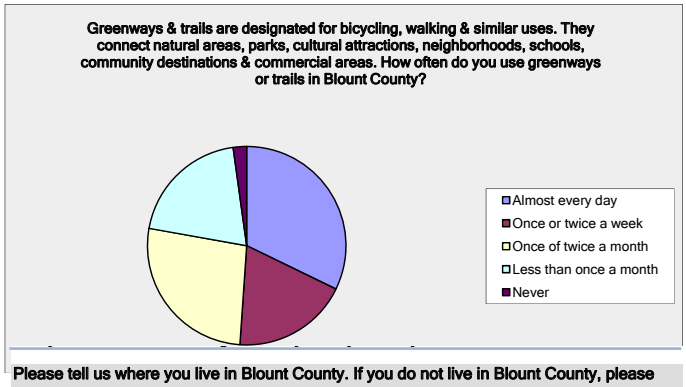
APPENDIX A: RESULTS OF PUBLIC PROCESS

Results of the First Public Survey

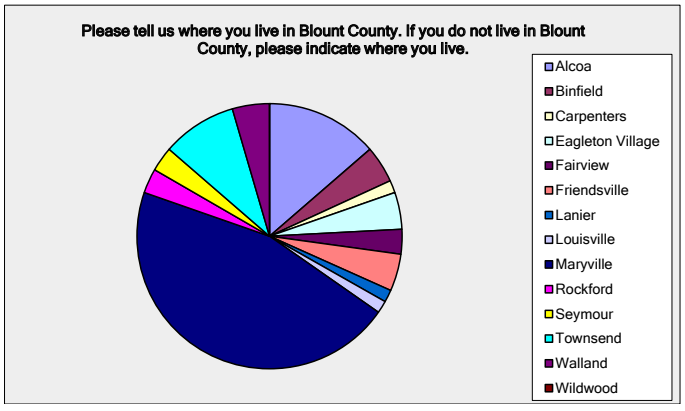
Greenways & trails are designated for bicycling, walking & similar uses. They connect natural areas, parks, cultural attractions, neighborhoods, schools, community destinations & commercial areas. How often do you use greenways or trails in Blount County?

Answer Options	Response Percent	Response Count
Almost every day	32.2%	29
Once or twice a week	18.9%	17
Once of twice a month	26.7%	24
Less than once a month	20.0%	18
Never	2.2%	2
answered question		90
skipped question		0



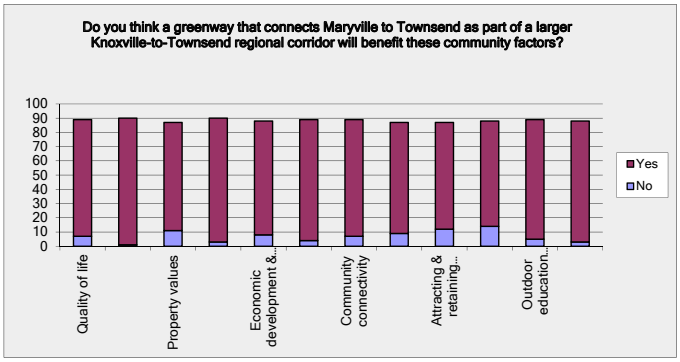
Please tell us where you live in Blount County. If you do not live in Blount County, please indicate where you live.

Answer Options	Response Percent	Response Count
Alcoa	13.6%	9
Binfield	4.5%	3
Carpenters	1.5%	1
Eagleton Village	4.5%	3
Fairview	3.0%	2
Friendsville	4.5%	3
Lanier	1.5%	1
Louisville	1.5%	1
Maryville	45.5%	30
Rockford	3.0%	2
Seymour	3.0%	2
Townsend	9.1%	6
Walland	4.5%	3
Wildwood	0.0%	0
Other (please specify)		26
answered question		66
skipped question		24



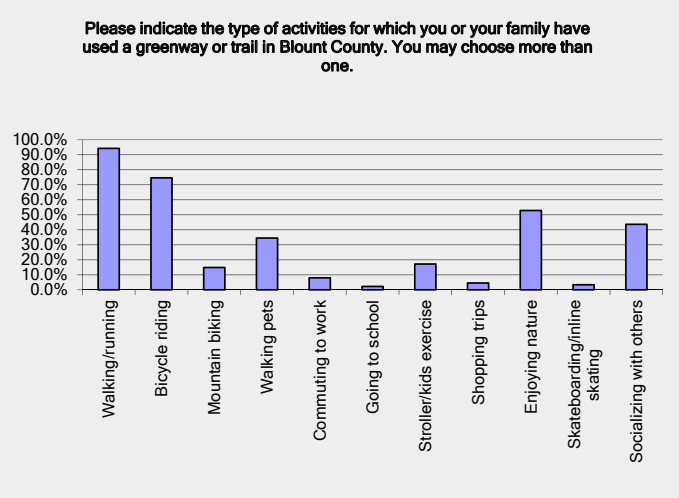
Do you think a greenway that connects Maryville to Townsend as part of a larger Knoxville-to-Townsend regional corridor will benefit these community factors?

Answer Options	Yes	No	Response Count
Quality of life	82	7	89
Recreational opportunities	89	1	90
Property values	76	11	87
Community health & fitness	87	3	90
Economic development & tourism	80	8	88
Community appearance	85	4	89
Community connectivity	82	7	89
More transportation options	78	9	87
Attracting & retaining businesses	75	12	87
Improving the environment	74	14	88
Outdoor education opportunities	84	5	89
A positive regional image	85	3	88
answered question			90
skipped question			0



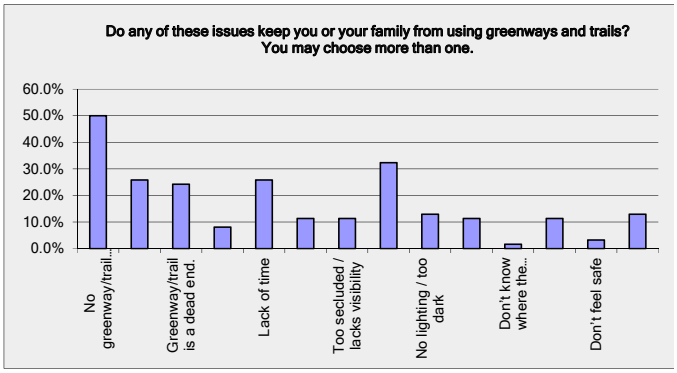
Please indicate the type of activities for which you or your family have used a greenway or trail in Blount County. You may choose more than one.

Answer Options	Response Percent	Response Count
Walking/running	94.3%	82
Bicycle riding	74.7%	65
Mountain biking	14.9%	13
Walking pets	34.5%	30
Commuting to work	8.0%	7
Going to school	2.3%	2
Stroller/kids exercise	17.2%	15
Shopping trips	4.6%	4
Enjoying nature	52.9%	46
Skateboarding/inline skating	3.4%	3
Socializing with others	43.7%	38
Other (please specify)		5
answered question		87
skipped question		3



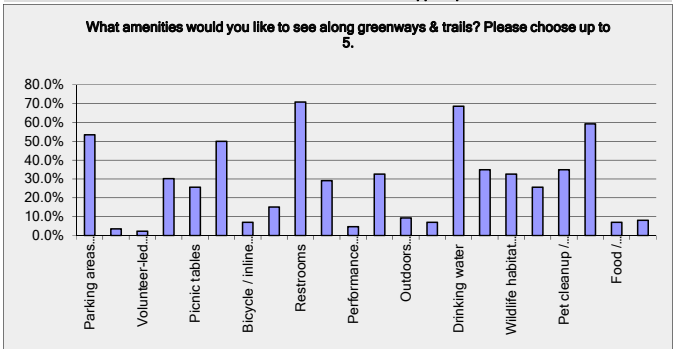
Do any of these issues keep you or your family from using greenways and trails? You may choose more than one.

Answer Options	Response Percent	Response Count
No greenway/trail nearby	50.0%	31
Greenway/trail doesn't go where I want to go	25.8%	16
Greenway/trail is a dead end.	24.2%	15
Route is too indirect	8.1%	5
Lack of time	25.8%	16
Hazards or obstructions on trails	11.3%	7
Too secluded / lacks visibility	11.3%	7
Not enough connections to get to the greenway / trail	32.3%	20
No lighting / too dark	12.9%	8
Intersects a street that is uncomfortable to cross	11.3%	7
Don't know where the greenways / trails are located	1.6%	1
No separation between pedestrians and bicyclists	11.3%	7
Don't feel safe	3.2%	2
Lack of signage	12.9%	8
Other (please specify)		8
answered question		62
skipped question		28



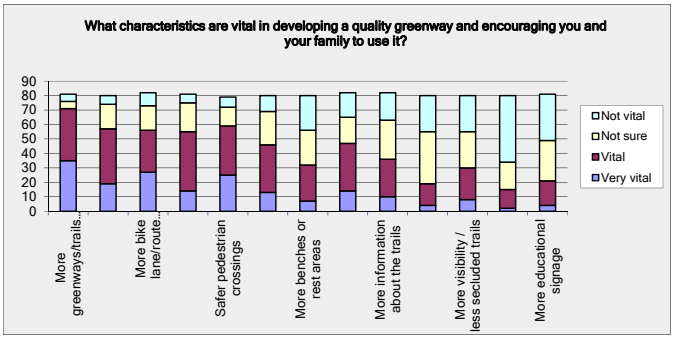
What amenities would you like to see along greenways & trails? Please choose up to 5.

Answer Options	Response Percent	Response Count
Parking areas at trailheads	53.5%	46
Bus connections to trailheads	3.5%	3
Volunteer-led tours	2.3%	2
Rest areas / shelters	30.2%	26
Picnic tables	25.6%	22
Directional signs / mile markers	50.0%	43
Bicycle / inline skate rental	7.0%	6
Bicycle parking / lockers	15.1%	13
Restrooms	70.9%	61
Benches / gathering spaces	29.1%	25
Performance space	4.7%	4
Pocket parks / open space	32.6%	28
Outdoors classrooms	9.3%	8
Interpretive signage	7.0%	6
Drinking water	68.6%	59
Native trees & shrubs	34.9%	30
Wildlife habitat improvements	32.6%	28
Community gardens	25.6%	22
Pet cleanup / water stations	34.9%	30
Trash cans	59.3%	51
Food / beverage concessions	7.0%	6
Fishing access	8.1%	7
Other (please specify)		4
answered question		86
skipped question		4



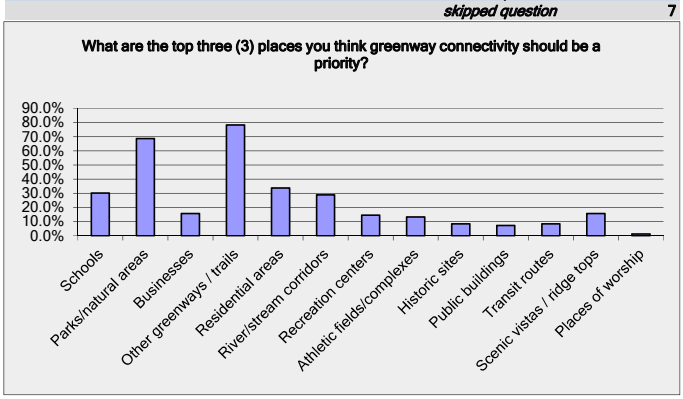
What characteristics are vital in developing a quality greenway and encouraging you and your family to use it?

Answer Options	Not vital	Not sure	Vital	Very vital	Response Count
More greenways/trails connections	5	5	36	35	81
More sidewalk connections to greenways	6	17	38	19	80
More bike lane/route connections	9	17	29	27	82
Better maintenance	6	20	41	14	81
Safer pedestrian crossings	7	13	34	25	79
More lighting	11	23	33	13	80
More benches or rest areas	24	24	25	7	80
More access to the natural environment	17	18	33	14	82
More information about the trails	19	27	26	10	82
More landscaping on the greenways	25	36	15	4	80
More visibility / less secluded trails	25	25	22	8	80
Public art	46	19	13	2	80
More educational signage	32	28	17	4	81
answered question					83
skipped question					7



What are the top three (3) places you think greenway connectivity should be a priority?

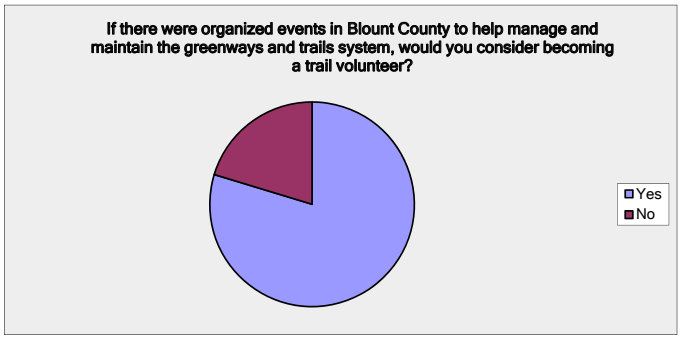
Answer Options	Response Percent	Response Count
Schools	30.1%	25
Parks/natural areas	68.7%	57
Businesses	15.7%	13
Other greenways / trails	78.3%	65
Residential areas	33.7%	28
River/stream corridors	28.9%	24
Recreation centers	14.5%	12
Athletic fields/complexes	13.3%	11
Historic sites	8.4%	7
Public buildings	7.2%	6
Transit routes	8.4%	7
Scenic vistas / ridge tops	15.7%	13
Places of worship	1.2%	1
Other (please specify)		1
answered question		83
skipped question		7



Results of the Second Public Survey

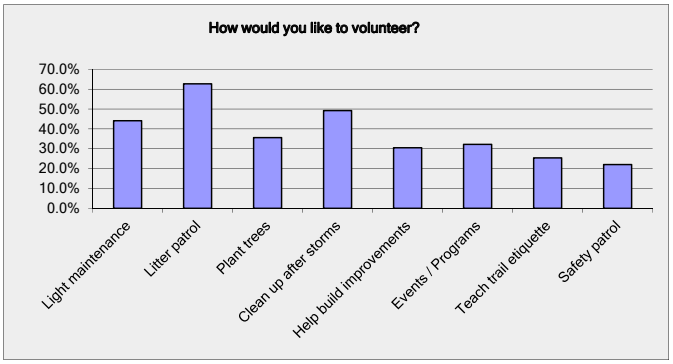
If there were organized events in Blount County to help manage and maintain the greenways and trails system, would you consider becoming a trail volunteer?

Answer Options	Response Percent	Response Count
Yes	79.7%	63
No	20.3%	16
answered question		79
skipped question		11



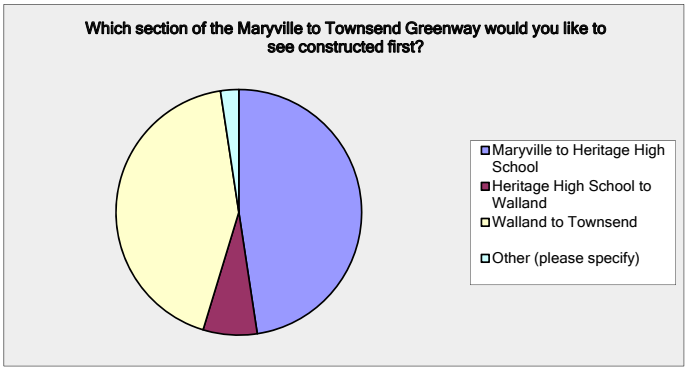
How would you like to volunteer?

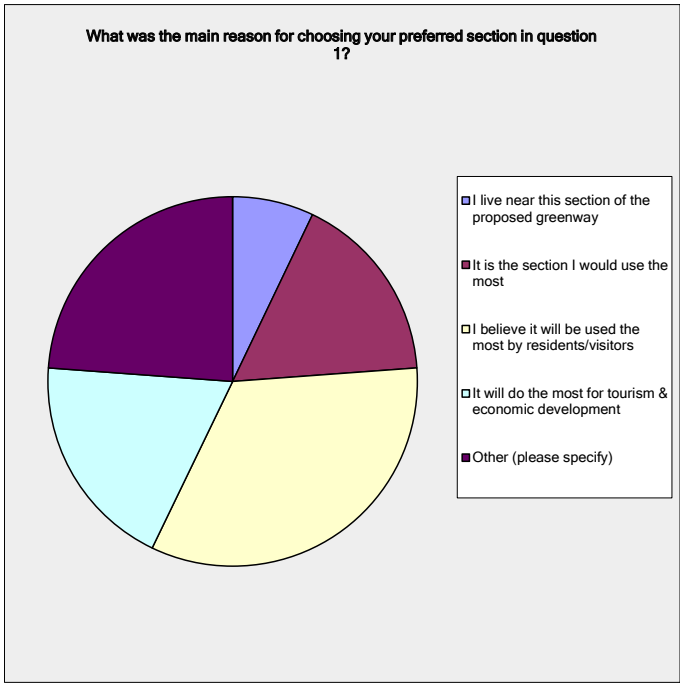
Answer Options	Response Percent	Response Count
Light maintenance	44.1%	26
Litter patrol	62.7%	37
Plant trees	35.6%	21
Clean up after storms	49.2%	29
Help build improvements	30.5%	18
Events / Programs	32.2%	19
Teach trail etiquette	25.4%	15
Safety patrol	22.0%	13
Other (please specify)		0
answered question		59
skipped question		31



Which section of the Maryville to Townsend Greenway would you like to see constructed first?

Answer Options	Response Percent	Response Count
Maryville to Heritage High School	47.6%	20
Heritage High School to Walland	7.1%	3
Walland to Townsend	42.9%	18
Other (please specify)	2.4%	1
answered question		42
skipped question		0





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Appendix B: ECONOMIC IMPACT METHODOLOGY

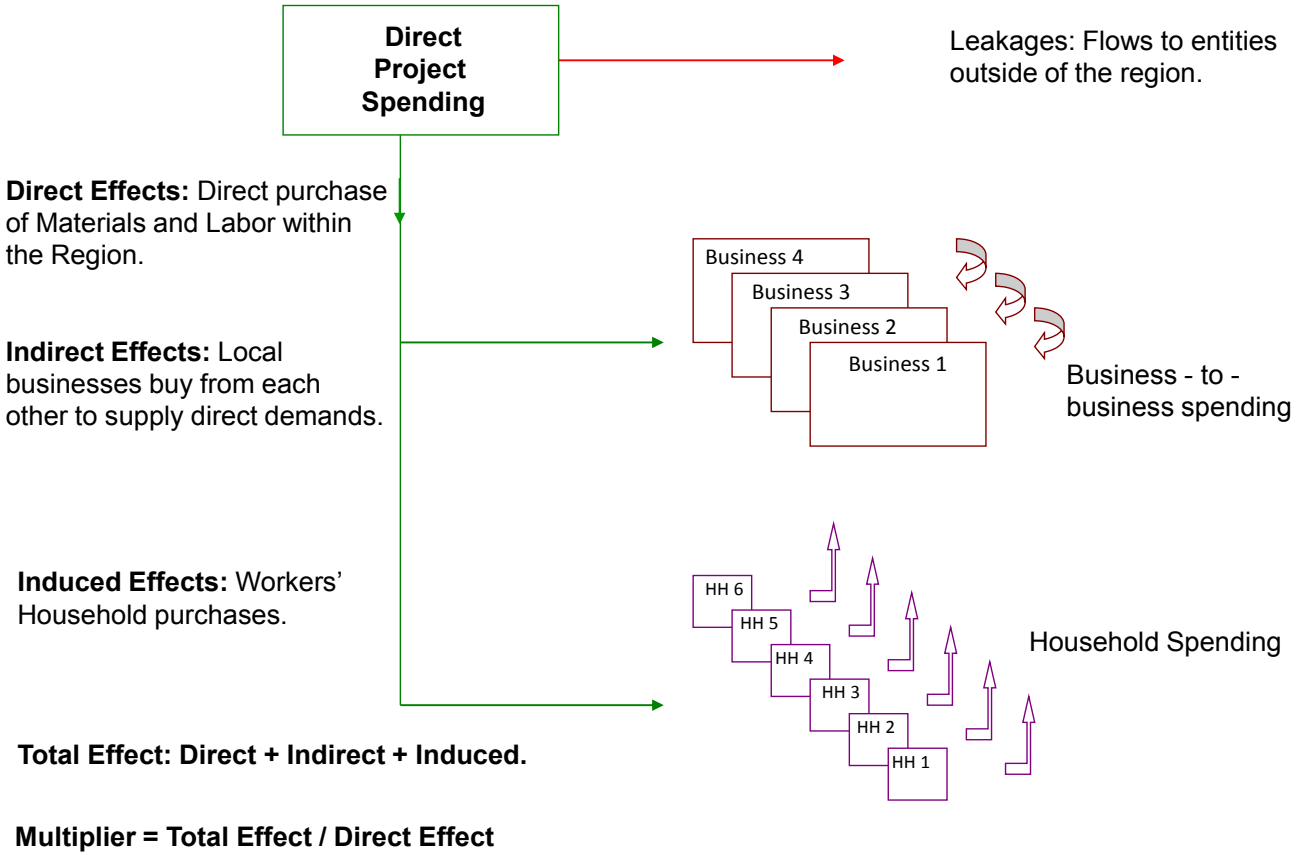
A. Defining Economic Impacts:

Economic impact analysis is a widely accepted tool used to assess the effects of increases or decreases in economic activity within a region. Its methodology springs from the work done by Nobel Prize winner Wassily Leontief and involves the "... estimation of economic activity that results from a specific event, facility, government policy, etc (economic stimulus). The basic premise underlying such analysis involves identifying economic activity in a given area (community/county/province) that can be attributed to a particular economic stimulus, activity that would not take place in absence of this stimulus. In other words, economic impact analysis involves the measurement of incremental economic activity. Such incremental economic activity is most often measured in terms of changes in expenditures (sales), income, employment and tax revenues."[1]

Economic impact analysis uses input-out models that detail the activity flows between industries required to satisfy "final demand," that portion of demand that is not used in the production of other outputs inside the regional economy. These include consumption, investment, government and exports. The economic impacts that the analysis measures are classified as being either direct economic effects, indirect effects,

1 Assessing the Economic Impact of Sport/ Recreation/Cultural Events/Facilities: A Guide by Dr. Brian Van Blarcom, Acadia University, (June, 2007); www.avesta.ns.ca/assets/pdfs_ppts/**impact**_guide/section1.pdf; *Accessed: June 8, 2010.*

Figure 96—The economic impact cycle



or induced effects, as depicted in Figure 96. Direct effects are those changes in output, employment, and earnings that occur as a direct consequence of public or private spending that remains within the affected region. They arise out of spending on construction, materials, labor, and ongoing incremental general and administrative expenses. The direct impact of a particular activity may be less than the total dollar amount allocated a particular project. This is because some of these dollars "leak" from the local economy to businesses outside of the region. Only dollars that can reasonably be assumed to flow to local entities are reported as direct effects.

In order to meet the demands for items associated with the direct effects, the contractors, retailers, and wholesalers who supply goods and services for the greenway's construction and purchases of greenway users must buy raw materials and inventory from their suppliers, who will in turn make purchases from their suppliers down the supply chain. The expenditures that arise as a consequence of this business-to-business spending are the project's indirect effects. Indirect effects reflect the necessity for supplying firms to expand their hiring and materials purchases to meet the direct demands of a project.

In addition to the direct and indirect effects, there is additional economic activity within the region as a result of spending by employees of businesses affected by the direct and indirect effects. Employee spending on food, clothing, shelter, consumer goods, and services such as utilities creates an additional impact, the project's induced effects. This spending will further expand the region's total economic activity by stimulating additional indirect effects. The sum of a project's direct impacts, indirect impacts, and induced impacts is referred to as the project's total economic effect. The ratio of the total impact to the direct impact is referred to as the implicit multiplier.

Economic impacts are typically expressed in terms of several different metrics. Most often, impacts are reported in terms of the total dollar volume of goods or services produced or sold within the relevant region as a result of project spending. This is termed the project's output impact. In addition to the output impact, the number of jobs or employment within the region supported by this output, the employment impact, is also reported.

Labor income, consisting of wages, benefits, and proprietor income, is also typically reported as the project's labor income impact. Less frequently reported is the project's value added impact. Value added is an expanded version of labor income in that it is made up of four components: employee compensation and proprietor income plus other property income and indirect business taxes. Value added is the most commonly used measure of the contribution of a region to the national economy as it avoids double counting of intermediate sales. It only captures the "value added" to final products by activities within the region in terms of changes in total business output or sales, jobs, and labor earnings supported by the overall economic activity.

The first step in estimating the impact of economic activity is to define the geographic area that will be primarily affected by the project's economic activities. The more extensive the geographic area included in the analysis, the smaller the amount of "leakage" from the area. Selecting a broader definition of the geographic region affected as the basis of the analysis, as opposed to a more limited region, will yield higher total impacts. The definition of the relevant geographic area should be a function of a variety of factors including the site of the project's activities, the residential locations of the labor force, the location of supporting industries, and the location of consumers. The objective is to define a geographic unit that is most relevant to the concerns of those affected by the project. Accordingly, it was determined that the geographic scope of this analysis should be restricted to the impacts upon Blount County, Tennessee. The next step in the process is to assign expenditures to the appropriate industrial sector.

The greenway's economic impact is modeled using the IMPLAN modeling software. IMPLAN was originally developed by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Department of the Interior's Bureau of Land Management to assist in land and resource management planning. The software was refined by the University of Minnesota in order to enable its use in non-forestry related applications. Over the past 20 years, it has become one of the most widely used economic impact analysis modeling packages. It is routinely employed by the U.S. Army Corps of Engineers, the U.S. Department of Agriculture, numerous state and local governments, and a wide variety of private consulting firms. Version 3.0, IMPLAN's newest version of the model, was used in this analysis as was the most recent release of the county data tables.

IMPLAN provides information on 440 different types of businesses or industrial sectors. Each sector has a different relationship with the surrounding business community. For example, a local restaurant spends money within the community to buy produce from local farms while the auto dealership sends dollars to a manufacturer outside of the local community. Because the auto dealer's dollars go to a business outside of the community, it is considered "leakage." This means that the restaurant will have a different impact on the local economy and a different multiplier. Utilizing local, regional, and national data, the IMPLAN model generates an input-output table with multipliers for output or sales, total value added, labor income, employment, and provides estimates of the federal, state, and local taxes generated by the project's activities.

B. Estimating the Number of Non-Local Greenway Users and their Expenditures:

Although there have been a number of studies that have attempted to develop quantitative models to estimate trail usage, there is not a single methodology that has been established as a widely accepted standard. Estimates of greenway use are often based on heuristics and generalizations applied to regional population figures. Typically, there is very little local greenway usage data upon which to base estimates of the number of potential users. Fortunately, the Knoxville Regional TPO in partnership with the City of Knoxville and the University of Tennessee has engaged in an extensive program designed to collect greenway usage data for greenways in the area. Data collected along six trails in the City of Knoxville between January 2009 and August 2012 are reported in Figure 97 which shows the average number of greenway users per day and each trail's length. The mean daily user counts and greenway data are contained in the table below. It is assumed that this is an accurate reflection of the number of local users that can be expected to use a local greenway. In addition to this data, researchers also collected user data from several hundred users of the Lakeshore and Third Creek Greenways.

Figure 97—

Regional Numbers of Greenway User Per Day

Greenway Name	Mean Users Per Day	Greenway Length in Miles
Lakeshore	495	2.25
Third Creek	250	4.5
Ten Mile	186	0.6
Sequoyah	174	2.6
Ijams	80	10
Bearden	57	2.1

The median value number of the average number of daily users for the six trails is 180 per day. This figure was taken as a reasonable estimate of the number of local users per day that the Maryville-to-Townsend Greenway will attract. This yielded an estimated annual usage of 65,700 local greenway users (180/day x 365 days = 65,700). A study conducted for the East Coast Greenway Alliance reported that the proportion of non-local users on longer distance trails generals falls in the 40 to 60% range[2]. Using the low end of this range, 40%, yields an annual estimate for non-local trail users of 43,800 and a total estimate of local and non-local users of 109,500 per year. These figures are quite similar to the 2007 estimated annual usage of the Virginia Creeper Trail, a much longer and much more remote facility[3]. It should be noted that this represents a conservative estimate of the number of potential greenway users given that approximately 400,000 hikers visit the Great Smoky Mountains National Park's network of wilderness trails each year. It is reasonable to assume that in light of its proximity, some of the Park's visitors will be attracted to the new greenway and greenway usage will grow over time.

Greenway users' spending patterns vary considerably by type of facility and location. In order to generate the total economic impact of the greenway, it is necessary to determine the spending patterns of non-local greenway users. Estimates of user expenditures vary from place to place. For example, Virginia Tourism Corporation estimates that the median spending for day trips in Virginia is $54[4]. This number is quite similar to estimates of daily spending by greenway and trail users. An estimate of $58 dollars for daily spending was generated in the study of the proposed Ecustra Rail Trail cited above, and a weighted average of $49 for the

2 Alicia Schatteman for East Coast Greenway Alliance. "Local and Tourism use of the East Coast Greenway", p.19.

3 Bowker, J.M. and Joshua Gill. "Estimating the economic value and impacts of recreational trails: a case study of the Virginia Creeper Tail Trail", Tourism Economics, 2007 (13:2). P. 249.

4 Virginia Travel Cooperation "Day Travel Profile to Virginia" Source TNS Travels America http://www.vatc.org/uploadedFiles/Research/DayTripsProfile fy2011TravelsAmerica.pdf, Accessed September 3, 2013.

Silver Comet Trail[5]. In 2010, the National Park Service published a report detailing visitor expenditures by type of trip. This report indicated that park visitors' average spending for day trips was $40.35[6]. Correcting for inflation, this equals $43.22 as shown in Figure 98.

All of these estimates are similar in magnitude. Given that the Maryville-to-Townsend Greenway will end near

Figure 98—

Average Annual Daily Spending Per Person At the Great Smoky Mountains National Park	
Spending category	**Local Day Trip**
Restaurants & bars	$13.51
Amusements	$4.88
Groceries	$6.51
Gas & oil	$9.37
Local transportation	$0.59
Retail Purchases	$8.36
Total	**$43.22**

the entrance to the Great Smoky Mountains National Park, the most visited National Park in the country, and that the Park attracted more than 9.4 million recreational visits in 2010[7] , it was assumed that the average spending figure from the National Park study would be appropriate for this study. Using the inflation corrected figure, the estimate for non-local spending on the trail is $1,893,036 annually (43,800 x $43.22). The expenditure pattern for day trips reported in the National Parks study is shown in the table above.

Figure 99— Economic Impacts from Construction Expenditures:

Economic Impacts from Annual Construction Impacts				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	15	$855,308	$911,600	$1,712,630
Indirect Effect	3	$111,740	$165,470	$290,260
Induced Effect	5	$164,865	$336,153	$537,200
Total Effect	**23**	**$1,131,913**	**$1,413,223**	**$2,540,090**

5 Econsult Corporation. "Silver Comet Trail Economic Analysis and Impact Study Draft"; (May, 2013), P. 3-7.

6 U.S. Department of the Interior, National Park Service. Economic Benefits to Local Communities from National Park Visitation and Payroll, 2010; P. 3.

7 http://www.nps.gov/grsm/parkmgmt/statistics.htm.

C. Project Economic Impacts:

Figures 99, 100, and 101 show the direct, indirect, induced and total employment, labor income, value added and output effects for annualized construction activities for each year of a 10-year construction cycle, annual trail maintenance expenditures and non-local user expenditures. Spending on the greenway's construction, facility maintenance and spending arising out of greenway user's activities will result in increased sales or output for businesses in the county and the creation of new jobs and the labor income that they produce. It is anticipated that the project will generate economic impacts of approximately $6,508,431 in sales or total output, 67 jobs and $2,636,168 in labor income.

Figure 100—

Economic Impacts from Annual Maintenance Expenditures				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	0.5	$9,379	$28,545	$58,695
Indirect Effect	0.2	$4,968	$13,260	$20,517
Induced Effect	0.1	$2,444	$4,983	$7,966
Total Effect	0.8	$16,719	$46,787	$87,178

Figure 101—

Economic Impacts from Annual Non-Local User Spending				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	26	$717,010	$994,010	$1,904,080
Indirect Effect	4	$139,485	$257,300	$428,920
Induced Effect	4	$146,220	$298,130	$476,510
Total Effect	34	$1,002,715	$1,549,440	$2,809,510

Figure 102—

Unit Day Values	
Point Values	**General Recreation Values**
0	$3.80
10	$4.51
20	$4.98
30	$5.70
40	$7.12
50	$8.07
60	$8.78
70	$9.26
80	$10.21
90	$10.92
100	$11.39

D. Social Benefits:

The 2013 Unit Day Value dollar equivalents used to generate estimates of the value of trail use for local users are shown in Figure 102[8].

8 U.S. Army Corps of Engineers. "Memorandum for Planning Community of Practice: CECW-P"; (February 13, 2013), P. 2.

APPENDIX C: COST ESTIMATES

M2T-corridor 1 (Town)

Probable Cost Estimate September 2013
Cost estimates are preliminary and subject to change

	Units	Quantity	Cost Per Unit	Costs	notes:
Grading & Greenway Construction					
mobilization	LS	1	$10,002.47	$10,002	2% of construction cost
earthwork	CY	216	$7.00	$1,512	assumed base course e
aggregate base course	TN	2762.57	$20.00	$55,251	55,942 sf x 6" Aggregate
4' concrete expansion	SY	2708	$35.00	$94,780	4,876 LF @ 3"
10' concrete new	SY	3506	$35.00	$122,710	2,525LF @ 3"
physical barrier (rail/jersey)	LS	1	$2,000.00	$2,000	
Stormwater BMPs/Storm drainage	MI	1.40	$60,000.00	*$84,000*	
Intersection Improvements	EA	8	$6,500.00	$52,000	stamped concrete, appro
			SUB-TOTAL	***$422,256***	
Trailhead					
Information/Map Kiosks	EA	1	$7,500.00	$7,500	
Vehicle deterrant treatment (at intersections)	EA	16	$1,250.00	$20,000	
Transit shelter	EA	1	$7,500.00	$7,500	
			SUB-TOTAL	**$35,000**	
Node Amenities					
stone and masonry	EA	3	$2,000.00	$6,000	
Landscape/Plantings Enhancements	EA	3	$15,000.00	$45,000	
Fence	LF	60	$4.50	$270	
Bicycle Rack	EA	2	$800.00	$1,600	
			SUB-TOTAL	**$52,870**	
Planning, Design, Permitting & Engineering					
Permitting*	LS	1	$3,000.00	$3,000	
Construction Documents & Engineering		*12%*		$60,015	(12% of Construction)
Surveying	LF	7392	$0.78	$5,766	
			SUB-TOTAL	**$68,781**	

SUBTOTAL	**$578,906**
15% Contingency	**$86,836**
TOTAL	**$665,742**

Italicized cells indicate items considered as an element that will require design & engineering

*Anticipated permitting includes erosion control, right of way encroachments, regulatory environmental (buffer encroachement, stream crossing, etc),

Units:
EA= each
LS= lump sum
LF= linear foot
TN= ton
SY= square yard
MI= Mile

Notes: 1.)Cost estimate does not include: landowner outreach, traffic impact studies, land acquisition, wetland determination/delineation, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, attorney costs, transactional fees and taxes 2.)Trail costs are based on historic project costs with varying conditions. Costs include clearing and grubbing, paving, base, geogrid, minor storm drain pipe, erosion control features, plantings, signs, pavement markings, minor modular retaining walls. 3.) This section includes estimates for major retaining walls (taken into account under "Grading" cost per unit).

M2T-corridor 2 (SUBURBAN)

Probable Cost Estimate September 2013
Cost estimates are preliminary and subject to change

	Units	Quantity	Cost Per Unit	Costs	notes:
Grading & Greenway Construction					
mobilization	LS	1	$47,884.99	$47,885	2% of construction cost
12' aphalt new	LF	29,515	$35.00	$1,033,025	includes base course & standard earthwork
physical barrier (rail/jersey)	LS	1	$15,000.00	$15,000	not identified in the plan
shared bridge retrofit	SF	1920	$75.00	$144,000	4 crossings @ 40' lf @ 12' clear deck
bridges (tributary crossings)	SF	2400	$85.00	$204,000	5 crossings @ 40' lf @ 12' clear deck
stormwater BMPs/Storm drainage	MI	5.59	$60,000.00	*$335,398*	
intersection Improvements	EA	8	$3,500.00	$28,000	striping / aprons
			SUB-TOTAL	***$1,807,308***	
Trailheads					
restrooms (vaulted toilet)	EA	1	$15,000.00	$15,000	
Information/Map Kiosks	EA	2	$7,500.00	$15,000	
vehicle deterrant treatment (at intersections)	EA	14	$1,250.00	$17,500	
Transit shelter	EA	1	$7,500.00	$7,500	
			SUB-TOTAL	**$55,000**	
Node Amenities					
stone and masonry	EA	6	$2,000.00	$12,000	
landscape/Plantings Enhancements	EA	3	$15,000.00	$45,000	
fence	LF	300	$4.50	$1,350	
bicycle Rack	EA	4	$800.00	$3,200	
			SUB-TOTAL	**$61,550**	
Planning, Design, Permitting & Engineering					
permitting*	LS	1	$3,000.00	$3,000	
flood study / No-rise permitting	LS	*1*	$8,000.00	$8,000	
construction Documents & Engineering (12% of Construction)		*12%*		$225,117	
surveying	LF	29515	$0.78	$23,022	
			SUB-TOTAL	**$259,138**	

SUBTOTAL	**$2,182,996**
15% Contingency	**$327,449**
TOTAL	**$2,510,446**

*Anticipated permitting includes erosion control, right of way encroachments, regulatory environmental (buffer encroachement, USACE 401/404, etc),

Units:
EA= each
LS= lump sum
LF= linear foot
TN= ton
SY= square yard
MI= Mile

Notes: 1.)Cost estimate does not include: landowner outreach, traffic impact studies, land acquisition, wetland determination/delineation, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, attorney costs, transactional fees and taxes 2.)Trail costs are based on historic project costs with varying conditions. Costs include clearing and grubbing, paving, base, geogrid, minor storm drain pipe, erosion control features, plantings, signs, pavement markings, minor modular retaining walls. 3.) This section includes estimates for major retaining walls (taken into account under "Grading" cost per unit).

M2T-corridor 3 (Walland Gap/Little River)

Probable Cost Estimate September 2013
Cost estimates are preliminary and subject to change

	Units	Quantity	Cost Per Unit	Costs	notes:
Grading & Greenway Construction					
mobilization	LS	1	$322,232.62	$322,233	2% of construction cost
12' aphalt new	LF	35472	$35.00	$1,241,520	includes base course & typical earthwork
physical barrier (rail/jersey)	LS	1	$20,000.00	$20,000	
stormwater BMPs/Storm drainage	MI	6.72	$60,000.00	$403,091	
shared bridge retrofit	SF	1440	$75.00	$108,000	3 crossings @ 40' @ 12' clear deck
retaining walls	FF	1830	$35.00	$64,050	1830 lf @ 5' avg height
Intersection Improvements	EA	7	$5,000.00	$35,000	stamped concrete / pedestrian refuges
bridges (tributary crossings)	SF	1440	$85.00	$122,400	3 bridges @ 40' @ 12' clear deck
cantilever boardwalks	SF	69756	$200.00	$13,951,200	5,813 lf @ 12' clear deck
			SUB-TOTAL	***$16,267,494***	
Trailheads					
restrooms (vaulted toilet)	EA	2	$15,000.00	$30,000	
Information/Map Kiosks	EA	2	$7,500.00	$15,000	
vehicle deterrant treatment (at intersections)	EA	14	$1,250.00	$17,500	
transit shelter	EA	0	$7,500.00	$0	
			SUB-TOTAL	**$62,500**	
Node Amenities					
stone and masonry	EA	6	$2,000.00	$12,000	
landscape/Plantings Enhancements	EA	6	$15,000.00	$90,000	
fence	LF	60	$4.50	$270	
bicycle Rack	EA	2	$800.00	$1,600	
			SUB-TOTAL	**$103,870**	
Planning, Design, Permitting & Engineering					
permitting*	LS	1	$15,000.00	$15,000	
flood study / No-rise permitting	LS	*1*	$8,500.00	$8,500	
construction Documents & Engineering		*12%*		$1,933,396	(12% of Construction)
surveying	LF	100	$0.78	$78	
			SUB-TOTAL	**$1,956,974**	

SUBTOTAL	**$18,390,837**
15% Contingency	**$2,758,626**
TOTAL	**$21,149,463**

*Anticipated permitting includes erosion control, right of way encroachments, regulatory environmental (buffer encroachement, USACE 401/404, etc),

Units:
EA= each
LS= lump sum
FF= face foot
LF= linear foot
TN= ton
SY= square yard
MI= Mile

Notes: 1.)Cost estimate does not include: landowner outreach, traffic impact studies, land acquisition, wetland determination/delineation, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, attorney costs, transactional fees and taxes 2.)Trail costs are based on historic project costs with varying conditions. Costs include clearing and grubbing, paving, base, geogrid, minor storm drain pipe, erosion control features, plantings, signs, pavement markings, minor modular retaining walls. 3.) This section includes estimates for major retaining walls (taken into account under "Grading" cost per unit).

M2T-corridor 4 (Townsend Gateway/ Intersection with Existing Greenway)

Probable Cost Estimate September 2013
Cost estimates are preliminary and subject to change

	Units	Quantity	Cost Per Unit	Costs	notes:
Grading & Greenway Construction					
Mobilization	LS	1	$30,000.00	$30,000	
demolition of asphalt/ informal parking area	SF	1325	$4.00	$5,300	
			SUB-TOTAL	***$35,300***	
Trailheads					
restrooms (vaulted toilet)	EA	1	$15,000.00	$15,000	
Information/Map Kiosks / Welcome To Townsend Sign	EA	1	$14,000.00	$14,000	
Information/Map at Parking Area	EA	1	$1,500.00	$1,500	
			SUB-TOTAL	**$30,500**	
Node Amenities					
stone and masonry	EA	8	$2,000.00	$16,000	
landscape/Plantings Enhancements	EA	3	$7,500.00	$22,500	
fence	LF	370	$4.50	$1,665	
bicycle Rack	EA	2	$800.00	$1,600	
			SUB-TOTAL	**$41,765**	
Planning, Design, Permitting & Engineering					
permitting*	LS	1	$1,000.00	$1,000	
construction Documents & Engineering		*12%*		$9,307.80	12% of Construction
surveying	LS	1	$1,000.00	$1,000	
			SUB-TOTAL	**$11,308**	

SUBTOTAL	**$118,873**
15% Contingency	**$17,831**
TOTAL	**$136,704**

*Anticipated permitting includes erosion control, right of way encroachments, regulatory environmental (buffer encroachement, USACE 401/404, etc),

Units:

EA= each
LS= lump sum
FF= face foot
LF= linear foot
TN= ton
SY= square yard
MI= Mile

Notes: 1.)Cost estimate does not include: landowner outreach, traffic impact studies, land acquisition, wetland determination/delineation, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, attorney costs, transactional fees and taxes 2.)Trail costs are based on historic project costs with varying conditions. Costs include clearing and grubbing, paving, base, geogrid, minor storm drain pipe, erosion control features, plantings, signs, pavement markings, minor modular retaining walls. 3.) This section includes estimates for major retaining walls (taken into account under "Grading" cost per unit).

APPENDIX D: KNOXVILLE TPO GREENWAY SIGNAGE GUIDELINES

Guidelines for Signing and Marking Greenways

Overview:
Adequate signing and marking are essential on shared-use paths, especially to alert bicyclists to potential conflicts and to convey regulatory messages to bicyclists, pedestrian and motorists at roadway intersections. Both advanced crossing and crossing warning signs are needed on roadways to provide appropriate warning to the motorists of the upcoming path intersection. In addition, guide signing on a path, such as to indicate directions, destinations, distances and names of crossing streets, should be used in the same manner as they are used on roadways. Occasional signs with maps of the entire path route and indicating important destinations should be placed at major trailheads. The most recent Manual on Uniform Traffic Control Devices (MUTCD) provides minimum traffic control measures that should be applied. Warning signs, directional signs and other devices along the path should also meet the MUTCD guidelines.

Traffic control at path-roadway crossings should be treated so that the intersection looks and functions like a regular road intersection. Path crossings can occur as signalized or unsignalized intersections, depending on the particular attributes of the location. Warrants for signals and beacons are discussed in the MUTCD and could be used as guidance for path crossings as bicycles are considered vehicles. Motor vehicle speeds along the crossing corridor are also an important factor in this analysis.

At unsignalized locations, adequate sight distance should be provided along the roadway approaches to the path and the path approaches to the roadway. In most cases, advance warning signs should be provided on the road, indicating that a path is crossing the roadway. The path crossing of the street should be marked as a crosswalk since it carries a mix of non-motorized users. Due to the potential conflicts at these junctions, careful design is of paramount importance to the safety of path users and motorists. Each roadway/path intersection is unique and will require sound engineering judgment on the part of the designer as to the appropriate solution. The 1999 AASHTO *Guide for the Development of Bicycle Facilities* provides examples and guidelines for various intersection treatments.

Refer to MUTCD Figure and Table 9B-1 for size and sign placement recommendations for shared-use paths.

Sign location types:
The following describes the sign location types and the recommended signage and markings for each.

At major trailheads (these are greenway entrances with parking)

- Greenway symbol sign—the Big G (Figure 1)
- Greenway map (Figure 2)
- Connections map showing how this greenway connects to other greenways, if relevant (Figure 3)
- "No Motor Vehicles" sign (R5-3), if needed
- Courtesy/user behavior sign if desired
- Bollards (see "Bollards" on Page 5)

On roadway next to trailhead parking area (oriented for motorists)

- Greenway symbol sign—the Big G (Figure 1)
- Greenway identifier (e.g. "Third Creek Greenway") (Figure 4)
- Directional/destination signage with distance (e.g. "To Downtown, 2. 4 miles" or "To Sutherland, 1.8 miles") as needed (Figure 5)

At minor trailheads (walking and bicycling access only)

- Greenway symbol sign
- Greenway identifier (e.g. "Third Creek Greenway")

At junctions with other trails or splits in the trail

- Directional/destination signage with distance (e.g. "To Downtown, 2. 4 miles" or "To Sutherland, 1.8 miles")

At road crossings, on the greenway

- "No Motor Vehicles" sign (R5-3)
- Yield signs, if sight distance is adequate
- Stop signs, if sight distance is limited
- Directional/destination signage for nearby schools, libraries, shopping malls, KAT stops and parks.
- Street name sign for greenway users
- Bollards (see "Bollards" section)

At road crossings, on roadway

- Crossing warning signs W11-15 and W16-7P, with supplemental plaque W16-9P or W16-2aP for advanced warning
- Marked crosswalk
- Stop or yield line pavement marking, set back from crosswalk (see MUTCD for guidance on distance)

Depending on road type and level of greenway use:

- Consider raised crosswalk
- Consider center line striping on greenway on intersection approach

- On multi-lane roads, consider median refuge island, signals, beacons and other strategies – refer to the MUTCD.
- On roads with posted speed higher than 40 mph, or roads with 4 or more lanes and ADT over 12,000, a marked crosswalk alone in not sufficient. See MUTCD for additional treatments, or another resource. NCHRP report 562 is a good one.

At driveway crossings, especially on greenways parallel to roadways

- At high-volume/commercial driveways, yield signs for greenway traffic, warning sign for driveway traffic (W11-15, W16-7P), and a marked crosswalk.
- For lower-volume driveways, consider signage for greenway users if the driveway is near a curve or is otherwise not obvious, or to warn of a series of driveways.

At railroad crossings

- Railroad crossing sign (R15-1) and advance sign (W10-1 for RR crossings ahead, W10-2, W10-3, or W10-4 for RR crossings following a turn)

Greenway sign examples

Figure 1: Big G sign

Figure 2: Greenway map

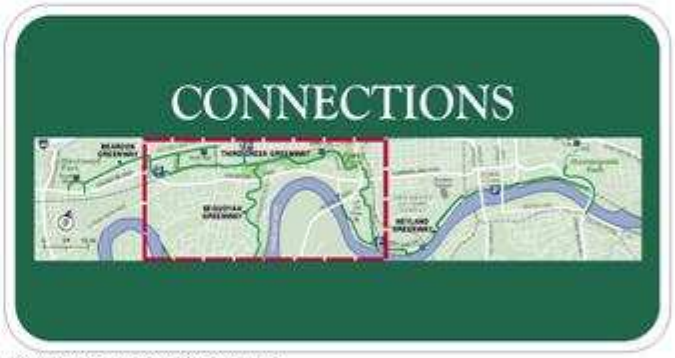


Figure 3: Connections map

Figure 4: Greenway identifier

Figure 5: Directional/destination sign

Other signs and markings may be used where needed for specific situations.

Warning users of potential hazards:
"Slippery when wet" (W8-10 and W8-10p)
"path narrows" (W5-4a)
"Bump" or "Dip" (W8-1,2)
and others as described in the MUTCD

The R9-6 ("Bicyclists yield to peds") or R9-7 ("Peds keep right, bikes keep left") signs could be used where user conflicts are occurring. Also consider centerline striping in those areas.

If a greenway must be closed for construction, signage should be used to show where the detour is. There should be an advance notice closure sign, a detour sign with an arrow, and a detour map sign.

Termini Signage

Path/greenway termini at roadways should be designed under the assumption that bicyclists and pedestrians may want to exit the greenway to the roadway and access the greenway from the roadway. Each terminus is different and should be analyzed to see what the appropriate treatment is for that intersection. The following are general guidelines to use:

- Analyze how greenways users (bicyclists, pedestrians, skaters) and motorists are behaving at the location. Is there a difference between desired and actual behavior?

- Provide sidewalks along the intersecting road, and design them knowing that some bicyclists will use them.

- Include positive guidance such as signs, pavement markings, and channelization to induce bicyclists to ride on the right side of the road once they have left the greenway.

- Provide educational materials for greenway users (such as courtesy signs listing proper behavior).

Bollards

Where needed, use bollards to keep unauthorized motor vehicles from entering a greenway. But recognize that bollards can be a hazard themselves, especially to bicyclists. In light of that potential hazard, consider these guidelines:

- Use bollards only where there is a demonstrated need: either a history of unauthorized drivers accessing the greenway, or a specific reason to believe that it will occur.
- Maximize the visibility of bollards by locating them properly and using reflective material on and around them.

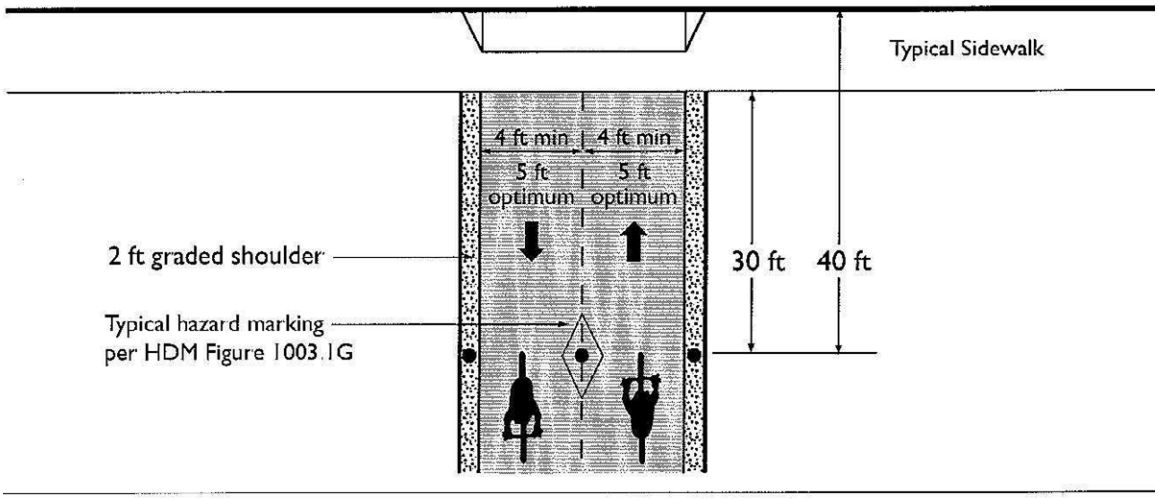


Figure 6: Typical bollard layout [Illustration source: Contra Costa County Trail Design Guidelines]

As Figure 6 illustrates, it's best to set bollards back from the trail entrance. This gives bicyclists more time to see the bollard after they enter the trail. Use reflective paint or tape on the bollard itself and in markings around the bollard to make it more visible in low-light conditions.

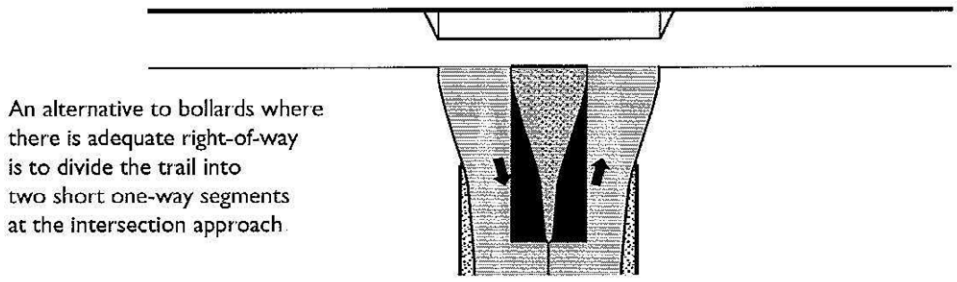


Figure 7: An alternative to bollards [Illustration source: Contra Costa County Trail Design Guidelines]

As an alternative to bollards, consider constructing or reconstructing trail entrances so that the path separates into two one-way paths, as in Figure 7. This design will help reduce conflicts between greenway users and keep unauthorized motor vehicles off the path.