Existing Roadway Conditions

There are two important components to every bicycle and pedestrian system: 1) The roadway network (such a bicycle lanes and sidewalks) and 2) The off-road network of trails. In order to accommodate pedestrians and cyclists, a system must contain both of these complimentary components.

Before the Implementation Plan can be established, the present roadway network must be evaluated. This chapter addresses the City of Clearwater's *Existing Roadway Conditions* and presents the methodology and the results of the evaluation of the City of Clearwater's current roadway conditions for both bicycling and walking. To evaluate roadway segments for both bicycling and pedestrian activity, a Level of Service Analysis was performed for arterial, collector, and connector roadway segments in the City.

The Bicycle and Pedestrian Level of Service models were selected for this evaluation because they are statistically calibrated, widely accepted throughout the United States, easily updated, and they provide an objective perspective. However, it is important to note that the model is segment based and does not address intersection geometry. This analysis provides a baseline condition from which new facility and strategy recommendations are developed.

An early-morning walk is a blessing for the whole day.

~Henry David Thoreau

Bicycle Level of Service

Bicycle level of service (BLOS) is a widely accepted method for quantifying the adequacy of existing roadway facilities for bicycling. The Bicycle Level of Service Model was developed in 1996 and has been applied to over 200,000 miles of roadway throughout the United States and has been adopted by the Florida Department of Transportation as reflected in their 2002 Quality of Service Handbook. The model is a statistically reliable method of evaluating the bicycling conditions of shared roadway environments. It utilizes the same traffic and roadway factors that are used to evaluate other travel modes.

"The bicycle level of service for each roadway segment is based on five variables with relative importance (T statistic) ordered in the following list:

- average effective width of the outside through lane,
- motorized vehicle volumes,
- motorized vehicle speeds,
- heavy vehicle (truck) volumes, and
- pavement condition.

Average effective width is largely determined by the width of the outside travel lane and striping for bicyclists, but also includes other factors such as the effects of street parking and drainage grates. Each of the variables is weighted by coefficients derived by stepwise regression modeling importance. A

Exhibit 2
Level of Service Categories

Level of Service	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

numerical LOS score, generally ranging from 0.5 to 6.5, is determined and stratified to a LOS letter grade. Thus, unlike the determination of automobile LOS in the Highway Capacity Manual 2000, in which there is usually only one service measure (e.g., average travel speed), bicycle LOS is determined based on multiple factors."[1] In the Bicycle LOS Model, levels of service for each segment

Bicycle Level of Service Score =
0.507 ln (Vol15/L) + 0.199SPt(1+10.38HV)2 +7.066(1/PR5)2 - 0.005(We)2 + 0.760

Where:
BLOS = Bicycle level of service score
ln = Natural log
Vol15 = Volume of directional motorized vehicles in the peak 15 minute time period
L = Total number of directional through lanes
SPt = Effective speed factor = 1.1199 ln(SPp - 20) + 0.8103
SPp = Posted speed limit (a surrogate for average running speed)
HV = percentage of heavy vehicles
PR5 = FHWA's five point pavement surface condition rating
We = Average effective width of outside through lane

Where:
We = Wv - (10ft x %OSP) Where W1 = 0
We = Wv + W1(1 - 2x %OSP) Where W1 > 0 & Wps = 0
We = Wv + W1 - 2 (10 x %OSP) Where W1 > 0 & Wps > 0
and a bicycle lane exists
Where:
Wt = total width of outside lane (and shoulder) pavement
%OSP= percentage of segment with occupied on-street parking
W1= width of paving between the outside lane stripe and the edge of pavement
Wps = width of pavement striped for on-street parking
Wv = Effective width as a function of traffic volume

Where:
Wv = Wt if AADT > 4,000 veh/day
Wv = Wt(2-(0.00025 x AADT)) if AADT < 4,000 veh/day, and if the street/road is undivided and striped

Bicycle Level of Service Model

[1] Florida Department of Transportation, "2002 Quality of Service Handbook", 2002.

are determined using the equation presented on the previous page and then applying the level of service thresholds (Exhibit 2) to the calculated scores.

Pedestrian Level of Service

To evaluate the walking conditions in a roadway environment, a similar Pedestrian Level of Service Model (see equation to the right) was developed by the Florida Department of Transportation. The pedestrian LOS measures the safety and comfort of pedestrians in the roadway or nearby roadside environment (either along the roadway lanes, on a sidewalk, or on a nearby exclusive pedestrian facility). Researchers developing the Pedestrian LOS Model, under contract with FDOT, conducted step-wise regression analyses using 1315 real-time observations from a research effort conducted in 2000 in Pensacola.

"In the Pedestrian LOS Model, pedestrian levels of service are based on four variables with relative importance (T statistic) ordered in the following list:

- existence of a sidewalk,
- lateral separation of pedestrians from motorized vehicles,
- motorized vehicle volumes, and
- motorized vehicle speeds.

Each of the variables is weighted by relative importance (determined by stepwise regression modeling): A numerical LOS score, generally

Pedestrian Level of Service Score =
-l.2276 ln (Wol + Wl + fp x %OSP + fb x Wb + fsw x Ws) + 0.0091 (Vol15/L) + 0.0004 SPD 2 + 6.0468

Where:
PLOS = Pedestrian level of service score
ln = Natural log
Wol = Width of outside lane
Wl = Width of shoulder or bicycle lane
fp = On-street parking effect coefficient (=0.20)
%OSP = Percent of segment with on-street parking
fb = Buffer area barrier coefficient (=5.37 for trees spaced 20 feet on center)
Wb = Buffer width (distance between edge of pavement and sidewalk, feet)
fsw = Sidewalk presence coefficient (= 6 – 0.3Ws)
Ws = Width of sidewalk
Vol15 = Volume of motorized vehicles in the peak 15 minute period
L = Total number of directional through lanes
SPD = Average running speed of motorized vehicles traffic (mi/hr)

Pedestrian Level of Service

ranging from 0.5 to 6.5, is determined along with the corresponding LOS letter grade. Thus, like the bicycle LOS approach, pedestrian LOS is determined based on multiple factors". In the Pedestrian LOS Model, levels of service for each segment are determined by using the equation and then applying level of service thresholds (see Exhibit 2) to the calculated scores.

"Many of the terms in the Pedestrian LOS Model equation are also used to determine automobile LOS in the Highway Capacity Manual methodology and in the Bicycle LOS Model."[2]

Data Collection

In order to evaluate Bicycle and Pedestrian Level of Service for Clearwater's roadway segments, the following required data items were collected. Please note that these data items correspond to a programmed database and the results are displayed in Appendix A-Bicycle and Pedestrian Level of Service Results.

Average Daily Traffic (ADT)

The average daily traffic volume is collected by segment. The ADTs were collected from the City of Clearwater or Pinellas County depending on the jurisdiction of the segment. The programmed database converted these volumes to Vol_{15} (volume of directional traffic every fifteen minutes) using the Directional Factor (D), Peak to Daily Factor (K_d) and Peak Hour Factor (PHF) for the road segment.

Percent Heavy Vehicles (HV)

The percentage of heavy vehicles (as defined in the *2000 Highway Capacity Manual*) was collected and recorded.

Number of traffic lanes (L)

The total number of *through* traffic lanes of the road segment and its configuration. (e.g., divided, undivided, one-way, center turning lane). The database converted these lanes into directional lanes.

Posted Speed Limit (S_p)

The speed limit was entered into the programmed database as posted.

[2] Florida Department of Transportation, "2002 Quality of Service Handbook", 2002.

Width of pavement (W_t)

The total width from the center of the road, yellow stripe, or, in the case of a multilane configuration, the lane separation striping to the edge of pavement or to the gutter pan of the curb was collected.

RATING	PAVEMENT CONDITION
5.0 (Very Good)	Only new or nearly new pavements are likely to be smooth enough and free of cracks and patches to qualify for this category.
4.0 (Good)	Pavement, although not as smooth as described above, gives a first class ride and exhibits signs of surface deterioration
3.0 (Fair)	Riding qualities are noticeably inferior to those above; may be barely tolerable for high-speed traffic. Defects may include rutting, map cracking, and extensive patching.
2.0 (Poor)	Pavements have deteriorated to such an extent that they affect the speed of free-flow traffic. Flexible pavement has distress over 50 percent or more of the surface. Rigid pavement distress includes joint spalling, patching, etc.
1.0 (Very Poor)	Pavements that are in an extremely deteriorated condition. Distress occurs over 75 percent or more of the surface.

Exhibit XXX: FHWA Pavement Condition Description
Source: U.S. Department of Transportation. Highway Performance Monitoring System-Field Manual. Federal Highway Administration. Washington, DC, 1987

Parking Pavement (W_{ps})

The pavement striped for on-street parking was collected only if there is parking to the right of a striped bike lane.

Outside Width (W_l)

The width of paving between the outside lane stripe and the edge of pavement was collected. It is measured from the outside lane stripe to the edge of pavement or to the gutter pan of the curb. When there is angled parking adjacent to the outside lane, W_l is measured to the traffic-side end of the parking stall stripes.

Occupied Parking (OSPA)

The percentage of the segment (excluding driveways) along which there is occupied on-street parking at the time of survey. Each side is recorded separately. If the parking is allowed only during off-peak periods and parking restrictions change widths and laneage, geometric changes are reflected in the comments field.

Pavement Condition (PC)

Existing Roadway Conditions

The pavement condition of the motor vehicle travel lane was collected according to the Federal Highway Administration's five-point pavement surface condition rating as demonstrated above.

Designated Bike Lane

A shoulder designated specifically for bicycles was recorded.

Evaluation Results

Generally, the City of Clearwater has an average bicycling accommodation of a level of service "C" and an average pedestrian accommodation of a level of service "C" on a statistically calibrated academic grading scale of "A" through "F". The level of service average is a distance-weighted average (of the road segments). The study network includes arterial, collector and select local roads.

The distribution of both the Bicycle and Pedestrian Level of Service grades are shown graphically on this page.

The results are shown graphically on the maps on the next two pages, with the grading scale color coded in a spectrum from red (LOS "E & F") to green (LOS "A").

Conclusion

The results of the Bicycle and Pedestrian LOS evaluation are used in the development of the City of Clearwater Bicycle and Pedestrian Master Plan through the prioritization process. The LOS models can be used in the future for benefits comparison among proposed bikeway/road cross-sections, prioritizing and programming facility improvements, and estimating future bicycling-roadway conditions. Finally, it can also be used to track changes in bicycling and walking conditions within the Clearwater network.