A Cost Model for Bikeways

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A model for estimating bikeway costs at the planning stage is presented. The development of the cost model proceeded in several phases. In the first phase, a survey of existing bikeway-cost estimating methodologies was completed. Agencies from two regions of the United States were interviewed by phone concerning how each prepares estimates and the standard costs used to do so. Upon finding a large variance in the data of the different agencies, the second phase, creating a data base of the costs of actual individual bikeway projects, was performed. The cost of each project was broken down into categories that were used in the third phase: the estimation of parameters of a cost model to reflect the gathered data. The model is composed of several submodels, one for each type of bikeway project under consideration. The cost model, with limitations specified, provides the user with a concise and sound means of applying the costs of actual bikeway projects to estimate the cost of planned bikeways.

The purpose of this study is to provide a method for estimating the cost of bikeways at the planning stage. The costs of building several types of bikeways, including bike paths along new alignments and bike lanes added to existing roads, are analyzed.

A survey of existing bikeway-cost estimating methodologies was completed. Upon finding a large variance in the data of the different agencies, a data base of the costs of actual individual bikeway projects was compiled. These data were used to calibrate a cost model, which is composed of several submodels. The submodels, one for each type of bikeway project under consideration, are discussed individually.

In spite of the great variety of design standards and environments that affect the cost of planned bikeways, the model presented should prove useful to planners trying to estimate bikeway costs during the planning stage. For the agency with a good cost data base of its own, the model provides a framework for the use of that data for future estimates. Agencies with limited recent bikeway planning experience can apply the model more extensively, since its parameters have been estimated using actual cost data from approximately 20 bikeway projects.

Most of the projects used to estimate the model's parameters are located in the mid-Atlantic region or in Arizona. Therefore, users from other regions may wish to adjust the model's results based on construction costs unique to their area.

DETAILS OF MODEL DEVELOPMENT

Survey of Existing Cost Estimating Methodology

General Methodology

All of the sources interviewed for this study estimate costs for planning purposes in essentially the same manner: they start with a basic cost (per foot or per mile) and adjust it for a specific site. The planners of James City County, Williamsburg, and York County, Va., start with a standard "per mile" figure and add the cost of "big ticket" items (such as utility poles that may need to be moved and major drainage that may be required) based on a drive-by site inspection. Cal Wagner, Trails Coordinator with the Fairfax County Park Authority, also uses this big ticket method. Ritch Viola (Bicycle Coordinator with Arlington County) and Bruce Hancock (Trails Coordinator with the Maryland National Capital Park & Planning Commission), use "per mile" figures that reflect the project's terrain.

Hampton Roads Planning District Commission, 723 Woodlake Drive, Chesapeake, Va. 23320.

Per Mile Costs

To compile a data base of standard "per mile" figures, representatives from the organizations were asked what standard figures they use to estimate the cost of planned bikeways. Tables (1 and 2) are a compilation of their responses. (The results are presented as received-in customary units, not metric.)

The tables show a great variance in the estimates of the standard cost of bikeways, some of which is due to legitimate differences in design and cost of construction. Some of the standard costs, however, are not based on the actual total cost of completed bike projects. They were developed by simply estimating the cost of a few inches of asphalt and a few inches of stone. This process of course does not reflect the complexity of bikeway construction (e.g., drainage, signage, fill, and right-of-way acquisition). Regardless of the reason for the variance, it obviously would not be wise to simply select a figure from this list and multiply it by the length of a proposed project to get an estimate of the cost. A need for more detailed information is indicated.

A New Model

Because of the great disparity among the standard costs used by various organizations around the country to estimate the cost of planned bikeways, a new cost model needed to be developed. To achieve accuracy and validity, the cost model presented is based on the cost of *actual bikeway projects*. Cost data were gathered from more than 20 projects. Because most of the projects were located in the mid-Atlantic region (with some from Arizona), the incorporation of data from more states would be required to label this a true "nationwide" model. Cost submodels were developed by bikeway type (see Figure 1) as follows:

Bike Path Projects

Bike *paths* are bikeways that are physically separated from roadways by open space or barriers. They can be found in their own right-of-way (e.g., along a creek, through a park, or along an aban-

TABLE 1 Standard "Per Mile" Costs—Bike Paths

Source	Cost Per Mile			Comments
Jones, Michael G. Building Bikeways. *Planning*, October 1993, p. 32.	$90,000	to	$200,000	Including right-of-way and bridge costs.
Proposed Additions and Revisions to the Bicycle Element, Washington Council of Governments, 1993.		$220,000		Montgomery County.
	$63,000	to	$65,000	Prince William County.
Trail Opportunities in the City of Chesapeake Southeastern Virginia Planning District Commission, 1987, pp. 61-100.	$60,000	to	$80,000	Basic construction only (not including bridges, major drainage work, etc.).
Maryland National Park & Planning Commission. (Bruce Hancock, unpublished data)	$95,000	to	$185,000	Construction only, 8' asphalt.
Greenways, Inc. (Chuck Flink, unpublished data)	$125,000	to	$150,000	10' asphalt, not including major items like bridges.
Unit Costs for Bicycle and Pedestrian Facilities. Florida Department of Highways, 1992.		$125,000		
November 1988 Costs for Bikeways. City of Tucson, AZ, 1988.		$46,000		12' wide, 4" thick.
Development Costs of Park Improvements. Fairfax County (VA) Park Authority, 1985.		$98,000	(asphalt, 8')	The figures at left are for 1992, having been projected by the Authority in1985.
		$244,000	(concrete, 8')	
		$82,000	(gravel, 8')	
		$212,000	(stream valley, 8')	
Fairfax County (VA) Park Authority. (Cal Wagner, unpublished data)		$111,000		8' wide, 4" aggregate, 2" asphalt, including excavation & clearing small trees; excluding signs & striping, large tree removal, bridges, and major drainage.
Trails and Greenways Master Plan. Prince William County (VA) Park Authority, 1993, p. 36.	$137,000	to	$185,000	Independent of road improvement project.
		$63,150		With road improvement project.
Paving and Surfacing. National Park Service, National Capital Region, undated.		$135,000		10' asphalt.

doned railroad), or they can lie within the right-of-way of an existing roadway. The cost of bike paths built as part of a road project are not covered by this model.

Ten bikeway projects were used in the development of the bike path cost model (see Tables 3 and 4). The model is based on the project costs as shown on *bid tabulations*, or detailed cost estimates when bid tabulations were not available. Bid tabulations are the portion of the project contract that show the actual quantities (e.g., 934 tons of asphalt), unit costs (e.g. $30/ton), and total (contract) cost of the project. These contract figures are used in the payment of the contractor after the work is finished. Although changes in quantities and the addition of change orders often lead to cost overruns, bid tabulation is a good indicator of the actual cost of a bikeway project.

Project costs were broken down into four main groups:

1. Mobilization,
2. Pavement,
3. Various categories, and
4. Big ticket.

The "various categories" group typically includes all excavation, drainage, traffic control, and erosion control items, regardless of price. (Extraordinary individual excavation, drainage, traffic control, or erosion control items, such as a $40,000 traffic signal, are included as "big ticket" items.) Miscellaneous items are split between the various categories and big ticket groups based on price. Inexpensive (less than $3,000) miscellaneous

TABLE 2 Standard "Per Mile" Costs—Bike Lanes and Shoulders

Source	Cost Per Mile			Comments
Jones, Michael G. Building Bikeways. *Planning*, October 1993, p. 32.	$3,000	to	$30,000	
Review of Paved Shoulders. Virginia Transportation Research Council, April 1990, p. 24.		$72,000		Marginal cost for adding a 4' shoulder when resurfacing an existing road.
Virginia Department of Highways, Williamsburg Residency (Quinton Elliott, unpublished data)	$60,000	to	$70,000	Base cost; add for poles, major drainage structures, etc.
Proposed Additions and Revisions to the Bicycle Element, Washington Council of Governments, 1993.	$55,000	to	$61,000	Leesburg.
Trail Opportunities in the City of Chesapeake Southeastern Virginia Planning District Commission, 1987, pp. 61-100.	$7,000	to	$9,000	Basic construction only; not including bridges, major drainage, etc.
Unit Costs for Bicycle and Pedestrian Facilities. Florida Department of Highways, 1992.		$185,000 $100,000 $100,000		Bike lanes. Wide curb lanes. Paved shoulders.
November 1988 Costs for Bikeways. City of Tucson, AZ, 1988.		$62,000 $32,000		Add 6"x4' pavement, both sides. (with curb replacement) (without curb replacement)
Trails and Greenways Master Plan. Prince William County (VA Park) Authority, 1993, p. 36.		$61,000		5' asphalt.
Pinsof, Susan and John Henry Paige. (Northeastern Illinois Planning Commission) Bicycling as a Transportation Resource. *Operations Review*, vol. 1, no. 2, October 1984, p. 16.		$125,000		5' added to both sides; $80,950 1982 projected at 4%.

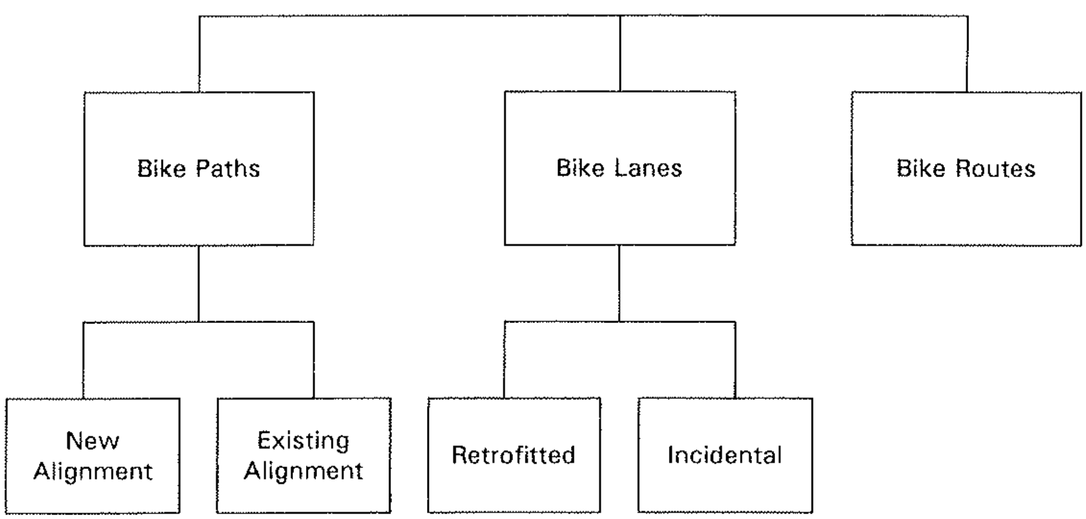

FIGURE 1 Cost model components.

TABLE 3 Bike Path Cost Model Projects

#	Project Name	Source	Length
1	Little Sugar Creek Trail, Option IV, Ph II Path in creek channel; Charlotte, NC; 1991.	Preliminary Cost Estimate	521 m (1709 ft)
2	3rd Creek Greenway Path mostly along creek; Knoxville, TN; 1993.	Bid Tabulation	1434 m (4700 ft)
3	Middle Bolin Creek Greenway/Bikeway Path along creek; Chapel Hill, NC; 1993.	Bid Tabulation	1270 m (4163 ft)
4	Farriss Avenue Greenway Path along creek; High Point, NC; 1991.	Bid Tabulation	1.3 km (0.8 mi)
5	Green Mill Run Pilot Greenway Project Path mostly along stream; Greenville, NC; 1991.	Cost Estimate	1295 m (4245 ft)
6	Fairfax Connector Trail Path through heavily wooded area, 25% of which is swamp; Virginia; 1992.	Bid Tabulation	2193 m (7190 ft)
7	Oyster Point Bikeway Path mostly along existing road right-of-way; Newport News, VA; 1993.	Detail Estimate	2288 m (7500 ft)
8	Research Triangle Park Pedestrian Trail, Ph III Path parallels roadway; North Carolina; 1992.	Bid Tabulation	2440 m (8000 ft)
9	Golf Links Bicycle/Pedestrian Path Path along drainage channel; Tucson, AZ; 1993.	Cost Estimate	1098 m (3600 ft)
10	Capital Crescent Trail Rails-to-trails project; Washington, DC; 1992.	Bid Tabulation	5.6 km (3.5 mi)

items are included in the various categories group. Expensive (more than $3,000) miscellaneous items are included in the big ticket group. These items, such as bridges, fill sand, and utility pole removal and replacement, must be estimated separately and on an individual basis.

Based on a thorough analysis of the four groups from the data in Table 4, the following process for estimating each category was devised:

1. Mobilization costs for the bike path projects (excluding Little Sugar Creek due to its concrete pavement and high "big ticket" costs) ranged from $0 to $12/m (see Table 4). Therefore, mobilization for bike path projects can be estimated using the average value of $5/m ($1/ft).

2. Pavement costs for the bike path projects (excluding Little Sugar Creek due to its concrete pavement) range from $9 to $20/m^2. The variance in pavement cost is due to differences in the pavement design, cost of materials, and pavement widths. Unfortunately, these factors are difficult to predict when preparing planning cost estimates. Therefore, pavement cost should be estimated using the average value of $14/m^2 ($1.33/ft^2).

3. It was found that the costs contributed to projects by items from the "various categories" group varied depending on whether the project was built on a new alignment (e.g., running through a park or along a creek) or on an existing alignment (e.g., paralleling a road) as indicated in Table 4 and Figure 2.

The average cost of the "various categories" group for projects along new alignments was $38/m ($12/ft), whereas that of the existing alignment projects was only $15/m ($4/ft). Therefore, when estimating the cost of planned projects, the appropriate one of these two figures should be used.

The rails-to-trails project (Project 10) had an even lower various categories estimate cost than did the other alignment projects. Although no separate model was developed for the conversion of railroads to bikeways, the rails-to-trails project, and common sense, indicate that one could expect the miscellaneous costs for such projects to be lower than for bikeways parallel to highways.

TABLE 4 Bike Path Cost Model Data

	Cost per Meter (per Foot) by Project Number[a]										Average, by Type		
	1	2	3	4	5	6	7	8	9	10			
Alignment Type:	New	New	New	New	New	New	Ex.[f]	Ex.	Ex.	Ex.	New[b]	Ex.[c]	All[d]
a. Mobilization	$37 ($11)	$12 ($4)	$0 ($0)	$0 ($0)	$10 ($3)	$5 ($1)	$5 ($2)	$4 ($1)	$5 ($1)	$0 ($0)	$6 ($2)	$4 ($1)	$5 ($1)
b. Pavement	$129[e] ($39)	$53 ($16)	$47 ($14)	$29 ($9)	$37 ($11)	$48 ($15)	$37 ($11)	$26 ($8)	$27 ($8)	$47 ($14)	$43 ($13)	$34 ($10)	$39 ($12)
c. Various Categories	$23 ($7)	$44 ($13)	$45 ($14)	$30 ($9)	$35 ($11)	$50 ($15)	$17 ($5)	$20 ($6)	$17 ($5)	$5 ($1)	$38 ($12)	$15 ($4)	$29 ($9)
d. Big Ticket	$338 ($103)	$43 ($13)	$148 ($45)	$25 ($8)	$148 ($45)	$56 ($17)	$1 ($0)	$5 ($1)	$55 ($17)	$48 ($15)	$126 ($39)	$27 ($8)	$87 ($26)
Total	$527 ($161)	$152 ($46)	$240 ($73)	$85 ($26)	$230 ($70)	$159 ($48)	$60 ($18)	$55 ($17)	$103 ($31)	$100 ($31)	$213 ($65)	$79 ($24)	$159 ($48)

[a] Construction costs only (design and right-of-way acquisition not included).
[b] Average of the projects along new alignments ("New");
Project 1 (Little Sugar Creek) excluded on pavement related items ('Mobilization', 'Pavement').
[c] Average of the projects along existing alignments ("Ex.").
[d] Average of all the projects (project 1 [Little Sugar Creek] excluded from mobilization and pavement totals).
[e] Concrete pavement used.
[f] Existing.

4. Unlike the preceding three groups, the big ticket costs of the projects in the data base did not lend themselves (by definition) to analysis on a *per foot* basis. Because big ticket items tend to be expensive and vary significantly from project to project, they must be *estimated individually* and added to the other three components.

Retrofitted Bike Lane Projects

A bike lane is a portion of a roadway designated for the use of bicycles. The pavement of a bike lane is contiguous with the pavement used by motor vehicles. The cost of bike lanes varies depending on whether the bike lanes are built as an independent project ("retrofitted" bike lanes) or as part of a roadway project ("incidental" bike lanes).

This study assumes that the cost of tearing out long sections of curb and gutter to construct wider pavement areas to accommodate bikes is usually prohibitive. In such an operation, costs are incurred to (a) remove and replace curbs and gutters, and (b) relocate what is behind the curb (e.g., sidewalks, utility poles) to acquire additional right-of-way. Therefore the bike lane cost model presented is

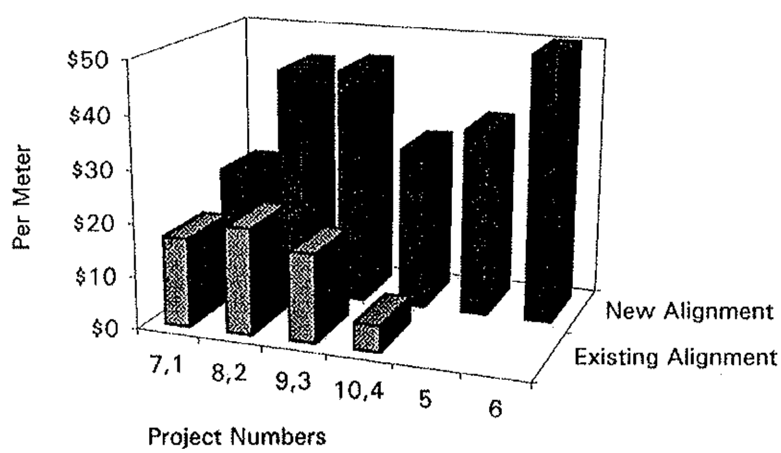

FIGURE 2 Cost of various categories for bike paths by alignment type.

valid only for the widening of roads with predominantly rural cross sections (no curbs and gutters). Of course projects along roads of rural cross sections with short lengths of curb and gutter can be estimated by adding the cost of removing and replacing the curb and gutter as a big ticket item [approximately $50/m ($15/ft)]. Agencies seeking to estimate the cost of projects that involve tearing out long sections of curb and gutter for bike-related widenings could modify the model using the actual completed cost of similar projects.

The data base used for the development of a cost model for bike lanes is composed of the costs of 10 bike lane projects. Because of their similarity, five of the projects from Arizona were averaged and treated as one record ("5 AZs") in the data base. The data base is shown in Table 5.

As with the bike path model, the bike lane models were broken down into mobilization, pavement, various categories, and big ticket groups, as follows:

1. Mobilization: Because of the similarity of mobilization costs of the bike lane projects, their average cost, $5/m ($2/ft), shall be used for the estimation of future projects.

2. Pavement: Because of the similarity of pavement costs of the projects, their average cost, $36/m or $15/m^2 [$1.38 per square foot; all data base projects are 1.22 m (4 ft) on both sides of road], shall be used for the estimation of future projects.

3. "Various categories": Because of the similarity of "various categories" costs of the bike lane projects, their average cost, $22/m ($7/ft), shall be used for the estimation of future projects.

4. Big ticket items: As with the bike path model, the cost of big ticket items for the bike land model must be estimated *individually* because the variance that they add to projects cannot be explained in any simpler form (such as the "per foot" form used for the other three groups).

TABLE 5 Bike Lane Cost Model Data Base

	Project Descriptions		
Abbrev.	Description[a]	Data Source	Date
NC86	Bicycle Project on NC-86, NC	Bid Tabulation	1991
5 AZ's	Five Tucson, AZ projects averaged 36th St., La Cholla Blvd. to Mission Lane Bilby Rd., Park Ave. to Tucson Blvd. Columbus Blvd., Broadway Blvd. to 29th St. Roger Rd., Campbell Ave. to First Ave. La Cholla Blvd., 22nd St. to Ajo Way	Cost Estimates	1993
P1	Big Bethel Rd., County line to Hampton Hwy., VA	Cost Estimate[b]	1993
Skyline	Skyline Drive, Orange Grove to Campbell Ave., AZ	Bid Tabulation	1992
Old YH	Old York Hampton Hwy., Hornsbyville Rd. to US17, VA	Bid Tabulation[c]	1992
P2	Allens Mill Rd., Dare Rd. to Wolftrap Rd., VA	Cost Estimate[b]	1993

	Cost per Meter (per Foot) by Project[d]						
Cost Grouping	NC86	5 AZs	P1	Skyline	Old YH	P2	Average
a. Mobilization	$3	$5	$2	$3	$10	$9	$5 ($2)
b. Pavement	$30	$31	$36	$25	$47	$44	$36 ($11)
c. Various Categories	$20	$22	$21	$12	$25	$30	$22 ($7)
d. Big Ticket	$0	$54	$2	$0	$94	$134	$47 ($14)
Total	$54 ($16)	$112 ($34)	$61 ($19)	$41 ($12)	$176 ($54)	$217 ($66)	$110 ($34)

[a] All projects are 4' widenings on both sides of road.

[b] Cost estimate based on quantities developed by the author for this hypothetical project and unit prices from three local (VA) contractors.

[c] The bid tabulation for this 'roadway improvement' project was modified to simulate a bike lane project.

[d] Construction costs only (design, right-of-way acquisition not included).

Incidental Bike Lane Projects

For a small increase in cost, space can be allocated for bike lanes during roadway construction (for both new roads and reconstruction of existing roads); hence the costs of bike lanes built as part of a roadway project are less than those of retrofitted bike lane projects. This *marginal cost* which bike lanes add to roadway projects is addressed by cost grouping, as follows:

1. Mobilization: Because the contractor is already mobilized to do road work, the marginal mobilization cost for the bike lane can be considered $0/m.

2. Pavement: Due to the economy of the scale of roadway projects (wider pavement widths and more total pavement), the marginal cost of paving a bike lane as part of such a project, $\$10/m^2$ ($\$0.93/ft^2$), is less than that of a retrofitted bike lane ($\$15/m^2$, above), as shown on Table 6.

The costs in Table 6 are based on the assumption that roadway sections with bike lanes will have the same widths of paved and gravel shoulders (in addition to their bike lanes) as roadway sections without bike lanes. Therefore, if an agency decides to reduce or eliminate (due to the inclusion of bike lanes) the regular shoulder width required (i.e., it is decided that little or no additional shoulder width is needed adjacent to the bike lane *because* the bike lane will also serve as a shoulder), the marginal cost of including bike lanes in a roadway section is less than that shown.

3. Various categories: This study assumes that the only significant various categories costs added to a roadway improvement project due to the inclusion of a bike lane are those of bike signs and bike pavement markings. Based on an average of the cost of these items from the NC86, 5 AZs, and P2 projects, the figure of $2/m (or $0.57/ft) is used.

4. Big ticket: If it is known that the additional width required for a bikeway would require the movement of a utility pole, then the cost of such work should be added to the bikeway's portion of the project cost. It is assumed, however, that the marginal big ticket cost for incidental bike lanes is $0/m.

Bike Routes

Bike routes are streets of regular widths that have been designated as a bikeway through the addition of *signs* and sometimes, through the making of minor improvements such as drainage grate modification. The data gathered on the cost of these bikeways can be found in Table 7.

The large variance in the data indicates that estimating the cost of bike routes on a per mile basis is probably not appropriate. Based on the fact that the cost of such routes lies primarily in signage and that bike signs are required primarily at significant intersections (i.e., not minor side streets), bike route costs were developed as shown in Table 8.

Therefore, it is recommended that the figure of $600 per significant intersection be used as the base cost of bike routes (covering signage) to which the cost of additional items, such as grate modifications, should be added. This cost can be reduced by using existing poles for new bikeway signs.

TABLE 6 Pavement Cost for Incidental Bike Lanes

Average Pavement Design[a]	Depth [cm (in)]	Unit Price[b] [per m^2-cm (sy-in)]		Price [per m^2 (sy)]
Asphalt	7.62	$0.65	=	$4.94
	(3)	($1.38)	=	($4.14)
Aggregate Base	17.78	$0.29	=	$5.10
	(7)	($0.61)	=	($4.27)
				$10.04
				($8.41)

[a]Average for projects used in bike lane cost model.

[b]From Old York-Hampton Highway project.

TABLE 7 Standard "Per Mile" Costs—Bike Routes

Source	Cost per Mile
Trail Opportunities in the City of Chesapeake Southeastern Virginia Planning District Commission, 1987, pp. 61-100.	$1,500 to $2,500
November 1988 Costs for Bikeways. City of Tucson, AZ, 1988.	$300
Trails and Greenways Master Plan. Prince William County (VA) Park Authority, 1993, p. 36.	$200

TABLE 8 Bike Route Cost Model Derivation

Project		Sign Cost
NC 86		$180 per sign
Middle Bolin Creek Greenway		$65 per sign
Farriss Avenue Greenway		$148 per sign
Green Mill Run Greenway		$175 per sign
	average	$150 per sign
Bike Route Signs per Major Intersection		4
Estimated Bike Route Cost per Significant Intersection		$600

Cost Overruns

Because problems not anticipated at the design stage generally arise during construction and add (through change orders) to the cost of a project, an accurate estimate of the actual cost of a project includes a factor for cost overruns. A typical figure used in public works projects is 10 percent. Therefore, *10 percent of the construction cost* should be added to cost estimates to account for cost overruns.

Model Validity

After the model was calibrated using a data base of actual projects as described previously, it was tested in two ways.

First, the data for the projects used in calibration were plugged into the model to compare the estimates produced by the model with the actual project costs. This test is recorded for bike path and bike lane projects on Tables 9 and 10, respectively. The test results indicate that the model, though far from perfect, explains enough of the variance in the cost of these bikeway projects to be useful for the estimation of planned projects.

Second, the parameters for a project that had not been used for the calibration, the Centerville Road project in James City County, Va., were compared with those of the model. The model's bike lane (retrofitted project) parameters, as described previously, are similar to those of Centerville Road, as follows:

TABLE 9 Checking Bike Path Model Fit

	Comparison of Model and Actual Costs by Project[a]								
Project #:	2[b]	3	4	5	6	7	8	9	10
I. Mobilization									
Actual cost, /m	$12	$0	$0	$10	$5	$5	$4	$5	$0
Model prediction, /m	$5	$5	$5	$5	$5	$5	$5	$5	$5
II. Pavement									
Width, m	3.05	3.05	3.05	3.05	2.44	2.44	2.44	3.05	2.44
Actual cost, /m^2	$17	$15	$10	$12	$20	$15	$11	$9	$19
Actual cost, /m	$52	$46	$30	$36	$49	$36	$26	$26	$46
Model prediction, /m^2	$14	$14	$14	$14	$14	$14	$14	$14	$14
Model prediction, /m	$44	$44	$44	$44	$35	$35	$35	$44	$35
III. Various Categories									
Actual cost, /m	$44	$45	$30	$35	$50	$17	$20	$17	$5
Alignment Type:	new	new	new	new	new	ex.	ex.	ex.	ex.
Model prediction, /m	$38	$38	$38	$38	$38	$15	$15	$15	$15
Subtotal (I,II,III)									
Actual cost, /m	$109	$90	$60	$81	$104	$58	$50	$47	$51
Model prediction, /m	$86	$86	$86	$86	$78	$51	$51	$60	$51
Error	-21%	-5%	43%	6%	-25%	-12%	2%	27%	0%

[a] Because the model does not predict big-ticket items, they have been excluded from this table.

[b] Project 1 omitted due to concrete pavement.

TABLE 10 Checking Bike Lane Model Fit

	Comparison of Model and Actual Costs by Project[a]					
	NC86	5 AZs	P1	Skyline	Old YH	P2
I. Mobilization						
Actual cost, /m	$3	$5	$2	$3	$10	$9
Model prediction, /m	$5	$5	$5	$5	$5	$5
II. Pavement						
Actual cost, /m	$30	$31	$36	$25	$47	$44
Model prediction, /m	$36	$36	$36	$36	$36	$36
III. Various Categories						
Actual cost, /m	$20	$22	$21	$12	$25	$30
Model prediction, /m	$22	$22	$22	$22	$22	$22
Subtotal (I,II,III)						
Actual cost, /m	$53	$58	$59	$41	$81	$83
Model prediction, /m	$63	$63	$63	$63	$63	$63
Error	18%	9%	6%	54%	-22%	-24%

[a]Because the model does not predict big-ticket items, they have been excluded from this table.

Model Parameters	*Centerville Road Parameters*	
Mobilization, per meter	$5	$7
Pavement, per sq. meter	$15	$17
Various categories, per meter	$23	$23

Although based on only one project, the results of this second test also support the validity of the model.

CONCLUSION

The variance in the standard "per mile" costs used by the agencies surveyed reduces the usefulness of that data set, and indicates a need for a cost model that is based on actual project data and that allows for differing bikeway scenarios and environments. Although the cost model presented is limited by the geographic diversity of the projects from which its parameters were estimated, and although it leaves unexplained a significant amount of variance in the data base, it is an important tool for those preparing planning costs. By providing a simple but effective series of submodels and cost groupings, the model allows the planning estimator, who makes estimates based solely on the length of the project and a "per mile" unit cost, to prepare more accurate estimates. If an agency has a significant number of recent bikeway projects, planners can disregard the projects included in this report and calculate their own model parameters using the framework provided. However, if an agency has little or no recent bikeway project experience, the model allows planners to apply cost data from actual projects to their own proposed project in a simple but flexible way. The cost model is present in Table 11.

TABLE 11 Cost Model Summary

	Unit Prices[a]		
	Mobilization [/m (/ft)]	Pavement [/m^2 (/sf)]	Various Categories [/m (/ft)]
Bike Path, Existing Alignment	$5 ($1)	$14 ($1.33)	$15 ($4)
Bike Path, New Alignment	$5 ($1)	$14 ($1.33)	$38 ($12)
Bike Lane, Retrofitted	$5 ($2)	$15 ($1.38)	$22 ($7)
Bike Lane, Incidental	$0 ($0)	$10 ($0.93)	$2 ($0.57)
Bike Route	$600.00 Per Significant Intersection		

[a]Construction costs only (design, right-of-way acquisition not included).

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