic Control Devices

Traffic control devices, whether they are intended for motorists or bicyclists, must adhere to five basic requirements to be able to perform their intended function. They must:

1. Fulfill a need.
2. Command attention.
3. Convey a clear, simple meaning.
4. Command respect of road users.
5. Give adequate time for proper response.

The design, placement, operation, maintenance, and uniformity of traffic control devices must be considered to meet the above requirements. Design is a critical feature to permit the device to fulfill a need and to command respect of road users. The placement—lateral, vertical, and longitudinal—plays an important part in making the device effective and in giving adequate time for proper response. The overall test of the device's effectiveness and a check on all five of the basic requirements.

Uniformity, achieved by following the recommendations and standards of this Manual, greatly enhances the ability of a device to convey a clear, simple meaning to the user.

Whenever devices are installed, they should be warranted and based on a prior engineering study. Where the guidance provided by this part of the Manual does not fully define where particular devices should be used, qualified traffic engineers should determine the application of devices on any bicycle facility before installation is made. It is intended that this Manual define the standards for traffic control devices, but shall not be a legal requirement for their installation.

9A-2 Scope

This Part covers bicycle-use related signs, pavement markings and signals which may be used on highways or bikeways.
9A-3 Definitions Relating to Bicycles

The following terms are used throughout Part IX:

1. Bikeway—Any road, street, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

2. Bicycle Trail—A separate trail or path from which motor vehicles are prohibited and which is for the exclusive use of bicycles or the shared use of bicycles and pedestrians. Where such trail or path forms a part of a highway, it is separated from the roadways for motor vehicle traffic by an open space or barrier.

3. Designated Bicycle Lane—A portion of a roadway or shoulder which has been designated for use by bicyclists. It is distinguished from the portion of the roadway for motor vehicle traffic by a paint stripe, curb, or other similar device.

4. Shared Roadway—A roadway which is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated.

5. Bicycle Route—A system of bikeways designated by appropriate route markers, and by the jurisdiction having authority.

9A-4 Standardization of Devices

Standards for basic design elements and devices using these standards are given in this Manual. These standard devices generally will serve most applications. Where particular conditions require the use of a device that is not included in this Manual, the general principles in this Manual as to color, size, and shape should be followed wherever practical. Such devices should also follow the design, installation and application concepts contained in the Manual.

9A-5 Maintenance

Bicycle signs and markings should be properly maintained to command respect from both the motorist and the bicyclist. When installing signs and markings on bicycle facilities, care should be taken to have an agency designated to maintain these devices.

9A-6 Legal Authority

Traffic control devices shall be placed only by the authority of a public body or official having jurisdiction, for the purpose of regulating, warning, or guiding traffic. No traffic control device or its support shall bear any advertising or commercial message, or any other message that is not essential to traffic control.

All regulatory devices, if they are to be enforced, need to be backed by applicable laws, ordinances, or regulations.

9A-7 Meanings of “Shall,” “Should,” and “May”

In this Part as in other parts of the Manual, the words “shall,” “should,” and “may” are used to describe specific conditions concerning traffic control devices. To clarify the meanings intended by use of these words, the following definitions are provided:

1. SHALL—A mandatory condition. Where certain requirements in the design or application of the device are described with the “shall” stipulation, it is mandatory that these requirements be met.

2. SHOULD—An advisory condition. Where the word “should” is used, it is considered to be advisable usage, recommended but not mandatory.

3. MAY—A permissive condition. No requirement for application is intended. If a particular device is used under a “may” condition, however, its design shall follow the prescribed format.

9A-8 Relation to Other Documents

The Uniform Vehicle Code and Model Traffic Ordinance published by the National Committee on Uniform Traffic Laws and Ordinances, have provisions for bicycles and are used as the legal basis for the control devices included herein. Under the Uniform Vehicle Code, bicycles are generally considered to be vehicles, so the bicyclists have the same privileges and obligations as other drivers.

Informational documents used during the development of the signing and markings recommendations in this part of the Manual include the following:

5. State and municipal design guides.

Other documents which relate to the application of traffic control devices in general, are listed in section 1A-7 of this Manual.

9A-9 Colors

The use of colors for bicycle facility traffic control devices should conform to the color code specified in section 1A-8 for signs and markings. This in part is as follows:

YELLOW—General warning
RED—Stop or prohibition
BLUE—Service guidance
9B-1 Application of Signs

Bicycle-use related signs on highways and bikeways serve three basic purposes: regulating bicycle usage, directing bicyclists along pre-established routes, and warning of unexpected conditions. Care should be taken not to install too many signs. A conservative use of regulatory and warning signs is recommended as these signs, if used to excess, tend to lose their effectiveness. The frequent display of guide signs, however, aids in keeping the bicyclist on the designated route and does not lessen their value. Some signs for the bicyclist can also serve the motorist and the pedestrian.

9B-2 Location and Position

Where signs are to serve both bicyclists and motorists, mounting heights and lateral placement shall be as specified in Part II, Signs. Figure 9-1 illustrates typical signing placement for bicycle trails. Overhead sign clearance on bicycle trails shall be a minimum of 8 1/2 feet. The clearance provided should also be adequate for the typical maintenance vehicles used on the bikeway. Where signs are for the exclusive use of bicyclists, care should be taken that they are located so that motorists are not confused by them.

![Figure 9-1. Bicycle sign placement on a trail.](image)

9B-3 Design

The design of signs for bicycle facilities should, wherever possible, be identical to that specified in this Manual for motor vehicle travel. Uni-
formity in design includes shape, color, symbols, wording, lettering, and illumination or reflectorization. Detailed drawings of the standard signs illustrated in this Manual are available to State and local highway and traffic authorities, sign manufacturers, and similar interested agencies.* Standardization of these signs does not preclude further improvement by minor changes in the proportion of symbols, stroke width, and height of letters, or width of borders. However, all shapes and colors shall be as indicated, all symbols shall be unmistakably similar to those shown and (where a word message is applicable) the wording shall be as provided herein.

The sign dimensions shown in this part of the Manual shall be considered standard for application on all types of bicycle facilities. Where signs shown in other parts of this Manual are intended for exclusive bicycle use, smaller sign sizes from that specified may be used. Incremental increases in special bicycle facility signs are also desirable to make the sizes compatible with signs for motor vehicles, where both motorists and bicyclists benefit by a particular sign.

The sign lettering shall be in upper-case letters of the type shown in the Standard Alphabets for Highway Signs and Pavement Markings.*

All signs should be reflectorized for bicycle trails as well as for shared roadway and designated bicycle lane facilities.

9B-4 Regulatory Signs

Regulatory signs are to inform bicyclists, pedestrians and motorists of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Regulatory signs normally shall be erected at the point where the regulations apply. The sign message shall clearly indicate the requirements imposed by the regulations and shall be easily visible and legible to bicyclists and where appropriate, motorists and pedestrians.

9B-5 Bicycle Prohibition Sign (R5-6)

This sign is intended for use at the entrance to facilities, such as freeways, where bicycling is prohibited. Where pedestrians and motor-driven cycles are also prohibited from using these facilities, it may be more desirable to use the R5-10a word message sign (sec. 2B-28). In reduced size (18 x 18 inches), this sign may be used on sidewalks where bicycle riding is prohibited.

9B-6 Motor Vehicle Prohibition Sign (R5-3)

This sign is intended for use at the entrance to a bicycle trail.

* Available from the Federal Highway Administration (HTD-39) Washington, D.C. 20590

9C-1 Functions and Limitations of Markings

Markings are important on roadways that have a designated bicycle lane. Markings indicate the separation of the lanes for motor vehicle and bicycles, assist the bicyclist by indicating assigned travel paths, and can provide advance information for turning and crossing maneuvers.

9C-2 General Principles

Although bicycles are generally not equipped with strong lighting equipment, the added visibility of reflectorized pavement markings is desirable even where there is exclusive use by bicyclists.

Markings shall be reflectorized on bicycle trails and on facilities used by both motor vehicles and bicycles.

Recognized bikeway design guides should be used when laying out markings for a bicycle lane on a highway facility (sec. 9A-8).

The frequent use of symbols and word messages stenciled in the bike lanes, is a desirable method of supplementing sign messages. Figures 9-4 through 9-6, show acceptable examples of the application of lines, word messages and symbols on designated bikeways with and without parking for motor vehicles.

If a specific path for a bicyclist crossing an intersection is to be designated, a dotted line may be used to define such a path.

9C-3 Marking Patterns and Colors

The color and type of lines used for marking bicycle facilities shall be as defined in section 3A-7. Normally, center lines would not be required on bicycle paths. Where conditions make it desirable to separate two directions of travel at particular locations, a double solid yellow line should be used to indicate no passing or no traveling to the left of the line.

Where bicycle paths are of sufficient width to designate two minimum width lanes, a broken yellow line may be used to separate the two directions of travel.

Broken lines used on bicycle paths should have the normal 1 to 3 segment-to-gap ratio. To avoid having gaps excessively long, a nominal 3-foot segment with a 9-foot gap is recommended.

Where bicycles and pedestrians use a common facility, it may be desired to separate the two traffic flows. A solid white line should be used to mark this separation of path use. The R9-7 sign may be used to supplement the pavement marking (sec. 9B-9).
Figure 9-4. Typical pavement markings—designated bicycle lane, two-way traffic with parking and low right turn volume.

Figure 9-5. Intersection pavement markings—designated bicycle lane with left turn area, heavy turn volumes, parking, one-way traffic or divided roadway.
9B-7 Bicycle Restriction Signs (R9-5 & 6)

This series of signs is intended for use where pedestrian facilities are being used for bicycle travel. They should be erected off the edge of the sidewalk, near the crossing location, where bicyclists are expected to dismount and walk with pedestrians while crossing the street.

The R9-5 sign may be used where bicycles can cross the street only on the pedestrian walk signal indication.

The R9-6 sign may be used where bicycles are required to cross or share a facility used by pedestrians and are required to yield to the pedestrians.

Figure 9-6. Word and symbol pavement markings for bicycle facilities
9B-8 Designated Lane Signs (R3-10 & 11)

The R3-10 sign should be used in advance of the beginning of a marked designated bicycle lane to call attention to the lane and to the possible presence of bicyclists. The R3-10 and R3-11 signs should be used only in conjunction with the Preferential Lane Symbol pavement marking and erected at periodic intervals along the designated bicycle lane and in the vicinity of locations where the preferential lane symbol is used (sec. 9C-4).

Where appropriate, the message ENDS may be substituted for AHEAD on the R3-10 sign and LEFT or CURB can be substituted for RIGHT on the R3-11 sign.

9C-4 Marking of Designated Bikeways

The diamond-shaped Preferential Lane Symbol is intended for use on highway facilities where lanes are reserved for exclusive use by a particular class of vehicle. Designated bikeways are considered as this type of lane and shall include use of the Preferential Lane Symbol as a pavement marking and on appropriate signing (sec. 9B-8). The symbols as a pavement marking shall be white and shall be used immediately after an intersection to inform motorists turning of the restricted nature of the lane. If the Preferential Lane Symbol is used in conjunction with other word or symbol messages, it shall precede them. A supplemental lane symbol or word may be used following as shown in figures 9-4 through 9-6.

9C-5 Word Messages and Symbols Applied to the Pavement

Where messages are to be applied on the pavement, smaller size letters can be used on exclusive bike lanes than are used on regular highways. Where arrows are needed, half-size layouts of the arrows can be used (sec. 3B-17). Optional word and symbol markings considered appropriate for use with the Preferential Lane Symbol marking are shown in figure 9-6. Standard pavement marking alphabets and symbols have been prepared.*

9C-6 Object Markings on Bicycle Trails

There may be hazardous objects located adjacent to bicycle trails which, if visible to the rider, can be avoided with little difficulty. Such objects can be marked with highly visible markings to make their identification by approaching riders more certain. Care should be taken to avoid having object markers become hazardous objects. Corners of object markers as well as signs should be rounded to prevent their becom-

* Available from the Federal Highway Administration (HTX. 30) Washington, D.C. 20590
Figure 9-2. Typical signing for beginning and ending of bicycle人脉.

Figure 9-3. Typical signing for beginning and ending of designated bicycle lanes.
9B-18 Other Warning Signs

Other warning signs may be required on bicycle facilities to warn riders of unexpected conditions. The intended use of these signs generally is self-explanatory. They should normally be installed no less than 50 feet in advance of the beginning of hazards.

Where construction or maintenance activity is present on bicycle trails, appropriate signs from Part VI of the Manual should be used.

9B-19 Guide Signs

On highways where a bicyclist is sharing a lane with motor vehicles or is using an adjacent bikeway, the regular guide signing as described in Part II of this Manual will serve both modes of travel. Where a designated bikeway exists, special bicycle route signing should be provided at decision points along the bikeway, including signs to inform cyclists of bicycle route direction changes and confirmatory signs to ensure that route direction has been accurately comprehended.

Figure 9-2 shows an example of the signing for the junction of a bicycle trail with a highway. Figure 9-3 shows the signing and marking for the beginning and ending of designated bikeways. Guide signing should be repeated at regular intervals to ensure that bicyclists approaching from side streets know they are traveling on an officially designated bikeway. Similar guide signing should be used for shared lane bikeways with intermediate signs placed frequently enough to ensure that cyclists already on the bikeway do not stray from it and lose their way.

9B-20 Bicycle Route Sign (D11-1)

This sign is intended for use where no unique designation of routes is desired. It should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

9B-21 Bicycle Route Marker (M1-8)

Where it is desired to establish a unique identification (route designation) for a State or local bicycle route, the standard Bike Route Marker, M1-8, should be used. The route marker shall contain a numerical designation and shall have a green background with a reflectorized white legend and border. The Bike Route Marker is intended for use on both shared facilities and on designated bikeways, as required, to provide route guidance for bicyclists.
9B-10 STOP and YIELD Signs (R1-1, 2)

STOP signs are intended for use on bicycle facilities where bicyclists are required to stop. Where conditions require bicyclists and not motorists to stop, care should be taken to place the sign so it is not readily visible to the motorist.

YIELD signs are intended for use where the bicyclist can see approaching traffic and where bicyclist must yield the right of way to that traffic. The visibility of approaching traffic must be adequate to permit the bicyclist to stop or to take other measures to avoid that traffic.

For added emphasis STOP and YIELD signs in regular 30 x 30-inch and 36 x 36 x 36-inch sizes may be used.

The smaller signs shown below are intended for use on bicycle trails where bicyclists are required to stop or yield the right of way. If the sign applies to motorists and bicyclists, then the size should be as shown in Part II-B.

9B-11 No Parking Signs (R7-9, & 9a)

Where it is necessary to restrict parking, standing, or stopping in a designated bicycle lane, appropriate signs as described in sections 2B–31 through 2B–33 may be used, or signs R7-9 or R7-9a shall be used.

9B-12 Lane-Use Control Signs (R3-7, R4-4)

Where right turning motor vehicles must merge with bicycle traffic on designated bike lanes, the R3-7 and R4-4 signs may be used. The R4-4 sign is intended to inform both the motorist and the bicyclist of this merging maneuver. Where a designated bicycle lane is provided near the stop line, an R3-7 sign may be used to prevent motorists from crossing back over the bike lane.

9B-13 Warning Signs

Warning signs are used when it is deemed necessary to warn bicyclists or motorists of existing or potentially hazardous conditions on or adjacent to a highway or trail. The use of warning signs should be kept to a minimum because the unnecessary use of them to warn of conditions which are apparent tends to breed disrespect for all signs.

Warning signs specified herein cover most conditions that are likely to be met. If other warnings are needed, the signs shall be of standard shape and color for warning signs, and the legends shall be brief and easily understood.

9B-14 Bicycle Crossing Sign (W11-1)

The Bicycle Crossing sign is intended for use on highways in advance of a point where a bikeway crosses the roadway. It should be erected about 750 feet in advance of the crossing location in rural areas where speeds are high, and at a distance of about 250 feet in urban residential or business areas, where speeds are low.

If the approach to an intersection is controlled by a traffic control signal, stop sign or yield sign, the W11-1 sign may not be needed.

9B-15 Hazardous Condition Sign (W8–10)

The Hazardous Condition sign is intended for use where roadway or bicycle trail conditions are likely to cause a bicyclist to lose control of his bicycle. These conditions could include slippery pavement, slick bridge
9B-10 Roadway Signs
30" × 30"
24" × 18"

9B-10 Bicycle Trail Signs
18" × 18"
12" × 9"

The W8-10 sign may be used with a supplemental plaque describing the particular roadway or bicycle trail feature which might be of danger to the bicyclist such as SLIPPERY WHEN WET, STEEL DECK, ROUGH PAVEMENT, BRIDGE JOINT, or FORD.

9B-16 Turn and Curve Signs (W1-1, 2, 4, 5, 6, 7)

On bicycle trails where it is necessary to warn bicyclists of unexpected changes in path direction, appropriate turn or curve signs should be used. They should normally be installed no less than 50 feet in advance of the beginning of the change of alignment.

9B-17 Intersection Signs (W2-1, 2, 3, 4, 5)

Intersection signs are intended for use as appropriate to fit the prevailing geometric pattern on bike trails where connecting routes join and where no STOP or YIELD signs are required. They should be used wherever sight distance at the intersection is severely limited, and may be used for supplemental warning at intersections where STOP and YIELD signs are erected.
9B-22 Supplemental Plaques for Route Signs and Route Markers

Where desired, supplemental plaques can be used with the D11-1 and M1-8 signs to furnish additional information, such as directional changes in the route, and intermediate range distance and destination information. The M4-11 through M4-18 signs may be mounted above the appropriate Route Signs or Route Marker. Supplemental plaques D1-1a, b and c are intended for use with the D11-1 Bicycle Route Sign. The appropriate arrow sign (M7-1 through M7-7), if used, should be placed below the Route Sign or Route Marker. These signs shall have a white arrow on a green background.

D. SIGNALS

9D-1 Application

It is rare when a traffic signal is installed solely for bicyclists; however, at some locations there may be a need to install signal devices to facilitate bicycle travel through the intersection. For warrants and other requirements relating to signal installations, see Part IV of this Manual. Warrants used for motor vehicles are considered appropriate for use in determining the need for signals to serve bicyclists. Warrant Four for school crossings is considered to be appropriate for bicyclists also.

9D-2 Visibility Requirements

At installations where programmed signals are used, special attention should be given to adjusting the signals so bicyclists on the regular bicycle lanes or travel paths can see the signals. If programmed signals cannot be aimed to serve the bicyclist, then separate signals shall be provided.

9D-3 Signal Operation for Bicycles

Bicycles generally can cross intersections under the same signal timing arrangement as motor vehicles. Where bicycle use is expected, extremely short change intervals should not be used and an all red clearance interval may be necessary.
Appendix E.

Park City Corporation 1992 Trails Cost Estimation
<table>
<thead>
<tr>
<th>Park City Trails Master Plan Update Cost Estimates</th>
<th>DATE: 8/23/91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trails Installation costs</td>
<td></td>
</tr>
<tr>
<td>1. One time expenditure on existing trail system</td>
<td>$22,605.54</td>
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<tr>
<td>2. High Volume paved trail</td>
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</tr>
<tr>
<td>(10' paved with 4' soft surface)</td>
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</tr>
<tr>
<td>includes filter fabric and wood chips</td>
<td></td>
</tr>
<tr>
<td>4&quot; striping</td>
<td></td>
</tr>
<tr>
<td>Crosswalks $41.20 ea. 1 crosswalk</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Signs 2 signs 23.48 ea + installation</td>
<td>$41.20</td>
</tr>
<tr>
<td>Bollards 3 bollards $138.00 ea + installation</td>
<td>$93.92</td>
</tr>
<tr>
<td>Total</td>
<td>$828.00</td>
</tr>
<tr>
<td>3. 8' paved trail</td>
<td></td>
</tr>
<tr>
<td>4&quot; striping</td>
<td></td>
</tr>
<tr>
<td>Crosswalks $41.20 ea. 1 crosswalk</td>
<td>$54,912.00</td>
</tr>
<tr>
<td>Signs 2 signs 23.48 ea + installation</td>
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</tr>
<tr>
<td>Bollards 3 bollards $138.00 ea + installation</td>
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</tr>
<tr>
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</tr>
<tr>
<td>4. 6' Concrete Sidewalk</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Signs 2 signs 23.48 ea + installation</td>
<td>$41.20</td>
</tr>
<tr>
<td>Bollards 3 bollards $138.00 ea + installation</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>5. 4' Concrete Sidewalk</td>
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</tr>
<tr>
<td>Crosswalks $41.20 ea. 1 crosswalk</td>
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</tr>
<tr>
<td>Signs 2 signs 23.48 ea + installation</td>
<td>$41.20</td>
</tr>
<tr>
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<td>$93.92</td>
</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>6. 8' Unpaved High Volume Gravel Trail</td>
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<tr>
<td>Filter Fabric</td>
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### 8. Woodchip Hiking Trails

<table>
<thead>
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<tbody>
<tr>
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<td>$138.00 ea. + installation</td>
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</tbody>
</table>

<p>| | |</p>
<table>
<thead>
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<td></td>
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| Total | $3,614.80 |

### 9. Backcountry Trails

<table>
<thead>
<tr>
<th>Volunteer Coordination</th>
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<td>Signs</td>
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<tr>
<td></td>
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<table>
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<tr>
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<tbody>
<tr>
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### 10. Bike Lanes

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<tr>
<th>Symbols</th>
<th>$1.09/ undetermined</th>
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| Total | $1,093.92 |

### TMPU Trails Installation Costs

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<td>3 bollards</td>
<td>$138.00 ea. + installation</td>
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<table>
<thead>
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| Total | $4,442.80 |

<table>
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<td>Total</td>
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| Total | $460.96 |

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<tr>
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<td>Total</td>
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<tr>
<td></td>
<td>$93.92</td>
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| Total | $1,093.92 |

<table>
<thead>
<tr>
<th>Signs</th>
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<p>| | |</p>
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<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>$46.96</td>
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</table>

<table>
<thead>
<tr>
<th>Bollards</th>
<th>3 bollards</th>
<th>$138.00 ea.</th>
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<p>| | |</p>
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<thead>
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<td>Total</td>
</tr>
<tr>
<td></td>
<td>$414.00</td>
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| Total | $460.96 |

<table>
<thead>
<tr>
<th>Signs</th>
<th>2 signs</th>
<th>23.48 ea + installation</th>
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</thead>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>$93.92</td>
</tr>
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| Total | $1,093.92 |
### Existing Trail Maintenance Cost Estimates

<table>
<thead>
<tr>
<th>Description</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently Approximately 8 miles</td>
<td></td>
</tr>
<tr>
<td><strong>One time costs</strong></td>
<td></td>
</tr>
<tr>
<td>Centerline striping 4&quot; reflectorized stripe $0.16/ft for 8 mi.</td>
<td>$6,758.40</td>
</tr>
<tr>
<td>Root barrier cost and installation-approx.600 ft.</td>
<td>$4,770.00</td>
</tr>
<tr>
<td>Bike path tear-up cost- approx.600 ft. pvt. removal $0.52/sq.ft.</td>
<td>$2,496.00</td>
</tr>
<tr>
<td>Root removal cost undetermined</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Bike path repave ment</td>
<td>$6,240.00</td>
</tr>
<tr>
<td>Striping for crosswalks-6 crosswalks $41.20/crosswalk</td>
<td>$247.20</td>
</tr>
<tr>
<td>6&quot;striping, stripes every 2 ft, 8 strips $0.20 lin.ft</td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td></td>
</tr>
<tr>
<td>2 safety signs at tunnel - Caution - $23.48</td>
<td>$93.92</td>
</tr>
<tr>
<td>6 path street crossing signs $13.21 ea.</td>
<td>$158.52</td>
</tr>
<tr>
<td>8&quot;x8&quot; Trail Bollards 3 bollards</td>
<td>$828.00</td>
</tr>
<tr>
<td>Carsonite symbols</td>
<td></td>
</tr>
<tr>
<td>$0.90/decal $1.70/custom decal</td>
<td></td>
</tr>
<tr>
<td>est. 5 decals at $0.90 per bollard</td>
<td>$13.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$22,605.54</strong></td>
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</tbody>
</table>

### Long term costs= less than yearly basis

<table>
<thead>
<tr>
<th>Description</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt 1&quot; Overlay replace every 15 years</td>
<td>$648.00</td>
</tr>
<tr>
<td>Fog seal replace every 3 years</td>
<td>$30.98</td>
</tr>
<tr>
<td>Slurry seal replace every 5 years</td>
<td>$100.25</td>
</tr>
<tr>
<td>Root Barriers 19.5&quot;x100' root barriers $495.00/roll</td>
<td>$139.92</td>
</tr>
<tr>
<td>Install as needed $4.95/ft.</td>
<td></td>
</tr>
<tr>
<td>15 year life 1mi in 20 miles</td>
<td></td>
</tr>
<tr>
<td>plus installation cost $3.00/ft-1 mi in 20 miles</td>
<td></td>
</tr>
<tr>
<td>Crosswalks-Restripe every other year</td>
<td></td>
</tr>
<tr>
<td>Cost for 5 crossings</td>
<td>$62.50</td>
</tr>
<tr>
<td>Centerline restripe every other year</td>
<td></td>
</tr>
<tr>
<td>Subtotal CPM</td>
<td>$1,404.05</td>
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</table>

### Short term costs= yearly or more frequent basis

<table>
<thead>
<tr>
<th>Description</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snow Removal based on 26 removal days</td>
<td></td>
</tr>
<tr>
<td>$25.00 per mile for bombadier</td>
<td>$793.00</td>
</tr>
<tr>
<td>$5.50 per mile for labor</td>
<td></td>
</tr>
<tr>
<td>Snow removal clean up 3x per year</td>
<td>$141.00</td>
</tr>
<tr>
<td>$25.00 per mile for bombadier</td>
<td>$47.00 per mile</td>
</tr>
<tr>
<td>$22.00 per mile for labor</td>
<td></td>
</tr>
<tr>
<td>Inspection cost</td>
<td></td>
</tr>
<tr>
<td>$5.00/mile in vehicle</td>
<td>$130.00</td>
</tr>
<tr>
<td>weekly, 26 weeks</td>
<td></td>
</tr>
<tr>
<td>$10.00/mile on foot</td>
<td>$260.00</td>
</tr>
<tr>
<td>Service</td>
<td>Weekly Cost</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Tree trimming</td>
<td>$50.00</td>
</tr>
<tr>
<td>Sweeping</td>
<td>$55.00</td>
</tr>
<tr>
<td>Signs</td>
<td>$46.96</td>
</tr>
<tr>
<td>Bollard replacement</td>
<td>$552.00</td>
</tr>
<tr>
<td>High volume multiple use paved</td>
<td></td>
</tr>
<tr>
<td>10' paved with 4' soft surface</td>
<td></td>
</tr>
<tr>
<td>Approximately 28.0 miles</td>
<td></td>
</tr>
<tr>
<td>at build out</td>
<td></td>
</tr>
<tr>
<td>Long term costs</td>
<td></td>
</tr>
<tr>
<td>Asphalt 1&quot; Overlay</td>
<td>$810.00</td>
</tr>
<tr>
<td>Asphalt Fog seal</td>
<td>$38.72</td>
</tr>
<tr>
<td>Asphalt Slurry seal</td>
<td>$125.31</td>
</tr>
<tr>
<td>Centerline stripe</td>
<td>$422.40</td>
</tr>
<tr>
<td>Wood chips</td>
<td></td>
</tr>
<tr>
<td>4' Soft surface</td>
<td>$283.91</td>
</tr>
<tr>
<td>Root Barriers 19.5&quot;x100' root barriers</td>
<td>$139.92</td>
</tr>
<tr>
<td>4&quot; Reflectorized pavement striping</td>
<td>$422.40</td>
</tr>
<tr>
<td>Short term maintenance</td>
<td></td>
</tr>
<tr>
<td>Snow Removal</td>
<td></td>
</tr>
<tr>
<td>Snow removal clean up</td>
<td>$141.00</td>
</tr>
<tr>
<td>Inspection cost</td>
<td>$260.00</td>
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</table>
### Cost Estimates TMPU

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Tree trimming</td>
<td>$10.00/mile on foot, biweekly 26 weeks</td>
<td>$520.00</td>
</tr>
<tr>
<td>Tree trimming</td>
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</tr>
<tr>
<td>Tree trimming</td>
<td>$40.00 labor</td>
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</tr>
<tr>
<td>Sweeping</td>
<td>2x per year continuous</td>
<td>$55.00</td>
</tr>
<tr>
<td>Sweeping</td>
<td>discontinuous</td>
<td>$75.00</td>
</tr>
<tr>
<td>Signs</td>
<td>Lose 10% of signs</td>
<td>$46.96</td>
</tr>
<tr>
<td>Signs</td>
<td>1 sign/mi</td>
<td></td>
</tr>
<tr>
<td>Bollards</td>
<td>2 replacements</td>
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</tr>
<tr>
<td>Subtotal CPM</td>
<td></td>
<td>$2,492.96</td>
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</table>

### 8' paved

Approximately 47 miles at build out

<table>
<thead>
<tr>
<th>Long term maintenance</th>
<th>Annual CPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt</td>
<td>1&quot; Overlay replace every 15 years</td>
</tr>
<tr>
<td>Asphalt</td>
<td>Fog seal replace every 3 years</td>
</tr>
<tr>
<td>Asphalt</td>
<td>Slurry seal replace every 5 years</td>
</tr>
<tr>
<td>Root Barriers</td>
<td>19.5&quot;x100' root barriers</td>
</tr>
<tr>
<td></td>
<td>Install as needed $4.95/ft.</td>
</tr>
<tr>
<td></td>
<td>15 year life</td>
</tr>
<tr>
<td></td>
<td>1mi in 20 mi</td>
</tr>
<tr>
<td>4&quot; Reflectorized pavement striping replace every other year, every 3 years if not winter maintained</td>
<td>$422.40</td>
</tr>
<tr>
<td>Subtotal CPM</td>
<td></td>
</tr>
</tbody>
</table>

### Short term maintenance

<table>
<thead>
<tr>
<th>Snow Removal based on 26 removal days</th>
<th>Annual CPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25.00 per mile for bombadier</td>
<td>$793.00</td>
</tr>
<tr>
<td>$5.50 per mile labor</td>
<td></td>
</tr>
<tr>
<td>Snow removal clean up 3x per year</td>
<td>$141.00</td>
</tr>
<tr>
<td>$25.00 per mile for bombadier</td>
<td>$47.00 per mile</td>
</tr>
<tr>
<td>$22.00 per mile labor</td>
<td></td>
</tr>
<tr>
<td>Inspection cost</td>
<td>$5.00/mile in vehicle, biweekly, 26 weeks</td>
</tr>
<tr>
<td></td>
<td>$10.00/mile on foot, biweekly, 26 weeks</td>
</tr>
<tr>
<td>Tree trimming</td>
<td>cost per mile</td>
</tr>
<tr>
<td></td>
<td>once every 3 years</td>
</tr>
</tbody>
</table>

Page 3
<table>
<thead>
<tr>
<th></th>
<th>cost per mile</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>$5.00</td>
<td></td>
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<tr>
<td>Sparsely wooded</td>
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</tr>
<tr>
<td>Sweeping</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2x per year continuous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>discontinuous</td>
<td>$75.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lose 10% every year</td>
<td>$46.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 sign/mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bollards 2 replacements</td>
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</tr>
<tr>
<td>Subtotal CPM</td>
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<tr>
<td>Sidewalks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approximately 20.5 miles at build out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long term maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4' Concrete Replace every 25 years</td>
<td>$1,900.80</td>
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</tr>
<tr>
<td>Inspection</td>
<td>once yearly</td>
<td>$15.00</td>
<td></td>
</tr>
<tr>
<td>$15.00/mi on foot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notice cost mailing cost for 200 notices $0.29/notice</td>
<td>$58.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal CPM</td>
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<tr>
<td>6' Concrete Replace every 25 years</td>
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<tr>
<td>Inspection</td>
<td>once yearly</td>
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<td></td>
</tr>
<tr>
<td>$15.00/mi on foot</td>
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<td></td>
</tr>
<tr>
<td>Notice cost mailing cost for 200 notices $0.29/notice</td>
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<tr>
<td>Additional Maintenance option</td>
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<tr>
<td>Short term maintenance</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Snow removal</td>
<td>Tractor cost</td>
<td>$82.00</td>
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<td></td>
<td>$9.42/mi</td>
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<tr>
<td>Fuel/supplies</td>
<td>$750.00</td>
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<tr>
<td>Personnel</td>
<td>$10.00</td>
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<tr>
<td></td>
<td>$10.00/mi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$10.00</td>
<td></td>
<td></td>
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<tr>
<td>Monthly inspection/litter removal</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>$10.00/mi on foot</td>
<td>$120.00</td>
<td></td>
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<td></td>
<td>12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lose 10% every year</td>
<td>$23.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 sign/mi</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Subtotal CPM</td>
<td>$912.90</td>
<td>added to</td>
<td>above costs</td>
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<tr>
<td>4' Cost per mile with additional maintenance</td>
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<td>Total CPM $2,886.70</td>
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<tr>
<td>6' Cost per mile with additional maintenance</td>
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<td>Total CPM $3,832.10</td>
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<td>Cost Estimates TMPU</td>
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<td></td>
</tr>
<tr>
<td><strong>Unpaved high volume multiple-use trails</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approximately 10 miles of 8' trail at build out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8' crushed limestone paving compacted on compacted subgrade</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Yearly costs</strong></td>
<td><strong>Annual CPM</strong></td>
<td></td>
<td></td>
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<tr>
<td>Grading</td>
<td>$200.00</td>
<td></td>
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<tr>
<td>Spot patching of gravel as needed</td>
<td>1 mi in 20 miles</td>
<td>$60.55</td>
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<tr>
<td>30 year life</td>
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<tr>
<td>Inspection cost/litter remo</td>
<td>$5.00/mile in vehicle</td>
<td>$130.00</td>
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<tr>
<td>biweekly, 26 weeks</td>
<td>$10.00/mile on foot</td>
<td>$260.00</td>
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<td>biweekly, 26 weeks</td>
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<tr>
<td>Signs</td>
<td>Lose 10% every year</td>
<td>$46.96</td>
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<tr>
<td>1 sign/mi</td>
<td>Sign and installation cost</td>
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<tr>
<td>Bollards 2 replacements</td>
<td></td>
<td>$552.00</td>
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<tr>
<td><strong>Subtotal CPM</strong></td>
<td>$1,249.51</td>
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<tr>
<td><strong>Hiking trails, Low volume gravel trails and Backcountry trails</strong></td>
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<tr>
<td><strong>Low volume 4' Crushed limestone trails</strong></td>
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<tr>
<td>Approximately 3.0 miles of 4' trail at build out</td>
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<tr>
<td><strong>Yearly costs</strong></td>
<td><strong>Annual CPM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spot patching of gravel as needed</td>
<td>1 mi in 20 miles</td>
<td>$30.27</td>
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<tr>
<td>30 year life</td>
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<td></td>
</tr>
<tr>
<td>Inspection cost once yearly</td>
<td>$10.00/mi on foot</td>
<td>$10.00</td>
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</tr>
<tr>
<td>Signs</td>
<td>Lose 10% every year</td>
<td>$23.48</td>
<td></td>
</tr>
<tr>
<td>1 sign/mi</td>
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<tr>
<td>Bollards 2 replacements</td>
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<td>$276.00</td>
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<td><strong>Subtotal CPM</strong></td>
<td>$339.75</td>
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<tr>
<td><strong>Wood chip hiking trails</strong></td>
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</tr>
<tr>
<td>Approximately 18 mi at build out</td>
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<tr>
<td><strong>Yearly costs</strong></td>
<td><strong>Annual CPM</strong></td>
<td></td>
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<tr>
<td>2' wood chip hiking trails</td>
<td>1 mi in 20 miles</td>
<td>$45.30</td>
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<tr>
<td>Spot replacement as needed</td>
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<tr>
<td>Inspection cost once yearly</td>
<td>$5.00/mi in vehicle</td>
<td>$10.00</td>
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<tr>
<td>$10.00/mi on foot</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td>Lose 10% every year</td>
<td>$23.48</td>
<td></td>
</tr>
<tr>
<td>1 sign/mi</td>
<td></td>
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<tr>
<td>Bollards 2 replacements</td>
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<tr>
<td>Backcountry trails</td>
<td>Subtotal CPM</td>
<td>$354.78</td>
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<td>--------------</td>
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<tr>
<td>Approximately 93.4 miles at build out</td>
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<tr>
<td>Yearly costs</td>
<td>Annual CPM</td>
<td>$10.00</td>
<td></td>
</tr>
<tr>
<td>Inspection cost once yearly</td>
<td>$10.00/mi on foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td>Lose 10% every year</td>
<td>$23.48</td>
<td></td>
</tr>
<tr>
<td>1 sign/mi</td>
<td></td>
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<tr>
<td>Bollards 2 replacements</td>
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<td>$276.00</td>
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<tr>
<td>Volunteer Coordination</td>
<td>undetermined</td>
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<tr>
<td><strong>Subtotal CPM</strong></td>
<td></td>
<td>$309.48</td>
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</tr>
</tbody>
</table>

| Bike Lanes | |
| Reflectorized white or yellow striping | Cost per mile |
| 4" wide | $844.80/mi + symbols estimated | $1,000.00 |
| Signs | Lose 10% every year | $46.96 |
| 1 sign/mi | Sign and installation cost | |
| Crosswalks | $41.20 per crosswalk | |
| 1 crossing or less per mile | | $41.20 |
| Symbols letters and shapes | Cost/sq. ft. | |
| | $1.09 | |
| Replacement | 2 times per year on roads | |
| 1 time per year on bikeways with winter maintenance | |
| 1 time every 2 years on bikeways without winter maintenance | |
| **Subtotal CPM** | | $1,088.16 |