APPENDIX A

2001 NATIONAL HOUSEHOLD TRAVEL SURVEY

TRIP PURPOSE FROM AND TO DATA

FOR NON-MOTORIZED TRIPS AND ALL TRIPS

2001 NATIONAL HOUSEHOLD TRAVEL SURVEY: TRIP PURPOSE FROM AND TO

Numbers reflect estimated daily average number of trips in Chicago CMSA (Illinois Part) for a 7-day week.

FOR WALKING AND BICYCLING TRIPS:

Note: Small Sample; Data indicates relative scale only, particularly non-home based trips. See **"Discussion of sample and suggested appropriate use of the data**" that follows on the next page.

From V TO>	Home	Work	Work-related	School/ Religion	Medical/ Dental	Shopping	Family and Personal	Social and Recreation	Eat Meal	Serve Passen-ger	Other, Skipped, or Not Ascertained	Total
Home	-	33,268	-	36,582	2,191	102,391	31,506	268,309	24,228	23,600	-	522,074
Work	27,970	-	5,089	-	-	6,545	-	17,377	33,209	-	-	90,190
Work-related	-	13,725	6,344	-	-	-	-	-	-	-	-	20,069
School	34,756	-	-	-	-	-	-	-	-	-	-	34,756
Medical/ Dental	2,191	-	-	-	-	-	-	-	-	-	-	2,191
Shopping	81,707	12,165	-	-	-	3,142	-	14,913	-	-	-	111,927
Family and Personal	22,667	-	-	-	-	-	-	5,382	-	-	-	28,048
Social and Recreation	231,549	2,978	8,636	7,628	-	6,366	1,910	87,718	16,421	-	-	363,205
Eat Meal	33,954	33,209	-	-	-	-	-	11,592	4,897	8,126	-	91,778
Serve Passenger	34,333	-	-	-	-	-	-	-	8,960	-	-	43,293
Other, Skipped, or Not Ascertained	-	-	-	-	-	13,444	-	-	4,063	-	26,413	43,920
Total	**469,126**	**95,344**	**20,069**	**44,210**	**2,191**	**131,888**	**33,416**	**405,290**	**91,778**	**31,726**	**26,413**	**1,351,450**

FOR ALL TRIPS

From V TO>	Home	Work	Work-related	School/ Religion	Medical/ Dental	Shopping	Family and Personal	Social and Recreation	Eat Meal	Serve Passen-ger	Other, Skipped, or Not Ascertained	Total
Home	22,069	616,330	10,108	362,814	78,900	810,773	185,856	755,616	316,896	485,975	4,252	3,649,588
Work	590,764	4,234	99,346	14,461	-	85,859	20,458	37,005	126,206	81,280	-	1,059,613
Work-related	32,818	81,250	69,660	-	-	10,108	-	-	-	-	-	193,837
School	324,034	7,549	-	2,131	2,368	40,683	29,880	20,990	16,197	30,445	-	474,277
Medical/ Dental	43,609	-	-	-	9,766	21,858	2,504	9,766	8,633	-	-	96,137
Shopping	879,993	67,727	2,979	39,755	-	343,824	22,226	52,334	119,102	56,871	8,211	1,593,023
Family and Personal	161,180	3,246	3,107	27,482	552	17,574	2,504	5,382	17,961	38,130	-	277,117
Social and Recreation	716,343	18,860	8,636	16,640	-	54,283	2,501	171,061	88,360	15,611	13,444	1,105,738
Eat Meal	427,801	175,395	-	15,948	-	60,904	2,326	29,521	21,199	45,555	-	778,649
Serve Passenger	421,812	98,621	-	-	4,550	112,739	14,230	42,638	59,275	50,416	-	804,281
Other, Skipped, or Not Ascertained	34,301	-	-	4,063	-	36,078	2,326	33,287	4,819	-	96,498	211,372
Total	**3,654,723**	**1,073,212**	**193,837**	**483,293**	**96,137**	**1,594,684**	**284,810**	**1,157,602**	**778,649**	**804,281**	**122,404**	**10,243,632**

Prepared by Chicago Area Transportation Study, September, 2003. Trips reflect daily average trips by trip purpose to and from for a 7-day week in the part of the Chicago CMSA within Illinois. Trip data was collected for all ages. Source: Bureau of Transportation Statistics, US Department of Transportation. 2003. [Center for Transportation Analysis, Oak Ridge National Laboratory]. Analysis by CATS. Raw data is posted at http://nhts.ornl.gov/2001/html_files/download_directory.shtml. **Discussion of sample and suggested appropriate use of the data:** *This data is provided here because this analysis is not available elsewhere, but plays an important role in the text.* Data is based on a sample of 244 ped/bike trips and 1,881 total trips. Since bike-ped trips are expanded to fill a matrix with 121 values, this sample is insufficient to accurately reflect low relatively low values in the bike/ped table. Data *can* be used to make statements about relative scale, e.g., "walking and biking from home to and from social and recreation activities and between social and recreation activities is common," or "trip chaining by foot or bike between medical/dental purposes and meal purposes is not common." However, it would be an **inappropriate** use of this data to suggest that "No one walks or bikes between school / religious purposes and eating purposes." It is also **inappropriate** to quote a number from the bike-ped table, e.g., "131,888 people walk or bike to shopping destinations on a daily basis in northeastern Illinois.

APPENDIX B

CHICAGO CENTRAL AREA PEDESTRIAN COUNTS

1999

Figure 1.

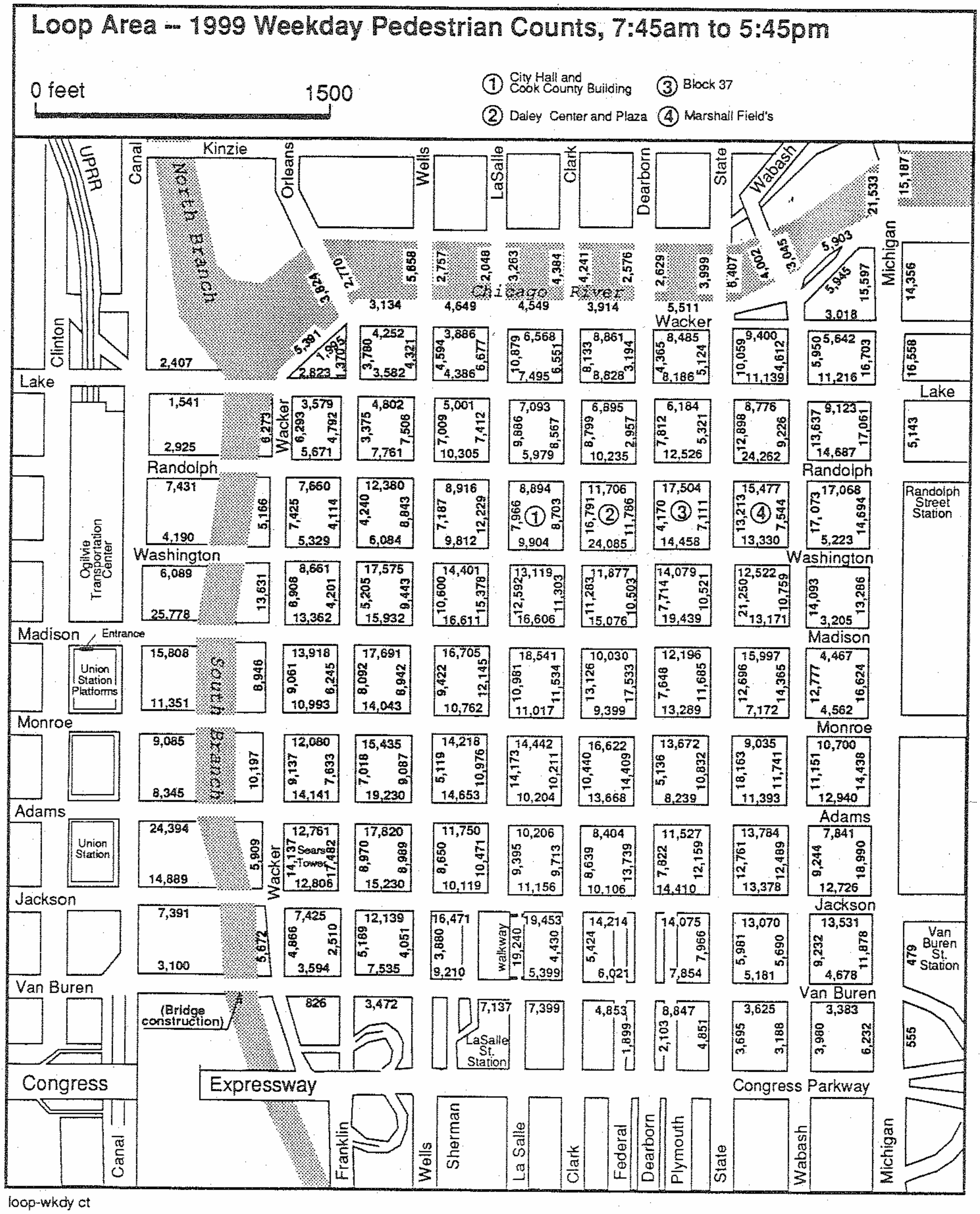

Loop Area -- 1999 Weekday Pedestrian Counts, 7:45am to 5:45pm
0 feet
1500
① City Hall and Cook County Building
② Daley Center and Plaza
③ Block 37
④ Marshall Field's
Kinzie
Lake
Randolph
Washington
Madison
Monroe
Adams
Jackson
Van Buren
Congress
Expressway
Congress Parkway
Canal
Clinton
Orleans
Wells
LaSalle
Clark
Dearborn
State
Wabash
Michigan
Wacker
Franklin
Sherman
La Salle
Federal
Plymouth
UPRR
North Branch
South Branch
Chicago River
Ogilvie Transportation Center
Entrance
Union Station Platforms
Union Station
Sears Tower
walkway
(Bridge construction)
LaSalle St. Station
Randolph Street Station
Van Buren St. Station
loop-wkdy ct

Figure 2.

1999 North Michigan Avenue Weekday and Saturday Counts

Numbers in parentheses are from the 1999 Saturday counts

1. One Magnificent Mile
2. Drake Hotel
3. 900 North Michigan Ave
4. John Hancock Building
5. Borders
6. Water Tower Place
7. Water Tower
8. Neiman Marcus
9. Chicago Place
10. St. Clair Building
11. Terra Museum
12. Chicago Marriott Hotel
13. Nordstrom (future)
14. Tribune Tower
15. Wrigley Building
16. Equitable Building

(oval) Block-face ID

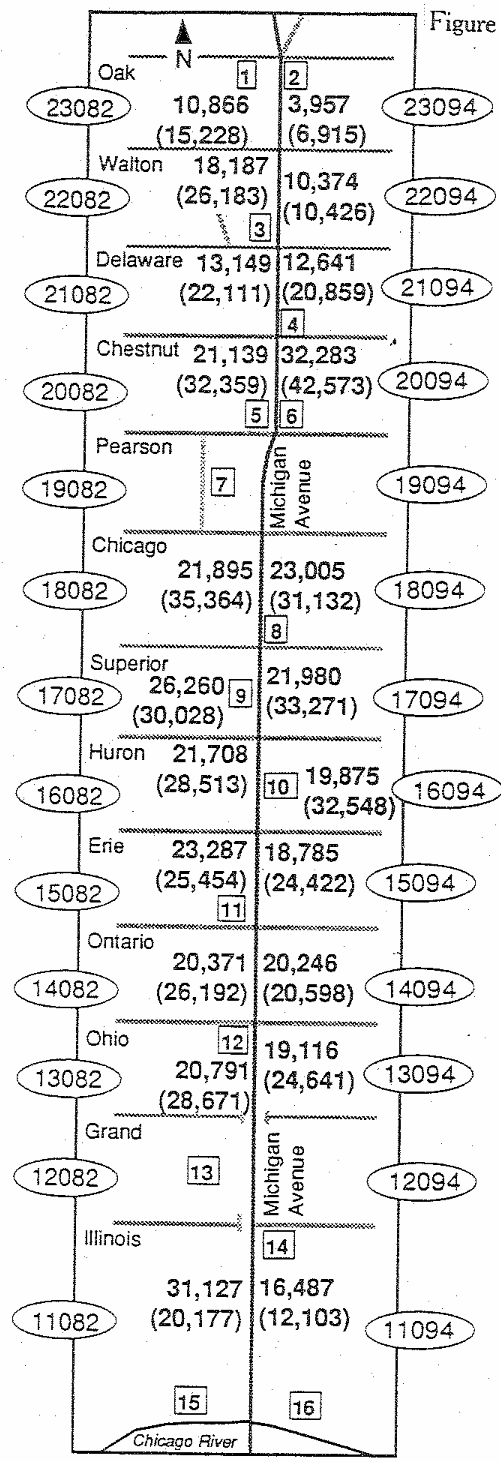
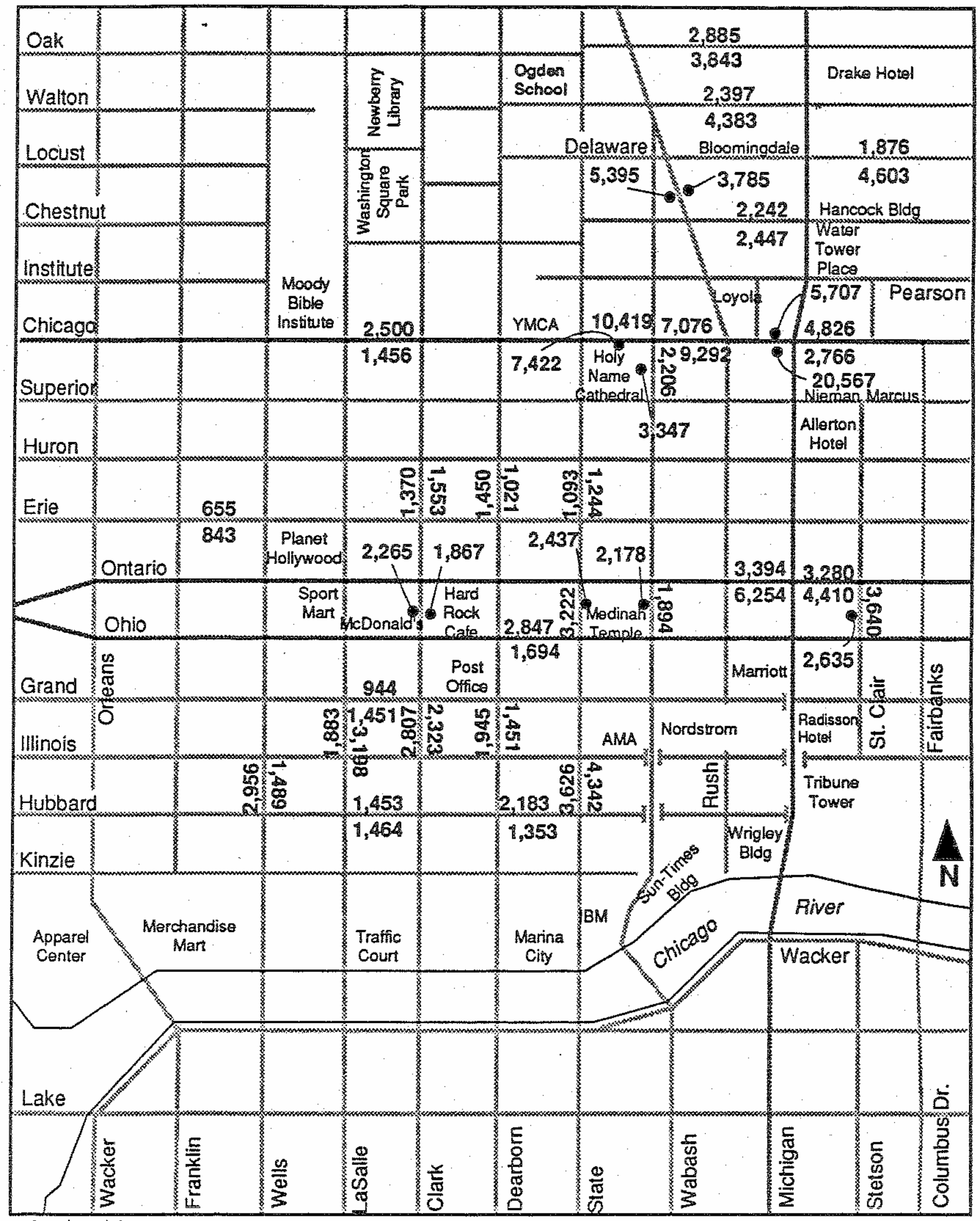


Figure 3.

River North and Streeterville Weekday Counts (7:45am to 5:45pm)



rn &strvl weekday counts

APPENDIX C

ANALYSIS OF CHANGES IN DEVELOPMENT DENSITY

1987-1997

DRAFT ANALYSIS OF POPULATION DENSITY ON NON-FARM ACREAGE, NORTHEASTERN ILLINOIS, 1987 - 1997.

COUNTY	COOK	DUPAGE	KANE	LAKE	MCHENRY	WILL	TOTAL
AREA (THOUSANDS OF ACRES)	612.48	215.04	335.36	301.44	391.04	543.36	2398.72
FARM ACRES (THOUSANDS), 1987	46.9	25.4	228	82.3	265.9	328.7	977.2
NON-FARM ACRES (THOUSANDS), 1987	565.58	189.64	107.36	219.14	125.14	214.66	1421.52
POPULATION, 1987	5,172,398	741,405	298,651	482,608	165,577	339,236	7,199,875
POPULATION PER THOUSAND NON-FARM ACRES, 1987	**9,145.3**	**3,909.5**	**2,781.8**	**2,202.3**	**1,323.1**	**1,580.3**	**5,064.9**
FARM ACRES (THOUSANDS), 1992	41	18	204	73	249	326	911
NON-FARM ACRES (THOUSANDS), 1992	571.48	197.04	131.36	228.44	142.04	217.36	1487.72
POPULATION, 1992	5,199,839	815,497	332,476	543,244	201,137	376,477	7,468,670
POPULATION PER THOUSAND NON-FARM ACRES, 1992	**9,098.9**	**4,138.7**	**2,531.0**	**2,378.1**	**1,416.1**	**1,732.0**	**5,020.2**
FARM ACRES (THOUSANDS), 1997	39	17	210	51	242	294	853
NON-FARM ACRES (THOUSANDS), 1997	573.48	198.04	125.36	250.44	149.04	249.36	1545.72
POPULATION, 1997	5,322,117	874,404	376,725	609,714	242,449	450,816	7,876,225
POPULATION PER THOUSAND NON-FARM ACRES, 1997	**9,280.4**	**4,415.3**	**3,005.1**	**2,434.6**	**1,626.7**	**1,807.9**	**5,095.5**
RATIO OF 1997 TO 1992	1.020	1.067	1.187	1.024	1.149	1.044	1.015
RATIO OF 1997 TO 1987	1.015	1.129	1.080	1.105	1.229	1.144	1.006

Prepared by the Chicago Area Transportation Study, Plan Development Division. September, 2003

SOURCES:

Farmland Acreage: U.S. Department of Agriculture, National Agricultural Statistics Service. Census of Agriculture. Compiled from Data Queries of 1987, 1992, 1997. Query at http://govinfo.kerr.orst.edu/php/agri/index.php linked from http://www.nass.usda.gov/census/
County Acreage: Chicago Area Transportation Study

Population Estimates: **1992, 1997**: U.S. Census Bureau Population Estimates for NIPC Area Counties, 1990-2002 http://www.nipc.cog.il.us/county2002.html **1987**: U.S. Census Bureau Historical County Estimates Files, Population Estimates of the U.S., States, and Counties posted at http://eire.census.gov/popest/archives/1990.php

Note 1:
Changes in the proportion of regional population by county influences regional rates calculated above:

YEAR	COOK	DUPAGE	KANE	LAKE	MCHENRY	WILL	
1987	0.718	0.103	0.041	0.067	0.023	0.047	1.000
1992	0.696	0.109	0.045	0.073	0.027	0.050	1.000
1997	0.676	0.111	0.048	0.077	0.031	0.057	1.000

Note 2:

2002 Census of Agriculture information is expected in February, 2004. See http://www.nass.usda.gov/census/census02/preliminary/2002censusdates.htm

Note 3:

Data is based on retrospective estimates and survey data and is subject to errror. Definitional change occurred between 1992 and 1997. Preliminary analyses show little effect of the change, involving nurseries and tree farms, in northeastern Illinois.

APPENDIX D

RESEARCH SUPPORTING USE OF PEDESTRIAN AND BICYCLE LEVEL OF SERVICE MODELS

Real-Time Human Perceptions
Toward a Bicycle Level of Service

BRUCE W. LANDIS, VENKAT R. VATTIKUTI, AND MICHAEL T. BRANNICK

The primary focus of this study by Sprinkle Consulting Engineers, Inc. is to develop a bicycle-quality, or level-of-service, model for applications in U.S. metropolitan areas. Although there are several model forms being used throughout the United States that attempt to quantify road suitability or the quality of service afforded bicyclists traveling the street and roadway networks of urbanized areas, to date there have been no statistically calibrated models published. The statistically calibrated level-of-service model described here is based on real-time perceptions from bicyclists traveling in actual urban traffic and roadway conditions. The study's participants represented a cross section of age, gender, experience level, and geographic origin of the population of cyclists that use the metropolitan road networks in the United States. The test course is representative of the collector and arterial street systems of North American urban areas. Although further hypothesis testing is being conducted and additional studies are planned to test the need for disaggregate models for central business district streets with high turnover parking, truck routes, and two-lane high-speed rural highways, the general bicycle level-of-service model reported here is highly reliable, has a high correlation coefficient ($R^2 = 0.73$), and is transferable to the vast majority of United States metropolitan areas. The study reveals that pavement-surface conditions and striping of bicycle lanes are important factors in the quality of service.

As reported in Landis (*1*), there exist very few, if any, calibrated and transferable models that estimate bicyclists' perceptions of the quality of service in the on-road cycling environments in U.S. metropolitan areas today. There are many applications for such a calibrated and transferable model. These applications range from annual end-user applications, such as setting priorities for construction projects and bicycle route suitability mapping using supply-side performance measures, to the less frequent travel-demand forecast modeling and logit model refining for alternatives testing in corridor studies.

Currently, the largest of the application needs for a bicycle quality-of-service model is in assessing roads and streets as a criterion for setting bicycle-facility investment priorities and developing a bicycle-suitability network map. Perhaps the most widespread application demand for a statistically valid, mainstream evaluative tool such as a bicycle-quality, or level-of-service, model is for setting priorities for bicycle-facility construction projects. Currently in the United States, the choice between bicycle-facility projects is often made in the absence of an objective supply-side evaluation of the existing roadway facilities. Because competition is fierce among the various transportation modes for project construction funding, a reliable, quantitative supply-side evaluation is needed for bicycle-mode projects.

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In the closely related and rapidly growing area of bicycle suitability mapping, the current practice in many areas of the United States is subjectively to evaluate roads to determine their compatibility for bicycle travel. However, consistent evaluation of the roads among the map updates is not possible without involving the same people in every update year. As a result, either inconsistency or inaccuracy results. A statistically calibrated, mathematically based model is thus needed. Such an objective evaluation tool will eliminate a large portion of the uncertainty in suitability mapping and will provide the transportation system users with technically accurate information.

Although less often needed, one of the pressing needs for a quality-of-service model is to overcome one of the current barriers in developing a sequential bicycle travel-demand simulation or forecasting model for urban-area utilitarian bicycling. This barrier is resident in both the trip distribution and assignment steps of the classic four-step transportation system model. Unlike the relatively straightforward trip distribution and assignment algorithms for motorized vehicles, which include only a few impedance factors such as travel distance (or travel time) and (if selected) vehicle-flow capacity constraint, route selection by bicyclists in the United States is influenced by many additional factors (although it is not usually influenced by bicycle flow-capacity constraints). Stated-preference survey work by Axhausen and Smith (*2*), the hypothetical-route choice model by Bovy and Bradley (*3*), and the environmental-preference survey of experienced recreational cyclists by Antonakos (*4*) suggest that bicycle-route selection for utilitarian trip purposes in an urban setting is influenced by several additional factors, which include the perceived hazard of sharing the roadway with motor vehicles and the roadway surface condition, grade, and scenery (possibly for some trip purposes). It is apparent that the first two factors can be combined into a single mathematical function and that the resulting quality-of-service function can be used as a travel impedance in both the trip-distribution and assignment algorithms of system-level travel-simulation models. Thus refined, this mathematical function, or quality-of-service model, can remove one of the barriers to the development of urban-area travel-demand models.

BACKGROUND

There are numerous local governments, metropolitan planning organizations, and state departments of transportation throughout the United States that are applying various methods to describe the quality of service to bicyclists provided by their collector and arterial systems. The majority are basing their methods on either the separate or combined works of Landis, Sorton, Epperson, and Davis (*1,5–7*). Despite having different names for their models, these researchers and other practitioners are generally headed toward developing a model, or group of models, that describe the quality of service afforded bicyclists in the shared-roadway environment. For the most part, they all take the approach of quantifying the bicyclists' perception of the magnitude of the hazards (stress, or conversely comfort) of traveling within the shared-roadway environment. Although offering different levels of precision and number of variables, the model forms published by the researchers have one important thing in common: the lack of basis in a statistically robust number of observations (*1*) for model calibration.

The perception of hazard, or alternatively safety or users comfort, within the shared-roadway environment is a performance measure (*8*). Although it has not yet been proved in the United States that the perceptions of safety by transportation system users correlate with actual safety, this perception is a reasonable measure of the quality of service for the bicycle mode of travel and is in keeping with the general guidelines according to the *Highway Capacity Manual* (*9*). As with performance or quality measures for motor-vehicle facilities, gradations in this quality of service are in levels of service. Thus defined, the bicycle level of service (BLOS) is not a measure of vehicular flow or capacity as is the convention for other travel modes. Although methods do exist for quantifying bicycle flow and capacity, such performance measures are generally not relevant for mixed-mode collectors and arterials in the United States, at least in the foreseeable future.

The BLOS is based solely on human responses to measurable roadway and traffic stimuli, similar to the comfort and convenience-type performance measures for other transportation modes. Although motor-vehicle system performance measures are usually based on single parameters such as time (average vehicle delay in seconds for intersections) or speed (average travel speed for road links), their gradations are solely based upon on operators' expectations of performance, that is, human perceptions. For example, the lower-bound level of service of signalized intersections is considered failure F or 60 sec of delay based upon a consensus on the motorists' tolerance threshold of travel delay. Although, the BLOS score is a mathematical function of human perceptions of stimuli, that is, a nondimensional value, it can be described in a similar manner using measurable physical attributes of motor vehicle traffic and roadway conditions. As demonstrated here, this has been done with a high degree of statistical reliability.

DESIGN OF RESEARCH

The common expression of bicyclists concerning how well a particular street or road accommodates their travel is from a perspective of safety. "It's very dangerous" or "it's fairly safe" is the way cyclists articulate their perceptions. Accordingly, this study placed its participants in actual urban traffic and roadway conditions to obtain feedback on real-time perceptions. Although a virtual reality, or simulation, study was first considered by the researchers, due to its advantage of safety to the participants, it was not pursued because of its potential inability to include all response stimuli (i.e., operator and vehicle response factors) present in the on-road bicycling environment.

Participants

The nearly 150 bicyclists who completed the course represented a good cross section of age, gender, experience level, and geographic origin. Figure 1 shows the distribution of age. Due to the potential hazards of riding in urban-area motor vehicle traffic, children younger than age 13 were not allowed to participate in the study. The gender split of the study group was 47 percent female and 53 percent male. The researchers also sought participant diversity in both geographic origins and cycling experience, or skill level. Accordingly, the study test course was located in Tampa, Florida, a metropolitan area with significant in-migration. Nearly half of the study participants had lived in areas other than the Tampa Bay region for the majority of their adult life.

There was a considerable range of cycling experience among the participants. There was a significant number who did very little bicycling and there were some who bicycle virtually every day. Figure 2 shows a histogram of the average annual bicycle distance traveled by the sample population. Nearly 25 percent of the participants ride less than 322 km (200 mi) per year. Despite considerable effort in soliciting participation from nonexperienced Group B cyclists (*10*), the higher response was from the segment of the population who currently bicycle the most often, the club-level riders.

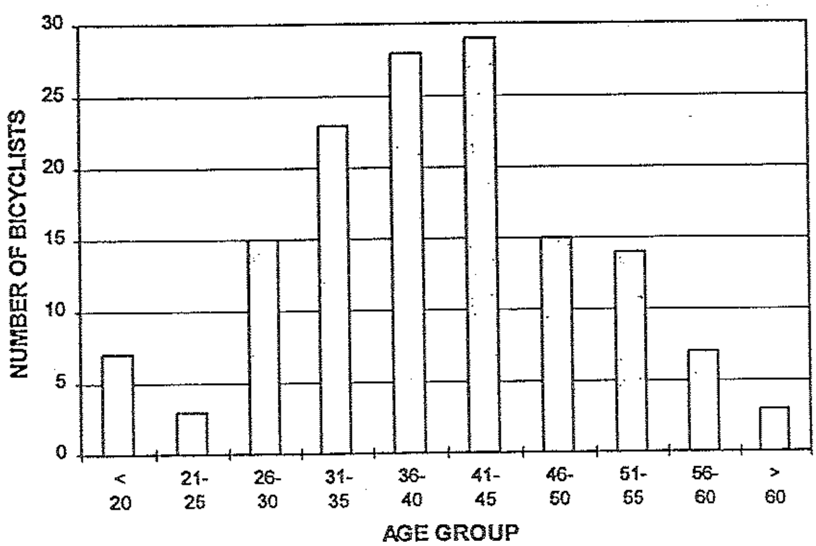

FIGURE 1 Age distribution of participants.

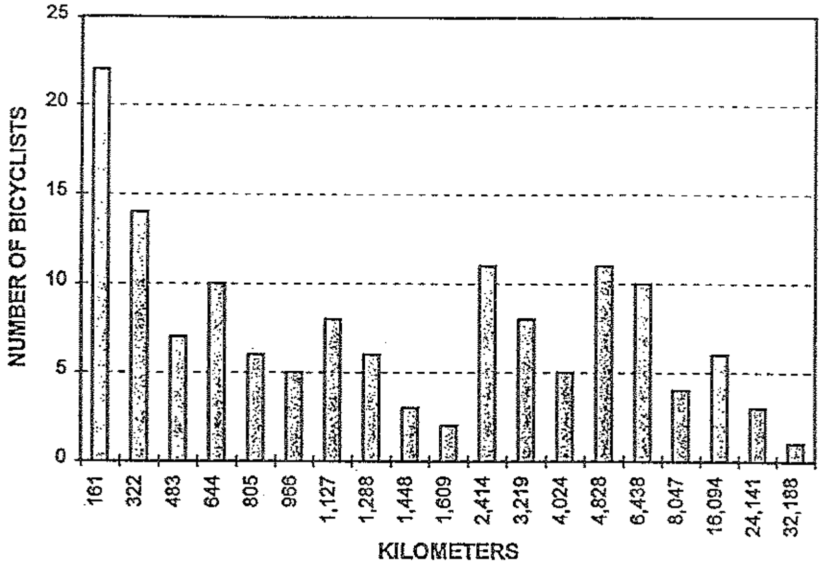

FIGURE 2 Distribution of annual bicycle kilometers traveled by participants.

Urban-Area Course

The course included representative traffic and roadway conditions and land development forms present in the urbanized areas of the United States. Approximately 27 km (17 mi) in length, the looped course consisted of 30 road segments with near equal lengths, but varying traffic and roadway conditions. Although the majority of the segments were collectors and arterials, several segments were local streets. During the course run by the participants, traffic volumes ranged from a low of 550 average daily traffic (ADT) to a high of 36,000 ADT, with a mean of 12,000 ADT. The percentage of heavy vehicles (as defined in the *Highway Capacity Manual* [9]) ranged from 0 to 2 percent. Posted speeds ranged from 40 to 80 km/hr (25 to 50 mi/hr) with a mode of 72 km/hr (45 mi/hr). The motor vehicle traffic lane configurations included divided, undivided, and continuous left-turn median lanes. The number of lanes ranged from two (undivided) to six (divided). The course included both curb and guttered as well as open shoulder cross-sectioned roadbeds.

There were a myriad of lane widths, bicycle-facility types, and striping conditions (and combinations thereof) present on the course. The width of outside motor vehicle through-lanes ranged from 3.05 to 4.88 m (10 to 16 ft). Striped bike lanes and paved shoulders ranged from nonexistent to 1.83-m (6-ft) wide. Pavement surface conditions ranged from poor to very good [FHWA Highway Performance Monitoring System (*11*) surface quality PAVECON ratings from 2 to 5]. Neither rumble strips nor outside lane reflectors were present on the course.

The course ran through the entire spectrum of land development forms and street network patterns found in U.S. metropolitan areas. Retail commercial development forms ranged from regional shopping malls (with several high-volume driveways) to small convenience strip centers (with numerous curb cuts). Modern community- and neighborhood-scaled centers were prevalent; 1950s and 1960s small retail-neighborhood centers with limited on-street parking were also represented. Some segments had office buildings fronting them, others were fronted with hospitals and medical complexes. Some segments passed by modern sports stadiums and museums. Several segments passed by elementary schools, a college, and a large state university. Other land uses included churches, convenience stores, sit-down and fast-food restaurants with drive-throughs, professional and personal care businesses, laundromats, car repair shops, a salvage yard, fire stations, city public works departments, golf courses, a national-scale theme park, a neighborhood park, a natural forest, and light industrial areas. The age of the development forms ranged from the 1940s to the present day.

In the residential areas, there was also an extensive variety of development forms directly adjoining the course. Residential dwellings included high-rise apartment and condominium units housing people from students to the managed-care elderly. Mid- and low-rise apartments were present, as were townhomes and other forms of attached dwelling units. Some course segments had single-family homes directly fronting them and intersecting traditional grid-pattern local streets. Others had entrance-drive connections from curvilinear street-form (planned-development) residential subdivisions. The age of the residential land forms ranged from the 1940s to the present day. Neighborhoods represented a balanced mix of upper, middle, and low household income levels. In summary, the majority of the nearly 1,000 land uses documented in the ITE trip generation manual (*12*) directly adjoined the study course.

Participant Response

Participants in the study were solicited using a broad-based, area-wide, multimedia approach that included newspaper notices and articles, radio announcements, direct mailings by numerous organizations and businesses, and brochure-registration form distribution. Displays with registration forms were deployed at retail sports outlets, colleges and universities, public schools, museums, government office lobbies, major employers, and bicycle shops. The real-time data collection activity of the study was promoted as an event entitled the Fun Ride for Science, with prize drawings and gifts as incentives for participation. The need to ensure a large number of volunteer bicyclists (*1*) mandated a weekend testing period. To ensure that uniform motor vehicle traffic volumes were experienced by all participants, the event was run during a single time block. The course run (the event) was scheduled for the morning of one of the busiest (from a traffic-volume standpoint) Saturdays of the year, April 27.

Approximately 150 people participated in the event. They first completed registration forms that included a battery of questions to generate individual profiles of the participants. Although the participants were being briefed on course configuration, instructions for completing the response cards, and logistical matters, course proctors were deployed. Consisting of staff from the Hillsborough County (Tampa) metropolitan planning organization, the Center for Urban Transportation Research, and Sprinkle Consulting Engineers Inc., over 20 proctors were strategically located throughout the course. The proctors ensured temporally spaced starts, individual riding, independent response scoring among the participants, and current completed response cards (participants were encouraged to reflect on their accumulating experience and hence re-grade as they proceeded through the course).

Similar to the separation between link and intersection analyses in highway capacity and level-of-service determinations, the study's purpose was to evaluate the quality, or level of service, of the roadway links, not the intersections. Accordingly, the participants were instructed to disregard the conditions at the termini of the segments. They were instructed to exclude from their consideration the aesthetics of the segments. They were to include only conditions within, or directly adjoining, their right-of-way. The participants evaluated on a 6-point (A to F) scale how well they were served (how safe or how comfortable they felt) as they traveled each segment. Level A was considered the most safe or comfortable (or least hazardous); Level F was considered the most unsafe or most uncomfortable (or most hazardous).

ANALYSIS OF DATA AND INITIAL HYPOTHESIS TESTING

Considerable data on both the participants and the course attributes were collected to permit extensive hypotheses testing. Although further hypothesis testing is ongoing, two tests have been performed in addition to the initial model development. First, a standard pooled error statistical comparison was made between the mean bicycle quality-of-service scores for females versus that of males. The means, standard errors, and sample size were, respectively, 3.33, 0.83, and 68 for female cyclists and 3.17, 0.72, and 77 for male cyclists. The computed t-test (1.23) was not significant at $\alpha = 0.05$. The second initial hypothesis test was for perception differences associated with bicycle experience level. Using annual bicycle kilometers (miles) traveled [BKT (BMT)] as a measure of experience, incremental standard pooled error tests were conducted beginning at the tails of the BKT (BMT) frequency histogram (Figure 2) and working toward the middle of the distribution until a statistically significant difference was encountered. Not surprisingly, a quality-of-service score difference was encountered between the riders who traveled less than 322 km (200 mi) per year and those with more than 322 annual BKT (200 annual BMT). What was surprising was that for the less-experienced riders, their average perception of the hazards of bicycling in a shared-roadway environment was less than that for the more experienced riders (2.75, a high C, versus 3.14, a middle C). Although further testing of perception differences among groups or subgroups is currently underway, the initial results suggest that once they are traveling on a road segment (i.e., after overcoming any impediment to traveling on an on-street network), the less-experienced bicyclists are not perhaps as aware of the potential hazards of traveling in a shared-roadway environment.

MODEL DEVELOPMENT

This study sought to mathematically express, for road or street links, the roadway and traffic conditions that affect bicyclists' perceptions of the quality of service, or level of accommodation. The following process in developing the preliminary model was applied: (*a*) identify which variables are relevant, (*b*) test for the best configuration of each variable (or combinations thereof), and (*c*) establish the coefficients for the variables (or combinations thereof) that result in the best-fit regression model.

The perceived quality of service (BLOS) in a shared-roadway environment was first hypothesized as a function of a set of variables, which takes the general form:

$$BLOS = f(X_1, X_2, X_3, X_4 \ldots) \quad (1)$$

Building upon the works of Landis, Sorton, Epperson, and Davis (*1,5–7*), a comprehensive Pearson correlation analysis of the extensive array of roadway and traffic variables with respect to BLOS was employed. Subsequently, the following relevant variables were selected for consideration in the second step of the model-development process, per-lane traffic volume, traffic speed, traffic mix, cross-traffic generation (traffic flow turbulence), pavement surface condition, and available roadway width for bicycling. The variables that were dropped from further consideration because of their poor correlation with the dependent variable (BLOS) or their colinearity with the more strongly correlated variables listed above included presence of curbing, controlled intersections (average through-movement green time to cycle-length ratio was 0.69), and number of directional lanes. Accordingly, Equation 1 can be rewritten as:

$$BLOS = f(V, S, M, X, P, W) \quad (2)$$

where

- V = per-lane motor vehicle traffic volume,
- S = speed of motor vehicles,
- M = traffic mix,
- X = potential cross-traffic generation,
- P = pavement surface condition, and
- W = width for bicycling.

Using a linear regression analysis technique, the model form would be:

$$BLOS = b + a_1(V) + a_2(S) + a_3(M) + a_4(X) + a_5(P) + a_6(W) \quad (3)$$

Because testing of variations in the construction of some variables was planned prior to any transformations or combination of variables, it would be more accurate to describe Equation 3 as:

$$BLOS = b + a_1[f(V)] + a_2[f(S)] + a_3[f(M)] + a_4[f(X)] + a_5[f(P)] + a_6[f(W)] \quad (4)$$

The stepwise regression analysis was conducted using the approximately 4,300 observations from the real-time course runs by the study participants. Numerous variable transformations and combinations were tested. Table 1 shows just three of the many model forms that were tested and the coefficients and t-tests. Model A does not include a potential cross-traffic variable, and it has only the total outside lane width as the "width for bicycling" variable. Model B also does not have the potential cross-traffic variable, but it does have a more comprehensive construction of the "width for bicycling" variable. The correlation coefficient (R^2) of the best-fit model (Model C) is 0.73. (See Figure 3 for a plot of predicted versus mean observed BLOS values and Figure 4 for the residuals plot.) The coefficients are all statistically significant at more than the 95 percent level except for the curb-cut, on-street parking (cross-traffic) term. Thus, the following model was developed for the total population of bicyclists and roads and streets in U.S. metropolitan areas:

$$BLOS = a_1\ln(Vol_{15}/L) + a_2\ln[SPD_p(1+\%HV)] + a_3\ln(COM15 * NCA) + a_4(PC_5)^{-2} + a_5(W_e)^2 + C \quad (5)$$

where

$BLOS$ = perceived hazard of the shared-roadway environment,
Vol_{15} = volume of directional traffic in 15-min time period,
L = total number of through lanes,
SPD_p = posted speed limit (a surrogate for average running speed),
HV = percentage of heavy vehicles (as defined in the *Highway Capacity Manual*),
$COM15$ = trip generation intensity of the land use adjoining the road segment (stratified to a commercial trip generation of 15, multiplied by the percentage of the segment with adjoining commercial land development),
NCA = effective frequency per mile of noncontrolled vehicular access (e.g., driveways and on-street parking spaces),
PC_5 = FHWA's 5-point pavement surface condition rating, and
W_e = average effective width of outside through lane ($W_e = W_t + W_l - \Sigma W_r$, where W_t = total width of outside lane (and shoulder) pavement, W_l = width of paving between the outside lane stripe and the edge of pavement, and W_r = effective width (reduction) due to encroachments in the outside lane.

(W_r has not been statistically calibrated during this first phase of the study.)

The cross-traffic *COM15NCA* term has been retained (in Model C) for institutional reasons. Although the course had an excellent variety and range of the roadway and traffic variables typically encountered by cyclists in metropolitan areas, only two segments had substantial high turnover on-street parking. Thus, it is postulated that the transverse turbulence created by on-street parking activity (i.e., motor vehicle and pedestrian ingress-egress to the parking spaces) may be a factor in the bicyclists' perception of safety. Although it is estimated that fewer than 1 percent of the total mileage of U.S. metropolitan areas' collector and arterial roadways have high turnover on-street parking, it may be beneficial to some urban areas to use BLOS Model C with this factor.

TABLE 1 Model Coefficients and Statistics

	Coefficients			T-Statistics		
Model Terms: form	Model A	Model B	Model C	Model A	Model B	Model C
Outside Lane Volume:						
ln(Vol$_{15}$/L)	0.649	0.607	0.589	6.351	7.256	6.657
Motor Vehicle and Speed:						
ln(SPD$_p$(1+HV))	0.436	0.901	0.826	1.185	2.825	2.419
Access from Adjoining Land Use:						
Potential cross-traffic generation:						
ln(COM15NCA)	---	---	0.019	---	---	0.647
Pavement Surface Condition:						
("Pavecon" rating)$^{-2}$	5.457	6.510	6.406	2.970	4.052	4.014
Width of Outside MV Lane and (any) paved shoulder:						
(Wt)^2	-0.009	---	---	-5.896	---	---
(We)^2	---	-0.005	-0.005	---	-8.680	-8.147
Constant	0.146	-1.833	-1.579	0.130	-1.841	-1.468
Model Correlation (R^2)	0.61	0.73	0.73			

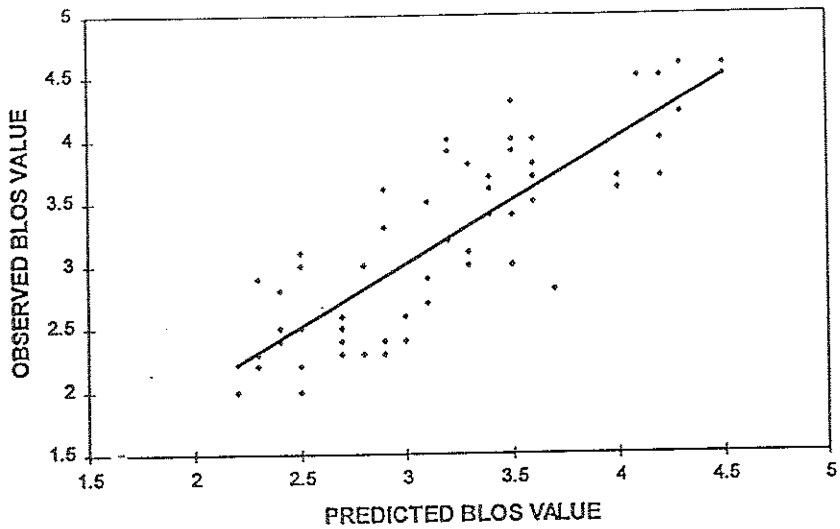

FIGURE 3 Regression plot of predicted and observed BLOS values.

FINDINGS AND APPLICATIONS

Bicycle Lane Striping: Does It Really Matter?

One of the secondary goals of this initial stage of the research was to determine the effect of striping in conjunction with a bicycle lane or a paved shoulder. It was expected and confirmed that extra pavement width to accommodate bicycle travel affects the roadway's quality of service to bicyclists. However, preliminary analysis of the data indicated that there might also be a relationship between the presence of a stripe separating the areas designated for the two travel modes and the perception of a safer condition.

For example, 30th Street had two segments in the course that were similar in virtually all aspects (including paved width) except that one had a striped bike lane and the other an unstriped, wide outside curb lane. However, the difference between their average quality-of-service scores was nearly 50 percent (2.45 and 3.65, respectively) even though the segment with the striped lane had nearly double the traffic volume of the other. Other segments with striped bike lanes or paved shoulders were perceived as being better (i.e., safer or less hazardous) than those without, all other traffic and roadway geometrics being the same.

Accordingly, a variable width of striped bicycling cross section (W_l) was introduced (Model B of Table 1) and transformations were tested within its range. The final form resulted in the variable W_l being a factor in the effective width W_e term, and its inclusion substantially increased the Model's correlation coefficient (R^2) from 0.61 to 0.73. As an example, Table 2 shows the effect of various lane widths and striping configurations using a 3.66-m (12-ft) lane width as a baseline. Notice that for a 4.88-m (16-ft) wide outside lane, the BLOS score decreases only 13 percent. However, with striping added, the quality of service is improved by 31 percent.

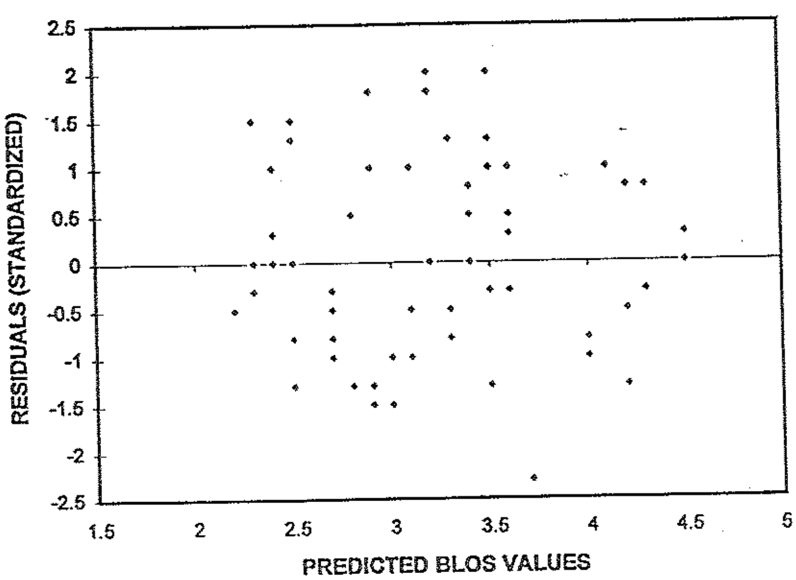

FIGURE 4 Residual plot of predicted and standardized residuals.

TABLE 2 Sensitivity Analysis for Lane Width, Striping, and Pavement Condition

$$BLOS = a_1 \ln(Vol_{15}) + a_2 \ln(S(1+HV)) + a_3 \ln(COM15NCA) + a_4 PC_5^{-2} - a_5 W_e^2 - C$$

a_1: 0.589 a_2: 0.826 a_3: 0.019 a_4: 6.406 a_5: 0.005 C: 1.579

Baseline inputs:

ADT	=	12,000 vpd	% HV	=	1
L	=	2 lanes	PC	=	4 (good condition pavement)
W_e	=	3.66 m (12 ft)	%COM	=	40 (Trip Rate = 15)
S	=	64.4 kmph (40 mph)	CCF	=	26 per km (42 per mile)

	BLOS	% Change
Baseline BLOS Score (BLOS)	4.1	N/A
Lane Width and Lane striping changes		
W_t = 3.05 m (10 ft)	4.4	5% increase
W_t = 3.36 m (11 ft)	4.3	3% increase
W_t = 3.66 m (12 ft) - - (baseline average)	4.1	no change
W_t = 3.97 m (13 ft)	4.0	3% reduction
W_t = 4.27 m (14 ft)	3.9	6% reduction
W_t = 4.58 m (15 ft) (W_l = 0.92 m (3 ft))	3.7 (3.2)	9% (22%) reduction
W_t = 4.88 m (16 ft) (W_l = 1.22 m (4 ft))	3.6 (2.9)	13% (31%) reduction
W_t = 5.19 m (17 ft) (W_l = 1.53 m (5 ft))	3.4 (2.5)	17% (41%) reduction
W_t = 5.49 m (18 ft) (W_l = 2.14 m (6 ft))	3.2 (2.0)	21% (52%) reduction[a]
Pavement Surface Conditions		
PC_5 = 1 Very Poor	10.2	145% increase[a]
PC_5 = 2 Poor	5.3	29% increase
PC_5 = 3 Fair	4.5	7% reduction
PC_5 = 4 - - Good - (baseline average)	4.5	no change
PC_5 = 5 Very Good	4.0	3% reduction

[a]Outside the variable's range present on the Course

1 Km = 0.62 miles

1 meter = 3.28 feet

Pavement Condition: Does It Have An Effect?

Although identified as being statistically significant in the stated-preference survey work by Axhausen and Smith (*2*), the hypothetical route-choice models of Bovy and Bradley (*3*), and the environmental-preference survey of experienced recreational cyclists by Antonakos (*4*), pavement condition is frequently dismissed by some practitioners as being insignificant. However, the response to real-time stimuli captured in this study does confirm that pavement condition plays an important role in bicyclists' assessment of the shared-roadway environment. This study proves conclusively that there is a statistically significant inverse mathematical relationship between pavement condition and the dependent variable BLOS (see Table 1). Poor surface conditions tended to strongly affect the level of service; good surface conditions played a lesser role (Table 2). This finding suggests that virtual reality or other environment simulation techniques used for estimating bicyclists' perceptions of the on-road environment would, in some cases, miss a significant factor in actual roadway conditions. Epperson (*6*) was wrong in suggesting that a video simulation (alone) could be used to calibrate a quality, or level-of-service model. The data clearly reveal that only through placing bicyclists in actual conditions, with real-time consequences of their interactions with motor vehicle traffic and their bicycle's response to the roadway pavement surface condition, can a bicycle quality-of-service model be ascertained with confidence. Videocamera simulation may prove to be an option, provided that it is calibrated with real-time observations. It might be used with caution to estimate perceptions in extreme traffic conditions where study bicyclists might refuse to participate (e.g., high-speed facilities with high-truck volumes).

Applications

The participants in this study represent a broad cross section of the U.S. population of bicyclists, and the course's segments are typical of the collectors and arterials prevalent in the urban and suburban areas of the United States. The initial result of this research is the development of a highly reliable, statistically calibrated model suitable for application in the vast majority of U.S. metropolitan areas. For individual validation, Table 3 may be used as a basis for stratifying the BLOS scores into bicycle level-of-service classes. Even as further hypothesis testing of the data set is under way, additional studies are being planned to test the need for separate models for central business district streets with high turnover parking, truck route segments, and two-lane high-speed rural highways.

ACKNOWLEDGMENTS

The authors would like to thank Sprinkle Consulting Engineers, Inc., and the Hillsborough County (Tampa) Metropolitan Planning Organization (MPO) for funding assistance; Tampa's Museum of Science

TABLE 3 Level of Service Categories

Level-of-Service	BLOS Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

and Industry, the Tampa Bay Freewheelers, and other corporate sponsors for promotional and facility support; the staff of the Center for Urban Transportation Research at the University of South Florida and the MPO and other individuals in data collection, event registration, and test course proctoring. The authors would also like to thank Bruce Epperson of the MetroDade (Miami) MPO and Timothy Trabold of the Niagara Frontier Transportation Committee (the Buffalo, New York, Regional MPO) for their assistance in the initial analysis and sensitivity testing of the bicycle level-of-service model. And finally, the authors would like to express their gratitude to the nearly 150 people who volunteered their time to participate in the study for the sole purpose of advancing applied science.

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All findings and conclusions are solely those of the authors.

Publication of this paper sponsored by Committee on Bicycling.

Paper No. 01-0511

Modeling the Roadside Walking Environment

Pedestrian Level of Service

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A method is needed to objectively quantify pedestrians' perception of safety and comfort in the roadside environment. This quantification, or mathematical relationship, would provide a measure of how well roadways accommodate pedestrian travel. Essentially, it would provide a measure of pedestrian level of service (LOS) within a roadway environment. Such a measure of walking conditions would greatly aid in roadway cross-sectional design and would help evaluate and prioritize the needs of existing roadways for sidewalk retrofit construction. Furthermore, the measure can be used to evaluate traffic-calming strategies and streetscape designs for their effectiveness in improving the pedestrian environment. Such a measure would make it possible to merge pedestrian facility programming into the mainstream of transportation planning, design, and construction. To meet the need for such a method, as well as to fulfill a state mandate to establish levels of service standards for all transportation modes, the Florida Department of Transportation sponsored the development of the Pedestrian LOS Model. The model was developed through a stepwise multivariable regression analysis of 1,250 observations from an event that placed 75 people on a roadway walking course in the Pensacola, Florida, metropolitan area. The Pedestrian LOS Model incorporates the statistically significant roadway and traffic variables that describe pedestrians' perception of safety or comfort in the roadway environment between intersections. It is similar in approach to methods used to assess automobile operators' level of service established in the *Highway Capacity Manual.*

In recent years there have been initiatives in metropolitan areas throughout the United States to create more livable communities in which walking and bicycling are encouraged and accepted as legitimate forms of transportation. Characteristic of these efforts is the reintroduction of bicycle lanes and sidewalks to the streetscapes, complete with street furniture, landscaping, pedestrian-scaled lighting, and other features making the public right-of-way more inviting for people to travel by bicycle or on foot. The transportation planning and engineering community has recently been attempting to provide analysis and design methods to help create more "livable" streets and roadway environments.

Historically, compared with the level of research done for motorized transportation, there has been relatively little study and analysis of the factors that affect the quality of the walking environment. Evaluating the performance of a roadway section for the walking mode is far more complex in comparison with that of the motor vehicle mode. Whereas operators of motor vehicles are largely insulated in their travel environment and hence are influenced by relatively few factors, the pedestrian is relatively unprotected and is subject to a host of environmental conditions.

In general, planners and engineers have not yet come to consensus on which roadway environment features have statistically reliable significance to pedestrians. There have been several recent initiatives by planners to develop "walkability audits"; however, these measures generally include the myriad features of the entire roadway corridor environment (including conditions at intersections) and they have not yet been statistically tested or widely applied. There is consensus that pedestrians' sense of safety and comfort within a roadway corridor is based on a complex assortment of factors including the following:

- Personal safety (i.e., the threat of crashes),
- Personal security (i.e., the threat of assault),
- Architectural interest,
- Pathway or sidewalk shade,
- Pedestrian-scale lighting and amenities,
- Presence of other pedestrians, and
- Conditions at intersections.

The complexity of the issue, however, should not deter attempts to model pedestrians' response to the roadway environment, even if it is for one aspect or component of a roadway corridor. Elected representatives, public officials, and transportation planners and engineers need to be able to determine a roadway's performance with regard to accommodating pedestrian travel. Roadway designers need solid guidance on how to better design pedestrian environments: how far sidewalks should be placed from moving traffic, what types of buffering or protective barriers are needed and when they should be used, and how wide the sidewalk should be.

The purpose of this study, therefore, is to focus on, and identify those factors in the right-of-way that significantly influence the pedestrian's feeling of safety and comfort. The collection of these factors into a mathematical expression, tested for statistical reliability, provides a measure of the roadway segment's level of service (LOS) to pedestrians. This measure evaluates the conditions along roadway segments between intersections. A key application of this measure is to help planners and roadway engineers make informed decisions when designing or choosing the appropriate cross section for any given roadway—a cross section that meets pedestrians' basic need to feel safe and comfortable while walking. As such, the measure presented in this paper is one piece of the puzzle, albeit an impor-

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tant one—many other factors influence a pedestrian's (enjoyment of the) walking experience. These factors should be studied further to improve the body of knowledge on this subject.

The researchers of this study acknowledge that intersection conditions have a significant bearing on the pedestrians' total roadway corridor experience, and must also be studied. Further, they believe that a measure(s) must be developed to be combined with this roadway segment performance measure. In fact the research sponsor, the Florida Department of Transportation (DOT), is using this research team to develop intersection performance measure(s) as Phase II of this study. FHWA is beginning a similar study initiative.

MEASURES OF THE PEDESTRIAN ENVIRONMENT

Dan Burden, a leading national advocate for more walkable communities and transportation systems, spoke for many when he said pedestrians in the roadside environment are subjected to a multitude of factors significantly affecting their feeling of safety, comfort, and convenience. These factors may be classified under three general performance measures describing the roadside pedestrian environment: (*a*) sidewalk capacity, (*b*) quality of the walking environment, and (*c*) pedestrian's perception of safety (or comfort) with respect to motor vehicle traffic. These three measures are briefly outlined below.

The first performance measure, sidewalk capacity, was developed in the early 1970s by Fruin (*1*). His method, as formalized in the *Highway Capacity Manual* (*2*), is the only established method of quantifying sidewalk capacity. However, this performance measure is limited in its applicability. It evaluates only conditions for an existing (or a planned) sidewalk and then only from the perspective of "walking space" or effective sidewalk width available to the pedestrian. Additionally, it cannot be used to evaluate and prioritize roadways for sidewalk retrofit construction, a widespread need in the United States today. This is an important limitation. It is estimated that typically less than 20 percent of the collector and arterial networks of U.S. metropolitan areas have sidewalks. Furthermore, it is estimated that less than approximately 3 percent of roadways have pedestrian activity levels that can be effectively measured by Fruin's capacity method.

Currently, there is no established approach for the second measure, that of the quality, or enjoyment aspect, of the walking environment. Several researchers and a number of planners have proposed qualitative measures of the total quality of the walking experience. Their approaches include numerous qualitative assessments relating to the pedestrian's enjoyment of the walking experience (e.g., convenience of the walking experience and the perception of personal security). Works by Sarkar (*3, 4*), Khisty (*5*), Dixon (*6*), Crider (*7*), and others are examples of methods that include a mixed combination of some factors of all three performance measures. However, most of these methods require the presence of a sidewalk to be applicable. And although the qualitative measure of a pedestrian's enjoyment of the walking experience is important to provide a complete picture of the walking environment and to design an "inviting" sidewalk, it is a separate measure of effectiveness and must be developed and calibrated, if possible, separately from the sidewalk capacity or safety perception measures.

The third measure, the perceived safety or comfort (with respect to the presence of motor vehicle traffic) has not, until now, been quantified as a stand-alone performance measure. The common expression of pedestrians concerning how well a particular street or road accommodates their travel is from a perspective of safety or comfort. "It's a dangerous place to walk" or "it's fairly safe and comfortable" is the way they express their views of the roadway. This measure is the subject of our research, hence this paper. Considering only the roadway environment (i.e., excluding intersection conditions), the factors thought to significantly affect pedestrians' sense of safety or comfort include the following:

- Presence of a sidewalk,
- Lateral separation from motor vehicle traffic,
- Barriers and buffers between pedestrians and motor vehicle traffic,
- Motor vehicle volume and composition,
- Effects of motor vehicle traffic speed, and
- Driveway frequency and access volume.

The perception of safety or comfort is a qualitative measure of effectiveness recognized by the *1994 Highway Capacity Manual.* The manual states, "The concept of level-of-service uses qualitative measures that characterize operational conditions within traffic the stream and their perception by (the facility users) . . . descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience for the facility type." With respect to measures of effectiveness, the manual states, "For each type of facility, levels of service are defined on the basis of one or more operational parameters that best describe operating quality for the facility type" (*2,* p. 1–5). This is the direction of our (measure of effectiveness) effort to model the roadway walking environment.

Therefore, a calibrated, transferable model is needed to objectively reflect the perceived safety or comfort of pedestrians along a roadway segment using measurable traffic and roadway variables. In response to this need, the Pedestrian LOS Model outlined herein has been developed. The model is objective, transferable, and applicable at the roadway segment and, ultimately, when combined with an intersection LOS measure, it is applicable at the facility corridor and network levels. It evaluates roadside walking conditions whether there is a sidewalk or not. It can also demonstrate the impact of adding or improving sidewalks. It uses common, measurable traffic and roadway variables for economy of data collection, accuracy, and reliable and repetitive application. The model is designed to evaluate a roadway segment; it does not include intersections and their complex conditions, which are the subject of separate research initiatives.

DESIGN OF RESEARCH

This research initiative by Florida DOT placed people in actual traffic and roadway conditions to obtain real-time feedback. Although a virtual reality, or simulation approach, was briefly considered by researchers because of its advantage of safety to the participants, it was not pursued because it was not possible to include or replicate all response stimuli of the roadway environment. Accordingly, a special event was created to place a significant number of people on a walking course consisting of typical roadways in a typical U.S. metropolitan area. The purpose was to obtain their real-time response to the roadway environment stimuli and to create and test a mathematical relationship of measurable factors to reflect the study participants' reactions. It should be noted that the research was designed to elicit responses from participants walking individually, not in pairs or groups. The following sections outline this approach.

Participants

Nearly 75 people participated in the first (i.e., the course-walking) portion of the study. The participants represented a broad cross section of age, gender, experience level, and geographic origin. Participants' ages ranged from 13 to 69. Because of the potential hazards of walking in urban-area motor vehicle traffic, children younger than age 13 were not permitted to participate. The gender split of the study group was 47 percent female and 53 percent male. The researchers and sponsor sought participant diversity in both geographic origin and walking experience. Accordingly, the study test course was located in Pensacola, Florida—a metropolitan area with significant in-migration. The average participant had lived in areas other than the Pensacola Bay region for most [approximately 73 percent] of their lives.

There was a considerable range of walking experience among the participants. A significant number made relatively few walking trips (hence, mileage), and some reported that they walked extensively virtually every day of the week. Average distances walked per week ranged from a low of 1.6 km (1 mi) to a high of 79 km (49 mi).

Walking Course

A walking course was designed to subject participants to a variety of traffic and roadway conditions. It included road segments with traffic and roadway conditions typical of U.S. metropolitan areas. Approximately 8 km (5 mi) in length, the looped course consisted of 24 road segments (48 directional segments) with near equal lengths, but with varying traffic and roadway conditions. Although most of the segments were collector and arterial roads, some were local streets. During the walking event stage of the study, traffic volumes ranged from a low average daily traffic (ADT) of 200 to a high ADT of 18,500. The percentage of heavy vehicles [as defined in the *Highway Capacity Manual* (*2*)] ranged from 0 to 3 percent. Traffic running speeds ranged from 25 to 125 km/hr (15 to 75 mph). The roadway cross sections included two to four lanes in forms of one-way, undivided, divided, and continuous left-turn median lane configurations. The walking course included both curb and guttered as well as open shoulder cross-sectioned roadbeds. Some segments had striped shoulders, and some included designated bicycle lanes.

There were a variety of typical metropolitan area roadside conditions in the course. For example, some segments were urban in character with mixed combinations of on-street parking, landscaped buffers, street trees, and buildings adjoining the sidewalks, with structures and awnings covering the sidewalks. Some segments were more suburban or rural in nature with roadside characteristics ranging from no sidewalks to sidewalks directly adjoining the travel lanes, to sidewalks with intervening buffers of widths ranging from 0 to 7.6 m (25 ft).

The walking course passed through a spectrum of land development forms and street network patterns found in U.S. metropolitan areas. Retail commercial development forms ranged from large retail shopping centers to small convenience strip centers. Some segments had office buildings or other professional service establishments fronting them. Other land uses included churches, auto dealerships, banks, sit-down and fast-food restaurants with drive-throughs, professional and personal care businesses, car repair shops, and light industrial areas.

In the residential portions an array of development forms directly adjoined the course. Residential dwellings included apartment and condominium units and other forms of attached dwelling units. Some course segments had single-family homes directly fronting them. Portions of the course passed through traditional grid street patterns; other parts ran through curvilinear street forms. Neighborhoods represented a mix of income levels.

Participant Response

The real-time data collection activity of the study was promoted as an event titled the FunWalk for Science, with prize drawings and gifts as incentives for participation. Volunteer participants were recruited using a broad-based, areawide multimedia approach that included newspaper notices and articles, radio announcements, and direct mailings by and to numerous organizations and businesses. Displays with brochure-registration forms were deployed at area retail sports outlets, health clubs, colleges, government office lobbies, major employers, and bicycle shops.

The need for a large number of volunteer walkers mandated a weekend testing period. Accordingly, the FunWalk for Science was scheduled for the morning of one of the busier (from a traffic-volume standpoint) Saturdays of the year in Pensacola, March 18. To ensure that all participants experienced uniform motor vehicle traffic volumes, the event was run during a single time block in the midmorning. Participants first updated or completed registration forms that included a variety of demographic questions. They were then briefed in groups as to the purpose and rules of walking the course. Following the briefings, walkers were sent to two starters who released them onto the course individually at 1-min intervals, in opposite directions. Although the participants were briefed on the course configuration and had instructions for completing the response cards, course proctors were deployed at strategic points throughout the course. The proctors consisted of staff from the West Florida Regional Planning Council, Florida DOT, the University of Florida, SCI, Inc., and a number of regional bicycle and pedestrian coordinators from throughout Florida. The proctors ensured that temporal spacing between walkers was maintained and that participants were independently completing the response cards as they walked each segment. Participants were encouraged to reflect on their accumulating experience and regrade any previously walked segments as they proceeded through the course.

The study's purpose was to evaluate the quality, or LOS, of the roadway segments, not the intersections. Accordingly, participants were instructed to disregard the conditions at intersections and their immediate approaches. They were also encouraged to exclude from their consideration the surrounding aesthetics. They were to include only conditions in, or directly adjoining, the right-of-way. The participants evaluated on a 6-point (A to F) scale how safe and comfortable they felt as they traveled each segment. Level A was considered the most safe and comfortable (or least hazardous). Level F was considered the least safe and comfortable (or most hazardous).

REDUCTION AND ANALYSIS OF DATA

The study design yielded approximately 1,700 initial observations coincident with a myriad of traffic and roadway conditions throughout the walking course. The resulting data were compiled into both spreadsheet and Statistical Analysis Software (SAS) program databases for extensive analyses. Response outliers and trends were identified resulting in 1,250 observations and 21 roadway sections

(42 directional segments) available for further analysis of the specific effect of traffic and roadway variables.

An interesting response trend was identified, ultimately determined to be that of response (or scoring) fatigue. A slight diminishing scoring trend was evident. Course length was not a factor (the average total duration of the participant's course experience was approximately 2 h) due to the clearly constant slope of the response trend. Presentation order of the segments was not a source of the trend either, because the course presented a variety of traffic, roadway, and urban forms in a random distribution. Because the participants walked the course in two direction groups, averaging the responses allowed for removal of the fatigue trend, thus Pearson Correlations among the traffic and roadway variables and stepwise regression of the dependent variable were possible using the nonbiased (averaged) responses for correlation.

MODEL DEVELOPMENT

Several Pearson Correlation analyses were run using the SAS program on a variety of traffic and roadway variables. Not surprisingly, several variables exhibited some colinearity. However, the colinearity was not enough to preclude the inclusion of some colinear variables into the model because of notable exceptions. For example, although in some cases the presence and width of sidewalks and buffers cor-related with increasing speed, in many cases they did not, reflecting that the current practice of roadside design (or provision of sidewalks and buffers) is not consistent with providing a uniform level of pedestrian safety and comfort throughout transportation systems.

A "long list" of potential primary independent variables influencing pedestrians' sense of safety or comfort within the roadway was generated and then tested (along with numerous other potential factors) in the stepwise regression portion of the model's development. The long list was generated based on the following: (*a*) results of the Pearson Correlation analyses; (*b*) variables (and model terms) identified by group consensus and confirmed during the development of the earlier Roadside Pedestrian Conditions Model [developed for the Tampa metro area's Hillsborough County Metropolitan Planning Organization Pedestrian Plan (*8*)], which is currently the basis for several major metropolitan area pedestrian plans; and (*c*) extensive iterative testing of segment groupings with common levels of independent variables (wherein additional variables were identified that potentially could further explain the variation of the dependent variable—the pedestrians' ratings of safety and comfort). The resulting long list of primary factors included, but was not limited to the following:

1. Lateral separation elements between pedestrians and motor vehicle traffic, including
   - Presence of sidewalk,
   - Width of sidewalk,
   - Buffers between sidewalk and motor vehicle travel lanes,
   - Presence of barriers within the buffer area,
   - Presence of on-street parking,
   - Width of outside travel lane, and
   - Presence and width of shoulder or bike lane;
2. Motor vehicle traffic volume;
3. Effect of (motor vehicle) speed;
4. Motor vehicle mix (i.e., percentage of trucks); and
5. Driveway access frequency and volume.

The factors listed above were considered the most probable primary factors affecting pedestrians' sense of safety. As such, they are the basis for the preliminary structure and testing of the Pedestrian LOS Model represented in the following mathematical expression:

$$\begin{aligned}\text{Pedestrian LOS} = {} & a_1 f(\text{lateral separation factors}) \\ & + a_2 f(\text{traffic volume}) \\ & + a_3 f(\text{speed, vehicle type}) \\ & + a_4 f(\text{driveway access frequency} \\ & \text{and volume}) + a_n f(x_n) + \cdots + C \end{aligned} \tag{1}$$

Researchers conducted stepwise regression analyses using the 1,250 real-time observations. Numerous variable transformations and combinations of the factors were tested. Table 1 shows the best model form and its terms, coefficients, and T-statistics. The correlation coefficient (R^2) of the best-fit model is 0.85 based on the averaged observations from the 42 directional segments (see Figure 1 for a plot of predicted pedestrian LOS versus mean observed values). The coefficients are statistically significant at the 95 percent level. Thus, the following model was developed:

$$\begin{aligned}\text{Pedestrian LOS} = {} & -1.2021 \ 1\text{n}\left(W_{ol} + W_l + f_p \times \%OSP + f_b \right. \\ & \left. \times W_b + f_{sw} \times W_s\right) + 0.253 \ 1\text{n}(Vol_{15}/L) \\ & + 0.0005 \, SPD^2 + 5.3876 \end{aligned} \tag{2}$$

where

W_{ol} = width of outside lane (feet),
W_l = width of shoulder or bike lane (feet),
f_p = on-street parking effect coefficient (= 0.20),
$\%OSP$ = percent of segment with on-street parking,
f_b = buffer area barrier coefficient (= 5.37 for trees spaced 20 feet on center),
W_b = buffer width (distance between edge of pavement and sidewalk, feet),
W_s = width of sidewalk (feet),
Vol_{15} = average traffic during a 15-min period,
L = total number of (through) lanes (for road or street),
SPD = average running speed of motor vehicle traffic (mph), and
f_{sw} = sidewalk presence coefficient
$= 6 - 0.3W_s$. (3)

TABLE 1 Model Coefficients and Statistics

Model Terms	Coefficients	T-statistics
Lateral Separation Elements: ln(*LS*)	- 1.2021	- 10.072
Motor Vehicle Volume: ln (Vol_{15}/L)	0.253	3.106
Speed Term: SPD^2	0.0005	2.763
Constant	5.3876	11.094
Model Correlation (R^2)	0.85	

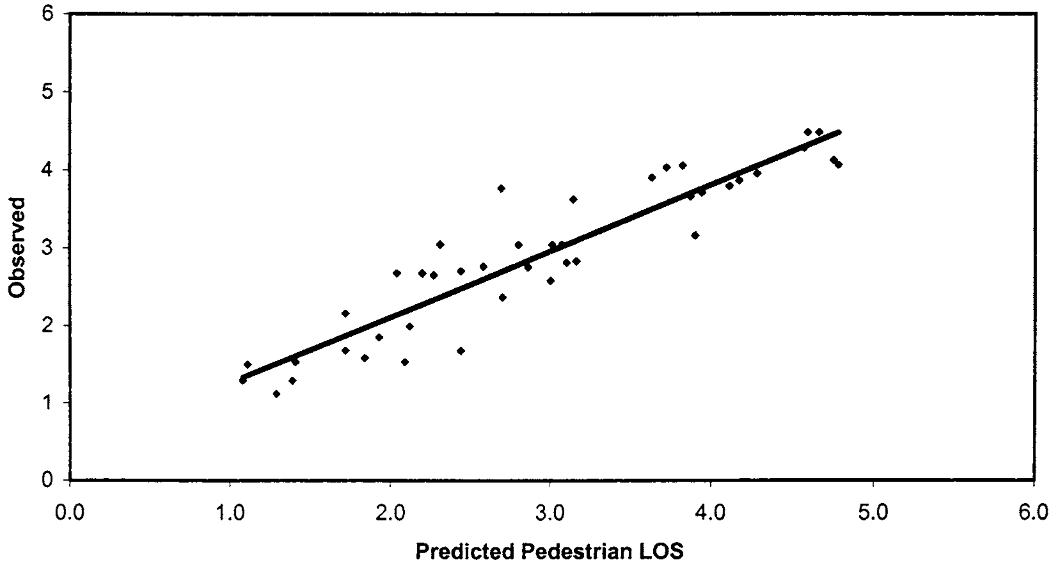

FIGURE 1 Residual plot of predicted and standardized residuals.

The Pedestrian LOS Model equation was created with a statistical significance at the 95 percent level. The factor "driveway access frequency and volume," although included in the stepwise regression analyses, was not found to be statistically significant at that level.

Table 2 may be used as a basis for stratifying the model's numerical result into a pedestrian LOS class when it is applied to a particular roadway segment. It should be noted that this stratification was predetermined because the responses gained in the study were based on the standard U.S. educational system's letter grade structure (with the exception of Grade "E").

DISCUSSION OF MODEL TERMS

Terms of the calibrated model were developed and refined through extensive variables transformation testing and regression. The following briefly outlines some of the aspects of the terms and how the dependent variable responds to them.

Presence of a Sidewalk and Lateral Separation

Having a safe, separate place to walk alongside the roadway is fundamental to pedestrians' sense of safety and comfort in the roadway environment. This sense of safety or comfort is strongly influenced by the presence of a sidewalk. Furthermore, as the calibrated model confirms, the value of a sidewalk varies according to its location and buffering (i.e., the lateral separation) relative to the motor vehicle traffic. In general, as the lateral separation increases, the pedestrian's comfort or sense of safety also increases (see Figure 2). Additionally, when a barrier such as on-street parking, line of trees, or roadside swale is present in the buffer area between motor vehicle traffic and the pedestrian, the pedestrians' sense of protection, hence safety, is improved (see Figure 3). Finally, the frequency of parked cars, trees, or an increase in the depth of the intervening roadside swale would further improve the sense of safety.

TABLE 2 Level of Service Categories

Level-of-Service	Model Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

The mathematical expression that reflects these elements of lateral separation, barriers, buffers, and presence of a sidewalk follows:

$$LS = W_{ol} + W_l + f_p \times \%OSP + f_b \times W_b + f_{sw} \times W_s \quad (4)$$

Examples of how the lateral separation elements are used to quantify some typical roadway cross sections follow.

Figure 4 shows a curbed cross section with no vertical barriers in the horizontal buffer area between the travel lane and sidewalk. Note that there is no on-street parking, therefore the *%OSP* term equals 0. Thus for this scenario, the lateral separation term is given by the following:

$$LS = W_{ol} + W_l + f_b \times W_b + f_{sw} \times W_s \quad (5)$$

In the case in which there is on-street parking, as illustrated in Figure 5, its effect as a barrier is quantified as in Equation 6. Note that there is no striped shoulder or landscape buffer, therefore the W_l and

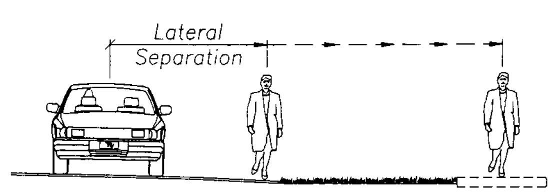

FIGURE 2 Effect of lateral separation.

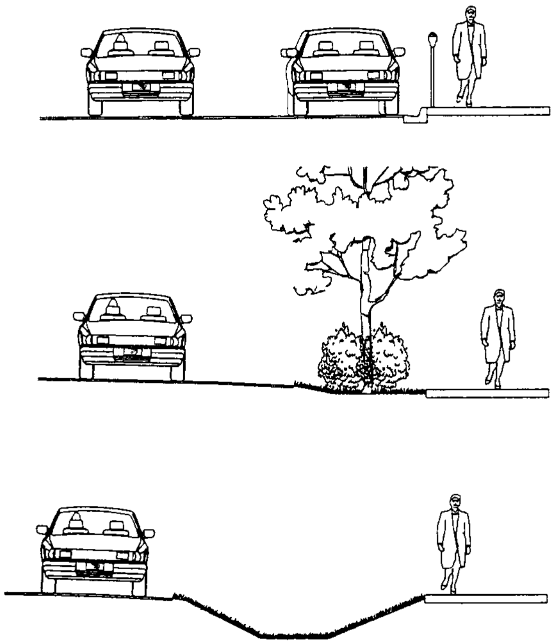

FIGURE 3 Typical barriers within the roadside buffer.

W_b terms equal 0. Thus, the lateral separation term is simplified to the following:

$$LS = W_{ol} + f_p \times \%OSP + f_{sw} \times W_s \tag{6}$$

This section introduced the elements of lateral separation and their mathematical expression. The next sections describe the other two statistically significant terms of the Pedestrian LOS Model.

Motor Vehicle Volume

The frequency of motor vehicles passing pedestrians, represented by the outside lane volume, was also found to be a significant factor. As passing frequency increases, the pedestrians' feeling of safety decreases. The effect of traffic volume is calculated by the following:

$$\text{Traffic volume} = \frac{Vol_{15}}{L} \tag{7}$$

The equation above assumes a 50/50 directional distribution. In cases in which the directional distribution is other than 50/50, Equation 8 (below) should be used. The difference between the two is that Equation 8 uses a directional factor and instead of using L (total num-

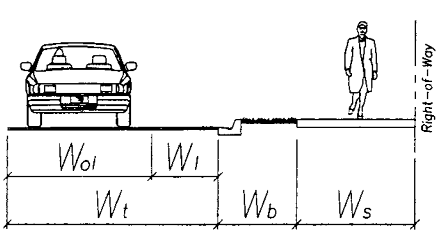

FIGURE 4 Buffers and sidewalk.

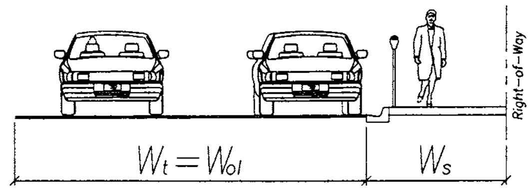

FIGURE 5 Lateral separation with on-street parking.

ber of through lanes), it uses L_d (total number of directional through lanes).

$$\text{Traffic volume} = \frac{Vol_{15}}{L_d} \times D \tag{8}$$

where

L_d = total number of directional (through) lanes (for road or street), and
D = directional factor

This effect on the walkers in the study was found to be statistically significant. Transformations of this variable and subsequent stepwise regressions revealed that at lower traffic volumes, changes in the independent variable produced significant changes in the dependent variable. At higher volumes, however, there was less sensitivity; hence, the natural log mathematical form of this term.

Effect of Speed

Similarly, the speed of motor vehicle traffic was confirmed as significantly affecting pedestrians' sense of safety. As speed increases, pedestrian discomfort increases. It was determined that the dependent variable had an exponential relationship with the average running speed of the motor vehicle traffic, somewhat similar to that relationship discovered during the development of the Bicycle Level of Service Model (*9*), which has been incorporated into Florida's multimodal level of service analysis guidelines (*10*).

Driveway Access Frequency and Volume

Along a roadway segment, uncontrolled vehicular access to adjoining properties (i.e., driveway cuts) was thought to reduce pedestrian sense of safety. This transverse feature represents a similar "turbulence" or hazard to the pedestrian as to motor vehicle operators. Accordingly, as the number of driveways increases, a corresponding decrease in the perceived safety to the pedestrian was expected. Affecting this perception of safety is the volume of vehicles accessing the driveways. However, stepwise regression analyses revealed that this effect was not statistically significant at the 95 percent confidence level.

FINDINGS AND APPLICATIONS

The result of this initial research sponsored by Florida DOT is the development of a reliable, statistically calibrated pedestrian level of service model suitable for application not only in Florida metropolitan areas, but also throughout North America. The Pedestrian LOS Model provides a measure of a roadway segment's performance with respect to pedestrians' primary perception of safety or comfort; as such it serves as the basis for Florida DOT's statewide multimodal (particularly for the pedestrian mode) LOS evaluation techniques. However, it can also be used to greatly influence roadway cross-sectional design and can help in the evaluation and prioritizing of the needs of existing roadways for sidewalk retrofit construction, applications for which the model's precursor, the Roadside Pedestrian Conditions Model, has been successfully used. For example, transportation planners and engineers can now establish a target pedestrian LOS and use the model to test alternative roadway cross-section designs by iteratively changing the independent variables to find the best combination of factors to achieve the desired LOS. The model thus provides roadway designers with solid guidance on how to better design pedestrian environments: how far sidewalks should be placed from traffic; what types of buffering or protective barriers are needed and when; how wide the sidewalk should be; and so on. Finally, the Pedestrian LOS Model, when coupled with the capacity (Fruin) measure and a quality performance measure (i.e., a walkability audit, in the case of an existing sidewalk, to assess the enjoyment and convenience of the walking experience) "completes the picture" of the roadside walking environment.

ACKNOWLEDGMENT

The authors wish to thank Jennifer Toole of SCI, Inc., the West Florida Regional Planning Council, Drs. Linda Crider and Rhonda Phillips of the University of Florida, and the state and regional bicycle and pedestrian coordinators of Florida who assisted in this study.

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Publication of this paper sponsored by Committee on Pedestrians.

APPENDIX E

UTILITY OF BICYCLE LEVEL OF SERVICE AND PEDESTRIAN LEVEL OF SERVICE MEASUREMENT AS AN ANALYSIS AND POLICY TOOL

Potential Uses of PLOS and BLOS

As illustrated in the text, the PLOS and BLOS measures can be used to provide a snapshot of existing walking and bicycling conditions in the region. In addition, they can serve as effective bicycle and pedestrian planning tools for a variety of projects. For example:

- A bicycle map can be produced for the public to assist them in route selection.
- The most appropriate routes for inclusion in the community bicycle network can be identified.
- "Weak links" in the walking and bicycling network can be determined, and sites needing improvement can be prioritized.
- Alternate treatments for improving bike and pedestrian conditions can be evaluated during the roadway design process – providing flexibility to the road engineer.

BLOS and PLOS as Policy Tools

In an increasing number of states around the country, these measures have been adopted not only as a planning tool – but also as a policy tool. Incorporating non-motorized level of service goals brings objectivity to the policy commitment of routinely accommodating all users in all roadway designs. Transportation plans from the federal to local levels often cite the need to accommodate non-motorized travel. However, without formalized implementation targets and policies, the goal is easily ignored. BLOS and PLOS can be used to facilitate implementation. Below are three possible levels of increasing policy commitment:

Raise awareness

Require that all (non-expressway) roadway project proposals include BLOS and PLOS ratings for both existing conditions and the completed project. This will increase awareness of the impact of a road design on non-motorized travel. This could be applied to all projects listed in capital programs, proposals for funding, and to projects within a specific agency. A web-based calculator – on the CATS website, for example – would make this a very simple task.

Provide incentive

CATS, the Councils of Mayors, and other agencies that choose projects for funding use a selection methodology that incorporates various goals. An incentive can be devised for agencies to better accommodate bicyclists and pedestrians by including BLOS and PLOS in these criteria or formulas. Credit can be given according to how a project changes conditions – “before” versus “after” scores – and to what level will be obtained – “after.” These terms could be weighted by demand-side criteria.

Policy requirement

Finally, a policy can be adopted to require a certain level of accommodation, as measured by BLOS and PLOS. As an example, one could require that new construction and road projects requiring right-of-way acquisition be constructed to (at least) a BLOS and PLOS grade “C”. For roads in areas of higher demand, one could require a “B”. For all other road projects, one could require that the ratings either stay the same or improve, but NOT be worsened.

APPENDIX F

Agency Plan Representation in the Bicycle Inventory System

Catalogue of Bicycle and Pedestrian Plans in Possession

Northeastern Illinois, August, 2004
Including CATS BIS Geodatabase Status

The Bicycle Inventory System (BIS) includes information from a number of agencies. The agencies that have provided bicycle facility information to CATS over the past several years are listed below. The status of these plans in the BIS as of December, 2003 is shown below. The status includes whether we have an electronic representation of the existing and planned facilities to include in our inventory, whether the plan is represented by its own line-work, and whether the data structure matches that set out in the BIS.

Agency	Inventory or Plan Name	Inventory or Plan Date	Have Line-work	Unique Feature	Data Structure
State, County, and Regional Agencies					
Central Council of Mayors	West Central Bikeway Plan	1996	✓	✓	✓
Chicago	Bicycle Facilities Development Plan (with Executive Summary)	1997			
Chicago	Streets for Cycling Plan	2000	✓	✓	✓
Chicago	Chicago Trails Plan (Draft)	2004	✓	✓	✓
Chicago	Bike 2000 Plan	1992	N.A.		
Cook County, Forest Preserve District of[158]	• Forest Preserve Opportunity Map (from Land Acquisition Plan (2000) • Recreational Facilities Map (1996) Trail Brochures: • Arie Crown Forest Bicycle Trail (no date, October, 2000) • Busse Woods Bicycle Trail (no date, received October, 2000) • Deer Grove Bicycle Trail (no date, received October, 2000) • I&M Canal Bicycle Trail (1993) • North Branch Bicycle Trail (1993) • Palos and Sag Valley Trail System (1996) • Salt Creek Bicycle Trail (no date, received October, 2000) • Thorn Creek Bicycle Trail (no date, received October, 2000) • Tinley Creek Bicycle Trail (no date, received October, 2000) • Trail Plan at Deer Grove (1996)	Various	✓		
DuPage County Department of Economic Development and Transportation Planning	Proposed Improvement Plan for the Existing DuPage County Trail System [Illinois Prairie Path and Great Western Trail]	2003	N.A.		

[158] This agency is not represented on the CATS Policy or Work Program Committees.

Agency	Inventory or Plan Name	Inventory or Plan Date	Have Line-work	Unique Feature	Data Structure
DuPage County [Division of Transportation]	DuPage County Trail Maintenance Policy Draft	2003	N.A.		
DuPage County Regional Planning Commission	DuPage County 2002 Regional Bikeway Plan Map [Existing and Proposed Bikeways in DuPage County]	2002	✓	✓	✓
DuPage County Regional Planning Commission	DuPage County 2001 Existing and Proposed Bikeways Map	2001 (superseded)	N.A.		
DuPage County Regional Planning Commission	DuPage County Regional Bikeway Plan [and Map]	1996 (superseded)	N.A.		
DuPage County Regional Planning Commission	DuPage County Bikeway Plan Map	1984 (superseded)	N.A.		
DuPage County, Forest Preserve District of	Salt Creek Greenway Master Plan	2001	✓		
Illinois Prairie Trail Authority[159]	Regional Off-road Trail Plan for Northeastern Illinois	2000	✓		
Illinois Prairie Trail Authority[160]	Year 2000 Regional Greenways and Trails Implementation Program	1997	N.A.		
Kane County	Kane County 2030 Transportation Plan	2004	N.A.		
Kane County Regional Planning Commission	Kane County 2030 Land Resource Management Plan	2004	N.A.		
Kane County	Kane County Bicycle Map	2003	N.A.		
Kane County, Kane County Council of Mayors, Forest Preserve District of Kane County	Kane County Bicycle and Pedestrian Plan	2002	✓	✓	✓
Kane County	Kane County Transportation Plan	(1996) (Superseded)	N.A.		
Lake County Council of Mayors	Lake Council Contribution to Bicycle/Pedestrian Component of 2020 RTP	1996	N.A.		

159 This agency is not represented on the CATS Policy or Work Program Committees.

160 This agency is not represented on the CATS Policy or Work Program Committees.

Agency	Inventory or Plan Name	Inventory or Plan Date	Have Line-work	Unique Feature	Data Structure
Lake County	Year 2020 Transportation Priority Plan - Lake County Illinois [Highways - Transit - Bikeways]	2002	✓	✓	
Lake County Forest Preserves[161]	Trail Brochures: • Buffalo Creek Forest Preserve (1996) • Cuba Marsh Forest Preserve (1997) • Grant Woods Forest Preserve (1996) • Greenbelt Forest Preserve (No date, Received 1999) • Half Day and Wright Woods (1994) • Lakewood/Stockholm Lake (No date) • Lyons Woods Forest Preserve (1996) • McDonald Forest Preserve (No date, Received 1999) • Old School Forest Preserve (1996) • Van Patten Woods with Sterling Lake (1997)	Various	✓		
McHenry County Council of Mayors	McHenry County Subregional Bicycle Plan - with Suggested Bicycle Facility Network[162]	1996			
National Park Service[163]	Illinois and Michigan Canal National Heritage Corridor	No Date	N.A.		
National Park Service[164]	Midewin National Tallgrass Prairie - Transportation and Trails Corridors	2001	✓		
North Central Council of Mayors	North Central 2001 Bikeway Plan Map	2001	✓	✓	✓
North Central Council of Mayors	North Central Bikeway Plan	1996 (Superseded)	N.A.		
Northeastern Illinois Planning Commission	Northeastern Illinois Regional Greenways and Trails Implementation Program	1997	✓	✓	
Northeastern Illinois Planning Commission	Northeastern Illinois Greenways Plan	1992 (Superseded)	N.A.		
Northwest Municipal Conference	Northwest Municipal Conference Bicycle Facilities Plan	No Date (1996?)	✓		
Northwestern Indiana Regional Planning Commission	Regional Bikeways Plan for Northwest Indiana	1994			
South Suburban Mayors and Managers Association	South Suburban Bikeway Plan	2001	✓	✓	✓

[161] This agency is not represented on the CATS Policy or Work Program Committees.
[162] Projects depicted are for illustrative purposes only. Individual projects have not been endorsed by the McHenry County Council of Mayors. Hence they are not distributed in the Bicycle Inventory System.
[163] This agency is not represented on the CATS Policy or Work Program Committees.
[164] This agency is not represented on the CATS Policy or Work Program Committees.

Agency	Inventory or Plan Name	Inventory or Plan Date	Have Line-work	Unique Feature	Data Structure
South Suburban Mayors and Managers Association	South Suburban Bikeway Plan	1996 (Superseded)	N.A.		
Southwest Council of Mayors	Southwest Suburban Bikeway Plan	2001	✓		✓
Southwest Council of Mayors	Southwest Suburban Bikeway Plan	1996 (Superseded)	N.A.		
Will County (Forest Preserve District of)[165]	Trail and Forest Preserve Information: • Hammel Woods (no date, rec'd 2004) • Hickory Creek Bikeway – West Branch (no date, rec'd 2004) • Hickory Creek Preserve – LaPorte Rd Access (No date, rec'd 2004) • I&M Canal Trails (No date, rec'd 2004) • Joliet Junction Trail Conceptual Development and Management Plan (2000) • Lake Renwick Heron Rookery [no bike facilities] (no date, rec'd 2004) • Messenger Woods [no bike facilities] (no date, rec'd 2004) • Monee Reservoir [no bike facilities] (no date, rec'd 2004) • Rock Run Greenway - Black Road Access (No date, 2003?) • Spring Creek Preserve - Homer Trails (No date, 2003?) • Theodore Marsh (No date, rec'd 2004)	Various	✓		
Will County (Land Use Department)	Land Resource Management Plan (Figures 2 Trails Concept and 3 Open Spaces and County-wide Trail Systems	2002	✓	✓	
Will County (Land Use Department)	Bikeway Plan	1995 (Superseded ?)	N.A.		
Municipalities *Note: Municipal plans are sought on an as-needed basis in response to requests from agencies for bike planning information. Municipal plans are sought if (1) the municipal plan was adopted after the municipality's subregional plan, (2) a subregional plan has not been adopted, or (3) the subregional plan specifically excludes local routes and trails, which information may be beneficial to have in the context of routine accommodation. Some municipalities have provided a copy of their bicycle plans to CATS beyond these requests above. In that case, the municipal data sets are checked against the regional data sets on an as-needed basis in response to agency requests.*					
Algonquin	Park Master Plan	2002			
Bartlett	Bike Path Map	2001			
Bartlett	Bike Path Map	1999 (superseded)			

[165] This agency is not represented on the CATS Policy or Work Program Committees.

Agency	Inventory or Plan Name	Inventory or Plan Date	Have Line-work	Unique Feature	Data Structure
Buffalo Grove	Bike Path Map	1998			
Downers Grove	Village Bikeway Plan (Note: Linework is included in DuPage County Bicycle Plan)	2000			
Frankfort	Bike Trail Master Plan	1998			
Highland Park	Greenways Plan	1995			
Hinsdale	Hinsdale Parks and Bicycle Route	? [a/o 2004]			
Lemont	Lemont Bicycle and Pedestrian Plan	2003			
Lincolnshire	Hiking, Biking, and Recreational Path System	2003			
Lockport	Bicycle Pedestrian System Master Plan	2003			
Minooka	Parks, Open Space, and Bicycle Plan (element of Comprehensive Plan)	1999			
Naperville	Comprehensive Transportation Plan [includes Bicycle Plan].	2002			
Naperville	Amendment to Bicycle Plan	2000			
Naperville	Bicycle and Pedestrian Plan	1997 (superseded)			
New Lenox	Open Space and Greenway Plan	1998			
Northbrook	Village of Northbrook Bicycle Plan and Map	2003			
Orland Park	Primary Bikeways (element of the comprehensive plan)	1999			
Oswego	Oswegoland Park District Trail Guide	2004			
Plainfield	Plainfield Area Bicycle Plan	1998			
Rolling Meadows	2002 Bikeway Plan	2002			
Roselle	Linking Neighbors: Roselle/Bloomingdale Community Trail Bridge at Lake Street with Rec Routes regional map [extending from Pratt Wayne Woods/Illinois Prairie Path to Busse Woods].	2003			
Roselle	Village of Roselle Bike Path Map [North DuPage Recreational Routes	2001			
Saint Charles	Bikeway Plan	2003 (Print Date)			
Saint Charles	River Corridor Master Plan	2002			
Schaumburg	Schaumburg Bikeways Plan, with Schaumburg Bikeways Map	1999			
Schaumburg	Schaumburg Bikeways Plan, with Schaumburg Bikeways Map	1993 (Superseded)			
Skokie	Bicycle Facility Plan	2003			
Wood Dale	Proposed Wood Dale Bike Path Location Map	1999			
Woodridge	Woodridge Bikeway Study	1996			
Yorkville	Bicycle/Pedestrian Trail System [Standards and Design]	2000			

Compilation of Survey Results - Bicycle Facility Plans

Northeastern Illinois, Fall, 2002
Soles and Spokes Municipal Survey

The Bicycle Inventory System (BIS) is not a comprehensive data set of local bicycle facility plans. Local facility plans are retrieved on an as-needed basis as part of project studies. The information below is used in project studies to determine whether local planning efforts are underway or have been completed that need to be polled when providing bicycle facility information to highway agencies.

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehensive Plan Including Bicycle Elements	Transportation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Alsip	Suburban Cook	FALSE					
Antioch	Collar Counties	TRUE	N	Y	?	N	N
Addison	Collar Counties	TRUE	N	N	N	N	N
Algonquin	Collar Counties	TRUE	Y, 2002	Y, 2002	Y, 2002	Y, 2002	Y
Arlington Heights	Suburban Cook	TRUE	N	N	N	?	Y
Aurora	Collar Counties	FALSE					
Bannockburn	Collar Counties	FALSE					
Barrington	Collar Counties	TRUE	Y	Y	Y	N	Y
Barrington Hills	Collar Counties	FALSE					
Bartlett	Suburban Cook	TRUE	Y	Y	N	Y	Y
Batavia	Collar Counties	TRUE	N	Y	N	Blank	Y
Beach Park	Collar Counties	TRUE	N	N	N	N	N
Bedford Park	Suburban Cook	TRUE	N	N	N	?	N
Beecher	Collar Counties	TRUE	N	Y	N	Y	Y
Bellwood	Suburban Cook	FALSE					
Bensenville	Collar Counties	TRUE	N	N	N	Y	Y
Berkeley	Suburban Cook	FALSE					
Berwyn	Suburban Cook	TRUE	Y	Blank	Blank	Blank	Y
Bloomingdale	Collar Counties	TRUE	Y	Y	N	Y	Y
Blue Island	Suburban Cook	TRUE	N	N	N	Y	N
Bolingbrook	Collar Counties	TRUE	Y	Y	N	Y	Y
Braidwood	Collar Counties	FALSE					
Bridgeview	Suburban Cook	TRUE	N	N	N	N	N
Broadview	Suburban Cook	FALSE					
Brookfield	Suburban Cook	TRUE	N	N	N	Y, 1998	Y
Buffalo Grove	Suburban Cook	TRUE	Y, 2001	Y	Y	Y, 2001	Y
Bull Valley	Collar Counties	TRUE	N	N	N	N	N
Burbank	Suburban Cook	TRUE	N	N	N	Blank	N
Burlington	Collar Counties	FALSE					
Burnham	Suburban Cook	TRUE	?	N	N	N	?
Burr Ridge	Collar Counties	TRUE	N	N	N	N	Y
Calumet City	Suburban Cook	TRUE	Y	Y	Blank	Y	Y
Calumet Park	Suburban Cook	FALSE					

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Carol Stream	Collar Counties	TRUE	N	N	N	N	N
Carpentersville	Collar Counties	TRUE	N	Y	N	N	N
Cary	Collar Counties	TRUE	Y, 2002	Y, 2003	N	?	Y
Channahon	Collar Counties	TRUE	Y, 1995	Y, 1996	N	N	Y
Chicago	Chicago	TRUE	Y, 2001	Blank	Y	Y	Y
Chicago Heights	Suburban Cook	TRUE	?	Y	?	?	Y
Chicago Ridge	Suburban Cook	TRUE	N	N	N	N	N
Cicero	Suburban Cook	FALSE					
Clarendon Hills	Collar Counties	TRUE	N	Y	N	?	Y
Country Club Hills	Suburban Cook	TRUE	N	?	N	Y	Y
Countryside	Suburban Cook	TRUE	N	N	N	N	N
Crest Hill	Collar Counties	FALSE					
Crestwood	Suburban Cook	TRUE	N	N	N	Y	N
Crete	Collar Counties	FALSE					
Crystal Lake	Collar Counties	TRUE	N	Y	Blank	N	Y
Darien	Collar Counties	TRUE	Y	Y	Y	Y	Y
Deerfield	Collar Counties	TRUE	Y	Y	N	Y	Y
Deer Park	Collar Counties	TRUE	Y	Y	Y	Blank	Y
Des Plaines	Suburban Cook	TRUE	N	N	N	N	N
Diamond	Collar Counties	TRUE	N	N	N	N	N
Dixmoor	Suburban Cook	FALSE					
Dolton	Suburban Cook	FALSE					
Downers Grove	Collar Counties	TRUE	Y	N	N	?	Y
East Dundee	Collar Counties	FALSE					
East Hazel Crest	Suburban Cook	FALSE					
Elburn	Collar Counties	TRUE	N	?	?	?	Y
Elgin	Collar Counties	TRUE	Y	Y	Y	Y	Y
Elk Grove Village	Suburban Cook	TRUE	Y, 1999	N	N	N	Y
Elmhurst	Collar Counties	FALSE					
Elmwood Park	Suburban Cook	TRUE	N	N	N	N	Y
Elwood	Collar Counties	TRUE	Y, 2002	Y, 2002	N	Y, 2002	Y
Evanston	Suburban Cook	TRUE	Y	Y	Y	Y	Y
Evergreen Park	Suburban Cook	TRUE	N	N	N	Y	Y
Flossmoor	Suburban Cook	FALSE					
Ford Heights	Suburban Cook	FALSE					
Forest Park	Suburban Cook	TRUE	N	Y, 2001	N	N	N
Forest View	Suburban Cook	TRUE	N	N	N	blank	N
Fox Lake	Collar Counties	TRUE	N	N	N	Y	Y
Fox River Grove	Collar Counties	TRUE	N	N	N	Y	N

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Fox River Valley Gardens	Collar Counties	FALSE					
Frankfort	Collar Counties	TRUE	Y, 2003	Y, 2003	Y, 1998	?	Y
Franklin Park	Suburban Cook	TRUE	N	Y	Y	Y	Y
Geneva	Collar Counties	FALSE					
Gilberts	Collar Counties	TRUE	N	Y	Y	Y	Y
Glencoe	Suburban Cook	TRUE	N	Y, 1996	N	Y, 1996	Y
Glendale Heights	Collar Counties	TRUE	Y	N	Y	Y	Y
Glen Ellyn	Collar Counties	FALSE					
Glenview	Suburban Cook	TRUE	N	Y	Y	Y	Y
Glenwood	Suburban Cook	FALSE					
Godley	Collar Counties	TRUE	N	N	N	Y	Y
Golf	Suburban Cook	TRUE	N	N	N	?	N
Grayslake	Collar Counties	TRUE	N	Y, 1989	Y, 1998	?	Y
Green Oaks	Collar Counties	FALSE					
Greenwood	Collar Counties	FALSE					
Gurnee	Collar Counties	TRUE	Y	N	Y	N	Y
Hainesville	Collar Counties	TRUE	N	N	N	Y	Y
Hampshire	Collar Counties	TRUE	N	N	N	N	N
Hanover Park	Suburban Cook	TRUE	N	Y	?	?	Y
Harvard	Collar Counties	TRUE	N	N	N	Y	Y
Harvey	Suburban Cook	FALSE					
Harwood Heights	Suburban Cook	FALSE					
Hawthorn Woods	Collar Counties	TRUE	Y, 2003	Y, 2003	Y, 2003	Y	Y
Hazel Crest	Suburban Cook	FALSE					
Hebron	Collar Counties	FALSE					
Hickory Hills	Suburban Cook	TRUE	N	N	N	N	Y
Highland Park	Collar Counties	TRUE	Y, 1995	Y	Y	Y, 1994	Y
Highwood	Collar Counties	TRUE	N	N	?	?	Y
Hillside	Suburban Cook	TRUE	N	N	N	N	N
Hinsdale	Collar Counties	TRUE	N	N	N	Y	Y
Hodgkins	Suburban Cook	TRUE	N	N	N	N	N
Hoffman Estates	Suburban Cook	TRUE	N	Y	Y	?	Y
Holiday Hills	Collar Counties	FALSE					
Hometown	Suburban Cook	FALSE					
Homewood	Suburban Cook	TRUE	N	N	N	?	N
Huntley	Collar Counties	FALSE					
Indian Creek	Collar Counties	FALSE					
Indian Head Park	Suburban Cook	TRUE	N	N	N	N	N
Inverness	Collar Counties	TRUE	N	N	N	N	N
Island Lake	Collar Counties	FALSE					
Itasca	Collar Counties	TRUE	N	N	N	Y	Y

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Johnsburg	Collar Counties	FALSE					
Joliet	Collar Counties	FALSE					
Justice	Suburban Cook	FALSE					
Kenilworth	Suburban Cook	TRUE	N	N	N	N	N
Kildeer	Collar Counties	TRUE	N	N	N	N	N
La Grange	Suburban Cook	TRUE	N	N	N	N	Y
La Grange Park	Suburban Cook	TRUE	N	Y	N	N	N
Lake Barrington	Collar Counties	TRUE	N	N	N	N	N
Lake Bluff	Collar Counties	TRUE	Blank	?	Y	Y	Blank
Lake Forest	Collar Counties	FALSE					
Lake in the Hills	Collar Counties	FALSE					
Lakemoor	Collar Counties	FALSE					
Lake Villa	Collar Counties	FALSE					
Lakewood	Collar Counties	TRUE	N	Y	N	Y	Y
Lake Zurich	Collar Counties	TRUE	Y, 2001	Y	N	Y	Y
Lansing	Suburban Cook	TRUE	Y	Y	N	Y	Y
Lemont	Suburban Cook	TRUE	N	Y	N	N	Y
Libertyville	Collar Counties	FALSE					
Lily Lake	Collar Counties	TRUE	N	N	N	N	N
Lincolnshire	Collar Counties	TRUE	Y	Y	N	Y	Y
Lincolnwood	Suburban Cook	TRUE	N	Blank	N	Y	Y
Lindenhurst	Collar Counties	TRUE	Blank	Y	Blank	Blank	Blank
Lisle	Collar Counties	TRUE	N	N	N	?	Y
Lockport	Collar Counties	FALSE					
Lombard	Collar Counties	TRUE	N	N	N	N	Y
Long Grove	Collar Counties	TRUE	N	Y	Y	Y	Y
Lynwood	Suburban Cook	TRUE	?	?	?	Y	N
Lyons	Suburban Cook	TRUE	N	N	N	N	Y
McCook	Suburban Cook	FALSE					
McCullom Lake	Collar Counties	TRUE	N	N	N	N	N
McHenry	Collar Counties	TRUE	N	Y	N	Y	Y
Manhattan	Collar Counties	TRUE	N	N	N	Y	N
Maple Park	Collar Counties	FALSE					
Marengo	Collar Counties	TRUE	N	Y	N	N	Y
Markham	Suburban Cook	FALSE					
Matteson	Suburban Cook	FALSE					
Maywood	Suburban Cook	TRUE	N	?	N	Y	Blank
Melrose Park	Suburban Cook	TRUE	N	?	N	N	?
Merrionette Park	Suburban Cook	FALSE					
Mettawa	Collar Counties	FALSE					
Midlothian	Suburban Cook	TRUE	Y, 2001	Y, 2001	Y, 2001	N	Y
Minooka	Collar Counties	FALSE					
Mokena	Collar Counties	TRUE	Y	Y	N	N	Y

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Monee	Collar Counties	TRUE	N	Y	Y	Y	Y
Montgomery	Collar Counties	TRUE	Y, 2002	Y, 2002	N	Y, 2002	Y
Morton Grove	Collar Counties	TRUE	N	Y	N	N	Y
Mount Prospect	Suburban Cook	TRUE	Y, 1998	Y, 1998	Y	Y	Y
Mundelein	Collar Counties	TRUE	N	Y	N	N	Y
Naperville	Collar Counties	TRUE	Y	Y	Y	Y	Y
New Lenox	Collar Counties	TRUE	Y	Y	Y	?	Y
Niles	Suburban Cook	TRUE	N	Y	N	?	Y
Norridge	Suburban Cook	TRUE	N	N	N	?	N
North Aurora	Collar Counties	TRUE	Y	Y	Y	Y	Y
North Barrington	Collar Counties	FALSE					
Northbrook	Suburban Cook	TRUE	N	N	N	?	Y
North Chicago	Collar Counties	TRUE	N	Y	Y	?	Y
Northfield	Suburban Cook	TRUE	N	Y	N	N	Y
Northlake	Suburban Cook	TRUE	N	N	N	N	Y
North Riverside	Suburban Cook	FALSE					
Oak Brook	Collar Counties	TRUE	N	Y	N	Y	Y
Oakbrook Terrace	Collar Counties	FALSE					
Oak Forest	Suburban Cook	TRUE	N	N	N	N	N
Oak Lawn	Suburban Cook	TRUE	N	N	N	N	N
Oak Park	Suburban Cook	TRUE	N	N	N	?	Y
Oakwood Hills	Collar Counties	FALSE					
Old Mill Creek	Collar Counties	FALSE					
Olympia Fields	Suburban Cook	TRUE	Y, 2001	N	Y	N	Y
Orland Hills	Suburban Cook	TRUE	Y	Y	?	Y	Y
Orland Park	Suburban Cook	TRUE	Y, 1991	Y, 1991	Y, 1991	Y, 1991	Y
Oswego	Collar Counties	TRUE	N	Y	?	Y	Y
Palatine	Suburban Cook	FALSE					
Palos Heights	Suburban Cook	TRUE	N	N	N	N	Y
Palos Hills	Suburban Cook	FALSE					
Palos Park	Suburban Cook	FALSE					
Park City	Collar Counties	TRUE	N	N	N	Y	N
Park Forest	Suburban Cook	TRUE	N	Y	Y	Y, 2001	Y
Park Ridge	Suburban Cook	FALSE					
Peotone	Collar Counties	FALSE					
Phoenix	Suburban Cook	FALSE					
Pingree Grove	Collar Counties	TRUE	N	Blank	N	N	N
Plainfield	Collar Counties	TRUE	Y	Y	Y	Y	N
Posen	Suburban Cook	TRUE	N	N	N	Y	N
Prairie Grove	Collar Counties	FALSE					
Prospect Heights	Suburban Cook	TRUE	N	N	Y	Y	Y
Richmond	Collar Counties	FALSE					

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
Richton Park	Suburban Cook	TRUE	N	Y	N	Y	N
Ringwood	Collar Counties	FALSE					
Riverdale	Suburban Cook	FALSE					
River Forest	Suburban Cook	TRUE	N	?	N	?	N
River Grove	Suburban Cook	TRUE	N	N	N	N	Y
Riverside	Suburban Cook	TRUE	N	N	N	N	N
Riverwoods	Collar Counties	TRUE	N	Y	Y	N	Y
Robbins	Suburban Cook	FALSE					
Rockdale	Collar Counties	FALSE					
Rolling Meadows	Suburban Cook	TRUE	Y	Y	Y	?	Y
Romeoville	Collar Counties	TRUE	Y, 2002	Y	Y	Y	Y
Roselle	Collar Counties	TRUE	Y, 1996	?	N	Y	Y
Rosemont	Suburban Cook	TRUE	N	N	N	N	N
Round Lake	Collar Counties	TRUE	N	N	N	N	N
Round Lake Beach	Collar Counties	FALSE					
Round Lake Heights	Collar Counties	TRUE	N	N	N	N	N
Round Lake Park	Collar Counties	TRUE	N	Y	Y	Y	N
Saint Charles	Collar Counties	TRUE	Y	Y	Y	Y	Y
Sauk Village	Suburban Cook	FALSE					
Schaumburg	Suburban Cook	TRUE	Y	Y	Y	Y	Y
Schiller Park	Suburban Cook	TRUE	N	N	N	N	N
Shorewood	Collar Counties	TRUE	Y	Y	N	Y	Y
Skokie	Suburban Cook	TRUE	Y, 2002	Y, 2002	Y, 2002	N	Y
Sleepy Hollow	Collar Counties	FALSE					
South Barrington	Suburban Cook	TRUE	N	N	N	N	N
South Chicago Height	Collar Counties	TRUE	N	N	N	N	N
South Elgin	Collar Counties	TRUE	N	Y, 2001	N	Y, 2002	Y
South Holland	Suburban Cook	TRUE	?	Y	?	Y	Y
Spring Grove	Collar Counties	TRUE	N	N	N	N	N
Steger	Suburban Cook	TRUE	N	N	N	N	Y
Stickney	Suburban Cook	TRUE	Y	N	N	Y	Y
Stone Park	Suburban Cook	FALSE					
Streamwood	Collar Counties	TRUE	Y	Y	Y	Y	Y
Sugar Grove	Collar Counties	TRUE	N	N	N	N	Y
Summit	Suburban Cook	TRUE	N	N	N	N	N
Symerton	Collar Counties	FALSE					
Third Lake	Collar Counties	TRUE	N	N	N	N	N
Thornton	Suburban Cook	TRUE	N	N	N	N	N
Tinley Park	Suburban Cook	FALSE					
Tower Lakes	Collar Counties	TRUE	N	Y	N	N	?
Trout Valley	Collar Counties	FALSE					
Union	Collar Counties	FALSE					

Municipality	District	Received Survey	Bicycle Plan (and year, if applicable [optional])	Comprehen-sive Plan Including Bicycle Elements	Transport-ation Plan Including Bicycle Elements	Park or Recreation Plan with Bicycle Elements	Planned Bicycle Facilities
University Park	Collar Counties	TRUE	Y	Y	Y	Y	N
Vernon Hills	Collar Counties	TRUE	N	?	?	?	Y
Villa Park	Collar Counties	TRUE	N	N	N	?	Y
Virgil	Collar Counties	TRUE	N	N	N	N	Y
Volo	Collar Counties	TRUE	N	N	N	N	N
Wadsworth	Collar Counties	TRUE	Y	Y	N	N	N
Warrenville	Collar Counties	TRUE	N	N	N	N	Y
Wauconda	Collar Counties	TRUE	N	N	N	Blank	N
Waukegan	Collar Counties	TRUE	N	N	N	N	Y
Wayne	Collar Counties	TRUE	Y	Y	Y	Y	Y
Westchester	Suburban Cook	FALSE					
West Chicago	Collar Counties	FALSE					
West Dundee	Collar Counties	TRUE	N	Y	N	N	Y
Western Springs	Suburban Cook	TRUE	N	N	N	N	N
Westmont	Collar Counties	TRUE	Y	Y	N	?	Y
Wheaton	Collar Counties	TRUE	N	Y	N	N	N
Wheeling	Suburban Cook	TRUE	Y	Y	Y	Y	Y
Willowbrook	Collar Counties	TRUE	Y, 1993	Y	Y	Y	Y
Willow Springs	Suburban Cook	TRUE	Y	Y	Y	N	Y
Wilmette	Suburban Cook	TRUE	Y	Y	Y	Y	Y
Wilmington	Collar Counties	TRUE	Y, 2003	Blank	Blank	Y, 2003	Y
Winfield	Collar Counties	FALSE					
Winnetka	Suburban Cook	TRUE	N	Y	N	?	Y
Winthrop Harbor	Collar Counties	FALSE					
Wonder Lake	Collar Counties	FALSE					
Wood Dale	Collar Counties	TRUE	Y	Y	N	N	Y
Woodridge	Collar Counties	TRUE	Y	Y	Y	Y	Y
Woodstock	Collar Counties	TRUE	N	Y	N	Y	Y
Worth	Suburban Cook	TRUE	N	N	N	N	Y
Yorkville	Collar Counties	TRUE	N	Y, 2003	N	N, 2003	Y
Zion	Collar Counties	TRUE	N	N	N	Y	Y

APPENDIX G

Chicago Bike Lane User Counts

Count Model Parameters and Evaluation

The SAS System 20:48 Thursday, January 1, 2004 14

The REG Procedure

Model: MODEL1

Dependent Variable: count

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	4081872	680312	84.31	<.0001
Error	515	4155419	8068.77490		
Corrected Total	521	8237291			

Root MSE 89.82636
R-Square 0.4955
Dependent Mean 70.69521
Adj R-Sq 0.4897
Coeff Var 127.06145

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	25.93211	8.82735	2.94	0.0035
Bkln	1	0.97635	0.09029	10.81	<.0001
lsd	1	566.45153	30.43285	18.61	<.0001
pmpeak	1	18.51221	8.57804	2.16	0.0314
sat	1	44.85071	10.02517	4.47	<.0001
midjn_midjl	1	34.41209	10.77827	3.19	0.0015
midjl_midaug	1	18.45427	9.26019	1.99	0.0468

Where

Count	Number of bicyclists counted by volunteers over 2-hour time frame
Intercept	Baseline count
Bkln	1 = presence of bike lane
lsd	1 = approach to Lake Shore Drive/Lakefront Path
pmpeak	1 = p.m. peak count
sat	1 = Saturday count
midjn_midjl	1 = count mid-june to mid=july
midjl_midaug	1 = count mid-july to mid-august

APPENDIX H

Detailed Programming Totals by Year and District

Table H-1
Transportation Awards for Bicycle and Pedestrian Projects
Northeastern Illinois, 1998-2002

District	1998	1999	2000	2001	2002	Total	Average
Chicago	2,226	$280	$394	$1,452	$625	$4,977	$995
Suburban Cook	8,272	1,041	4,608	3,520	3,417	20,858	4,172
DuPage	3,703	1,515	1,124	4,166	2,797	13,303	2,661
Kane	1,701	1,936	2,345	111	553	6,646	1,329
Lake	2,575	994	0	166	115	3,850	770
McHenry	0	0	0	472	39	511	102
Will	705	0	0	0	303	1,008	202
Total	19,181	5,765	$8,471	$9,889	$7,851	51,153	10,231

Source: CATS, Federal Fiscal Year 1998-2002 Regional Project Award and Obligation Reports for Northeastern Illinois (2002: draft). Amounts shown include local share. Awards include Illinois Transportation Enhancement Program (ITEP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), Surface Transportation Program (STP), the Illinois Fund for Infrastructure, Roads, Schools, and Transit (Illinois FIRST), Motor Fuel Tax funds, and other local and state transportation funds.

Table H-2
IDNR Bicycle Trail Grant Program in Thousands of Dollars
Northeastern Illinois, 1990-2002 (as of February, 2002)

Status	Year	District							Total
		Chicago	Suburban Cook	DuPage	Kane	Lake	McHenry	Will	
Awarded	1990	-	$2,125	$876	$346	$1,633	-	$80	$5,090
	1991	$400	2,265	145	516	477	$550	71	4,424
	1992	-	2342	-	1,112	-	400	2,653	6,507
	1994	187	1,613	-	352	1,329	305	1,100	4,886
	1995	400	139	-	313	1,221	-	41	2,114
	1996	900	838	-	352	753	212	487	3,542
	1997	1,150	1,515	336	405	816	318	-	4,540
	1998	778	763	-	2,169	587	-	551	4,848
	1999	209	634	1,105	401	1,404	421	1,003	5,177
	2000	401	543	129	1,020	400	305	890	3,688
	2001	-	-	-	-	830	-	436	1,266
	2002	-	-	-	-	-	130	-	130
Awarded Total		4,425	12,807	2,591	6,986	9,450	2,641	7,312	46,212
Status	Year	District							Total
		Chicago	Suburban Cook	DuPage	Kane	Lake	McHenry	Will	
Programmed but Not Awarded	1997	-	-	-	-	-	-	606	606
	1998	-	249	50	-	820	-	872	1,991
	1999	-	-	-	-	336	-	-	336
	2000	-	98	-	-	-	-	-	98
	2001	2,296	-	2,700	4,176	3,413	-	1,087	13,672
	2002	471	700	4,209	186	-	-	506	6,072
Programmed Not Awarded Total		2,767	1,047	6,959	4,362	4,569	-	3,071	22,775
Grand Total		7,192	13,854	9,550	11,348	14,019	2,641	10,383	68,987

Note: Figures represent total project cost, including local share. In addition, non-IDNR funds in total project cost may be federal or state funds tabulated separately in this report. Funds are in thousands of dollars. Kane County numbers include funds for part of Kendall County. Raw data is from IDNR. Source: Chicago Area Transportation Study.

APPENDIX I

Enhanced Urban Arterial Development Costs Excluding ROW Acquisition

Enhanced Urban Arterial Development Costs

Planning Level Analysis

Element	Cost per Centerline Mile	Assumptions Regarding Element	Source
FIXED PAVEMENT ELEMENTS			
ROW Preparation	$ 115,349.12	Clearing, grubbing, rough grading	txdot 1005002
Excavation	42,501.89	3.51/cy; cy/mile = 4X12X5280X(8"+4")/12/(27) (27 cu ft/cu yd)	txdot 1100501
Reworking in situ Subbase (Add Cement)	54,489.60	1.5/sq yd new base	txdot 2750511
4 in granular subbase	69,544.87	17.23/cu yd	txdot 2470599
Compaction	10,000.00	LS	
Reinforced Joint Plane Concrete 8"	996,796.42	27.07/sq yd	txdot 3600503
Miscellaneous and Contingencies	322,170.47	25% of above pavement marking, signing, etc.	
Subtotal	**1,610,852.37**	2 lanes in each direction - design for 40k adt passenger vehicles only	
FREIGHT ELEMENTS			
Change to Reinforced Joint Plane Concrete 10"	52,310.02	for 40K pv + 2K SU + 2K MU. 28.88 per sq yd	tx dot 3600505
Excavation	10,625.47	Additional 2"	
Intersection Design Enhancements	50,000.00	12.5K per intersection X 4 intersection: recessed stop bars; signage, pavement marking.	
Miscellaneous and Contingencies	28,233.87		
Subtotal	**141,169.36**		

URBAN DRAINAGE			Note: Urban water and sanitary sewer services not in transportation costs. Nor are gas and electric services.	
Storm Sewer Reinforced Concrete Pipe 36 in.		431,217.07	63/ft;	tx dot 4640509
Tied Curb and Gutter		141,809.18	10.41/ft (excludes median curb/gutter, counted separately)	tx dot 5290522
Inlet/Catch Basin (Complete)		330,240.00	2K each; 128/mile. Stormwater Management	tx dot 4650508
Miscellaneous and Contingencies		190,364.27	25% of above	
Subtotal		**1,129,082.82**	meets overall check of a quarter to half of pavement cost	0.50
TRANSIT ELEMENTS				
Bus Rapid Transit Stations		2,000,000.00	2 million per station spaced every mile. 1 station. Consistent with Cermak BRT	Cermak BRT submittal; Pace Vision 2020
Miscellaneous and Contingencies		500,000.00	line haul bus stops and shelters, ped facilities	
Subtotal		**2,500,000.00**		
SIGNALS		**500,000.00**	2 per mile	
OTHER URBAN ELEMENTS, including bicycle and pedestrian treatments				
Bike Lane Markings	$	20,000.00	Signage, thermoplastic long lines, 3M Stamark symbols.	CDOT Lettings
Bike Lane Pavement	$	214,780.02	4 feet per direction (per AASHTO, assuming c/g)	8/48 X pavement total (less curb and gutter and contingencies

			, the latter being counted below)
Sidewalks	$ 290,400.00	Two 5' sidewalks (one on each side)	$5.5/ft^2
Curb Ramps and Landings	$ 47,306.88	12 per intersection X 4 interesections per mile	txdot 58660501
Street Lighting	$ 410,000.00	Typical	Lettings
Raised Center Median - Pedestrian Refuge/ Boulevard Treatment	$ 220,226.69	18' Sodded + C/G	Txdot 10.41/ft cg 5290522USA CE: $6.8/sy for sodding
Tree Planting	$ 33,000.00	300 2" trees per mile, including 2 parkways and center median	$110/tree at http://www.elmhurst.org/elmhurst/publicworks/faq.asp
Pedestrian Signal, Pedestrian and Bicycle Signal Activation and Control	$ 50,000.00	2 per mile	25K each
Parkway	$ 219,413.33	Sodded, With Curb and Gutter. Two X 5'	USACE
Miscellaneous and Contingencies	$ 362,858.03	25% of above	
Subtotal - Urban Treatments	**$ 1,881,409.02**		
ITS			
Signal Interconnects:	$ 360,000.00	Fully Interconnected; No Railroad Involvement	Lettings
Other Smart Corridor Elements	$ 583,333.33	CCTV, VMS, HAR, etc. in support of IMS, CMS, PTMS	3.5 million for Cicero Smart Corridor 31st to 79th
Miscellaneous and Contingencies	$ 235,833.33		
Subtotal-ITS Elements	**$ 1,179,166.67**		
GRAND TOTAL	**$ 8,906,227.94**	Note: 6 lanes =	9,604,939.31

Note: USACE adjustments: Chicago Factor 1.29; inflation discount from 2005 to 2001: 2138/2276

txdot: Average Low Bid Unit Price - Construction - Statewide. Posted on Txdot Expressway. Multiplied these costs by 1.29 to account for higher Chi const costs.

APPENDIX J

TABULAR SUMMARY
OF SAFETY AND ENCOURAGEMENT PROGRAMS

Chicagoland Pedestrian and Bicycle education and encouragement programs

Category/name of program	Where	Contact	Phone	Activity	Annual cost	Funding source	Audience
Youth Safety- school bike							
Highland Park school bike safety	Highland Park	Officer Debbie Fishman	847/926-1123	bike ed- preschool through 8th grade			
Woodridge school bike safety	Woodridge	Officer Darlene Hurvath		Darlene goes into schools, gives safety presentation			
Lemont school bike safety	Lemont	Officer Jack Bluis	630-257-5877	5th grade- junior high			300
Chicago Police Protector Program	Chicago	Ray Ranne/Jim Caparelli (HQ)	312/745-5838	bike rodeos, safety presentations park districts/boy scout troops/schools			100
Sec of State Traffic Safety Unit	Chicago/Cook suburbs	Kathleen Widmer					
"Operation Lifesaver"	Beecher	Tim Mitchell (police dept)	708-946-2341	covers ped and bike safety 4th-6th grades in two schools			250
Mundelein school bike safety	Mundelein	Mundelein police					
Schaumberg school bike safety	Schaumberg	Officer Zwirowski	847-882-3534				
Elk Grove Village school bike safety	Elk Grove Village	Maura Condon					
Wood Dale school bike safety	Wood Dale	Sgt Stout		go into schools every year, teach safety			700
Wilmette school bike safety	Wilmette	Wilmette Police Dept		2nd graders right now, want to increase			
Thornton school bike safety	Thornton	Max Salmon	708-877-4456	police go in, every 2 years or so. Max is the Chairman of Planning & Transportation			
Youth Safety- school ped							
Schaumberg school ped safety	Schaumberg	Officer Zwirowski	847-882-3534	safe walking/crossing the street, traffic lights			
Naperville school ped safety	Naperville	Naperville Police Dept		teaching ped safety to pre-school and elementary children			
CBF Safe Routes to School Program (bike and ped)	Chicago	CBF	312-427-3325	train students, parents, and teachers about the benefits of walking & cycling			
Youth Safety- park or day camp							
Buffalo Grove Park District Safety Town	Buffalo Grove			bike rodeo, bike safety			
Safety Village- Highland Park Park District	Highland Park	Kathy Donahue		2 wk curriculum- one in summer, one in fall			
Safety Village - Lemont	Lemont	Officer Jack Bluis	630-257-5877	mini walking area, stop signs- teaches safety to kids- just opened- built through donations- land donated by NWRD (metro sanitary)- business			
Cycling Voyagers	Chicago	Andrew Dortsch					50 kids
Itasca Boy Scouts/Police Dept bike rodeo	Itasca	Mike Shrader	630-773-1004				
"Safety Town"	Schaumburg						

MDBAs Day Camp Bicycle Safety Presentations	Chicago	Eve Jennings	312-427-3325	educate kids about bike safety, encourage, roughly 25 parks across Chicago		
Elk Grove Safety Village	Elk Grove	Maura Condon				
Youth Safety- bike rodeo						
Bike rodeo (2 a year)	Arlington Heights					
Bike rodeo (2 a year)	Buffalo Grove	Steve Husak	847-808-2632			around 150 each
Bike rodeo (end of May, early June)	Oak Park	Sean O'Shay	708-358-5577			
Bike rodeo	Brookfield	Cathy Edwards		hosted in conjunction with St Farm Insurance		
MDBAs	Chicago	Eve Jennings	312-427-3325			
Bike rodeo	Beecher	Tim Mitchell	708-946-2341	takes place 1st or 2nd weekend of May		100
Bike rodeo	Chicago Heights	John Cresentki	756-6400	parking lot of rec center		
Bike rodeo	Stickney	Sgt Gary Dunoh	788-2131	gave away helmets	badge program	100
Bike rodeo	Mundelein	police dept		annual- helmets, bike safety checks		
Bike rodeo	Country Club Hills	Brian Sullivan-park district	708-799-8171	rodeo/inspection/helmets- takes place in Heritage Plaza	police dept/park district	
Bike rodeo	Schaumberg	Sandy Olson	847-348-7274	rodeo/bike registration/education- officers heavily involved		3 a year-500 kids total
Bike rodeo	Chicago Ridge	Eugene Siegel	708-425-7700			
Bike rodeo	Crestwood	Officer Thomas Scully	708-371-4800	usually done in school parking lot		50
Bike rodeo(s)	Streamwood	Streamwood Police Dept		several over the summer- bike inspection/safety talk/rodeo		400
Bike rodeo	Steger	Sgt Rossi	708-755-0220			
Bike rodeo	Wood Dale	Sgt Stout		rodeo/presentation/giveaways	donation from Chamber of Commerce	120
Youth Safety- officer friendly						
Bike With A Cop	Buffalo Grove	Steve Husak	847-808-2632	bike safety from officers. Ride around bike path woth officers		
Coupon Hand-Outs	Highland Park	Debbie	847/926-1123	police hand out redeemable coupons to kids exhibiting good bike safety		
Helmet Coupon Program	Grayslake	Kirk Smith		police give out $15 off coupons for bike helmets (2 participating stores)		
"Lunch With A Cop"	Chicago Ridge	Eugene Siegel	708-425-7700	bike safety tends to be a strong element in the Lunch with a Cop program		
Lombard Police Bicycle Safety Fair	Lombard					
DuPage County Sheriff's Safety Saturday	DuPage County					
"Operation Cool" certificates	Wood Dale	Sgt Stout		police hand out certificates to kids, redeemable for a free slurpy		

Youth Safety- crossing guard						
School crossing guard	Naperville					
Youth Safety- publication						
Kids on Bikes in Chicago	Chicago- Chi Bike Fed		312-427-3325		IDOT, Division of Traffic Safety	
Kids on Bikes in Illinois	Chicago- Chi Bike Fed		312-427-3325		IDOT, Division of Traffic Safety	
Youth Safety- other						
Cook County Hospital's helmet safety program		Sue Avila				
"Books and Bikes"- part of Bike Month Chicago	Chicago	Eve Jennings	312-427-3325	story time followed by bike safety presentation by MDBAs		
Youth Encouragement- low income bike						
Joliet bicycle club bike and helmet distribution	Joliet	Bob Kehoe	815-436-7701	club uses ride proceeds to donate bikes & helmets to 25 underprivileged kids	Joliet Bicycle Club	25
Urban Bikes work for parts program	Chicago	Tim Herlihey				10-May
Blackstone Bicycle Works work for parts program	Chicago					
XXX-Racing Team Clif Bar Juniors Program	Chicago	Vince Kamholtz Roberts		promotes recreational and transportation cycling to disadvantaged youth		
Trips for Kids	South Elgin	Laura Andersen		promotes outdoor rec & cycling to kids		
Youth Encouragement- walk to school day						
Walk to School Day	Hinsdale	Elizabeth Barrow		5 different schools involved		
Walk-to-school day	Naperville	Carmen Carruthers	630-305-5315			
Walk to school day	Berwyn	Mrs Kay Otter	708-795-2322			
Walk to school day	Clarendon Hills	Mrs Maryann Romanelli	630-323-0868	Prospect and Walker Schools		
Walk to school day	Melrose Park	Marisol Migilore				
Walk to school day	Shorewood	Junne Ulbrich	815-725-6210	Troy Crossroads School		
Walk to school day	Buffalo Grove	Dr Peter King	847-459-0022	Ivy Hall, Kildeer #96		
Walk to school day	Elmhurst	Ms Meg Sullivan	630-832-8065			
Walk to school day	LaGrange	Sara Adducci	708-579-5452	Ogden Ave School 102		
Walk to school day	Oak Park	Tracy Alesky	708-358-5494			
Walk to school day	Wheaton	Barb Williams	630-682-2080			

Walk to school day	Chicago			Hurley, Eberhart, Marquette, Morrill Elementary Schools		
Walk to school day	Evergreen Park	Beth Donahue	708-424-5816	8 different schools participating		
Walk to school day	Park Ridge					
Youth Encouragement-publications						
Chicago Kids Want To Walk and Bicycle To School	Chicago	Dave Glowacz	312-427-3325	encourages biking/walking to school/promotes CBF program	IDOT, Division of Traffic Safety	
Adult Safety- Bike Ed						
Folks on Spokes Road I class	Park Forest	Al Sturges	708-481-3429	course dealing with safety on roads and trails	free for members- $35 for non-members	
CCC & EBC "safety awareness / bike handling skills ride	Chicago & Evanston	Jim Kreps	312-960-8376			
CBF's Bike School's Handling & Traffic Cycling Class	Chicago	Dave Glowacz				10
Rehabiliatation Institute of Chicago's Think First Program	Chicago	Heidi Schneider	312/238-4995			
MDBA's Lakefront Path Education	Chicago	Eve Jennings	312-427-3325	educate folks about staying safe on the Lakefront Path		
Adult Safety-Publications/other media						
Safe Bicycling in Chicago	Chicago	Dave Glowacz	312-427-3325		IDOT	
Safe Bicycling in Illinois	Chicago	Dave Glowacz	312-427-3325		IDOT	
Passing Other Bikers	Chicago	Dave Glowacz	312-427-3325			
Bike Riders: Want Respect? Give Respect!	Chicago	Dave Glowacz	312-427-3325		IDOT	
Locking Your Bike	Chicago	Dave Glowacz	312-427-3325		IDOT	
Using the Bike Lane	Chicago	Dave Glowacz	312-427-3325		IDOT	
Bicycling in Oak Park (TV Channel 6)	Oak Park			local cable bicycle safety show		
The Wilmette "Communicator"- Bicycle Task Force Component	Wilmette	Nancy Chouffer	847-251-4840	village paper, someone on taskforce writes cycling safety-pertinent article every issue		
Illinois Bicycle Laws (reprint by LIB)	Chicagoland	Ed Barsotti	630-978-0583	excerpts from the Illinois Vehicle Code	printing by SRAM	
Adult Encouragement-Maintenance						
Cycling Sisters (more than maintenance)	Chicago	Gin Kilgore		maintenance, workshops, events for women cyclists		60-100
CBF Bike School's Bike Repair for Dummies	Chicago	Dave Glowacz				
Windy City Cycling	Chicago	Jefferson		maintenance- flats, adjusting brakes, gears, etc		50

Club Bike Academy		McCarley				
Adult Encouragement-commuter encouragement						
Car-free trail-riding	Chicagoland area	Eric Anderson	773-342-1493	grassroots program: organizes off-road rides using CTA, Metra, PACE		
CTA's Bikes on Trains/Buses Program (Bike & Ride)	Chicago					
Metra pilot bikes on trains program						
Commuter Bicycle Lockers	Naperville		630-420-6059	commuter bike lockers at the Rt 59 station (deposit and annual fee)		
CBF Bike School's Biking to Work or School class	Chicago	Dave Glowacz				300
Wicker Park Bike Pool	Chicago	John Greenfield		daily bike to work ride		
Adult Encouragement-events						
Bike Winter	Chicago			events/rides over the winter months		
Bike Chicago incl Bike to Work Day Rally	Chicago					
Arlington Heights bike month, bike commuter appreciation day	Arlington Heights					
Skokie Traffic Safety Commission Bike Safety Day	Skokie			bike rodeo, general bike safety	Skokie Park District/Police Dept	
Adult Enc.- health based walk or bike						
Walking group	Oak Park	Katherine MacNamara	708-358-5484			
Walking club	South Holland			once a week walk for health		20
Annual Chicago Heights bike tour	Chicago Heights	Dominic Candeloro		15 mile bike tour of city with police officers		150
High Steppers walking club	Park Forest	John Joyce				
Mundelein Mainstreet family bike ride	Mundelein	John Maguire	847-970-9235	ride, bike safety checks, helmet use		
"Meet the community" coffee and walk (annual)	Lynwood					
Tour Von Schaumberg	Schaumberg			bike ride with Mayor Larson		
Harper School ride	Wilmette	Nancy Chouffer	847-853-7621	ride between schools-parents/kids/etc		
Adult Encouragement-publications/media						
CTA Bike & Ride	Chicago			how to use the CTA with your bike		
Chicago Bike Map	Chicago	Nick Jackson	312-427-3325	bike map	IDOT Division of Traffic Safety	
Chicagoland Bicycle Map	Chicago			bike map		
Buffalo Grove Bike Path Map	Buffalo Grove	Greg Boysen	847-459-2547	bike map		
Woodridge bicycling TV promotion	Woodridge			advertises bike trails, projects		

Woodridge Bicycle Map	Woodridge				
Lemont town website- "Rate the Streets" (proposed)	Lemont				
"The Derailleur"	Chicago	Alex Wilson		official Xine of Critical Mass	
Shop by Bike	Chicago			shopping by bike	CMAQ
Grayslake Greenway Trails Map	Grayslake	Kirk Smith		$8,000	
School walk route map	Naperville				
Schaumburg Bike Map	Schaumburg				
Chicago's Lakefront- A Guide For Everyone	Chicago	Chicago Park District	312-742-PLAY	Lakefront Path Map/Safety Tips	Chi Park District/La Salle Bank Chi Marathon
The Grand Illinois Trail- User Guide	Chicagoland	Ed Barsotti-LIB		user guide to Grand Illinois Trail	
Tricks and Tips for Biking To Work	Chicago	Dave Glowacz	312-427-3325	commuting by bike	CBF
Where Should Bike Racks Be Installed in Chicago?	Chicago	John Greenfield		form for suggesting bike rack locales	
Get More Fun From Your Bike- CBF Bike School	Chicago	Dave Glowacz	312-427-3325	brochure detailing list of safety and encouragement classes offered by CBF	
Biking to Work or School	Chicago	Dave Glowacz	312-427-3325	IDOT Division of Traffic Safety	
Adult Encouragement-Cycling Clubs					
Arlington Heights Bicycle Association	Arlington Heights	Karen Zmrhl		cycling club	
Bicycle Club of Lake County	Libertyville	John Serrano		cycling club	
Bike Psychos	Oak Lawn	Mario Sprindys		cycling club	
Chicago Area Tandem Society	Barrington	Tom Masters		cycling club	
Chicago Cycling Club	Chicago	Steve Kramer		cycling club	
Elmhurst Cycling Club	Elmhurst	Bob Sack		cycling club	
Evanston Cycling Club	Evanston	Beverly Arends		cycling club	
Folks on Spokes	Park Forest	Larry Lewis		cycling club	
Fox Valley Bicycle Club	St Charles	Julie Szafraniec		cycling club	
Joliet Bicycle Club	Joliet	Bob Kehoe		cycling club	
McHenry Co. Bicycle Club	Crystal Lake	Richard Homan		cycling club	
Mount Prospect Bike Club	Mount Prospect	Dan Currier		cycling club	
Naperville Bicycle Club	Naperville	Kent Weber		cycling club	
Oak Park Cycle Club	Oak Park	Alba Alexander		cycling club	
Schaumburg Bicycle Club	Schaumburg	Bob Estrada		cycling club	
Wheeling Wheelmen	Wheeling	Rich Drapeau		cycling club	
Windy City Cycle Club	Chicago			Primarily gay and lesbian cycling club	
XXX-Racing Team Athletico	Chicago	Randy Warren			
Adult Encouragement-other					
MDBA's Shop by Bike	Chicago				

campaign					
CBF Student Marketing Campaign	Chicago			outreach at colleges and universities across the region	
Windy City CC Mtn Biking Skills; Track Skills Clinic Class I and II; Winter Bike Skills Clinic	Chicago	Jefferson McCarley		mtn biking 101, off and on trail training; evening clinic about velodrome riding; how to prepare for winter riding	Primarily gay and lesbian cycling club
Circle Cycling Club	Chicago- UIC	Chris Gagnon		promotes cycling at UIC	
Working Bikes Cooperative	www.workingbikes.org			Since 2001, Working Bikes Cooperative shipped thousands of bicycles to Africa, Central America, and the Caribbean and gifted hundreds of bikes locally to Chicago individuals and groups.	
Motorist Sensitivity- taxi driver training					
Share the Road mod. of Har Wash. Coll. taxi-driver training	Chicago				
Motorist Sensitivity- bus driver traning					
Share the Road module of CTAs bus-driver training	Chicago	CTA			
Motorist Sensitivity- HS Driver's Ed					
CBF Sharing the Road with Bike Riders class	Chicago	Dave Glowacz			
Motorist Sensitivity- Outreach					
MDBAs motorist campaign	Chicago	Eve Jennings	312-427-3325	educate motorists to share road w/ cyclists, incl bike lane and community tours	
Motorist Sensitivity- Publications					
Tips for Motorists	Chicago			sharing the road with bike riders	IDOT
This Is Not A Parking Spot	Chicago			don't park in bike lanes	
Bike Lanes: FAQ	Chicago			bike lanes- general info	
Bike Rules of the Road		217-785-0440			
Enforcement- ticket cyclists for safety					
Sheridan Rd/Ardmore	Chicago	Sgt Sacks		ticketing bicyclists for riding on sidewalk	
Skokie youth helmet ordinance	Skokie	James Cox	(847) 933-8447	kids must wear helmets	
Schaumberg bicycle safety patrol program	Schaumberg	Sandy Olson	847-348-7274	police give "violations" to unsafe riders- usually verbal warnings	
Naperville Bicycle License Ordinance	Naperville	Naperville Police		$1.00 bicycle license every 3 years- helps police to recover stolen bikes	

Enforcement- ticket peds for safety		
Enforcement- ticket motorists for ped issues		
Enforcement- ticket motorists for bike issues		
Chicago Dept of Revenue's parking enforcement aides	Chicago	Savi Simmons
Chicago Police Dept	Chicago	Tom Kuroski
Enforcement- neighborhood speed enforcement		
Enforcement- publications		