Is the playing field finally leveling?
Non-auto roadway performance measures

The reign of the automobile in transportation planning may finally be coming to an end. After decades worth of virtually no consideration for bicycles in roadway design, there is growing evidence that planning agencies throughout the U.S. are giving equal weight to bikes, transit and pedestrians. As far as bicycles are concerned, one of the most significant accomplishments in this area has been the development and use of quantifiable roadway performance measures, like the long-used Level of Service (LOS) standards for automobiles.

Bicycle Level Of Service (BLOS) and Bicycle Compatibility Index (BCI) are emerging national standards for quantifying the bike-friendliness of a roadway. While other "level-of-service" indices relate to traffic capacity, these measures indicate bicyclist comfort level for specific roadway geometries and traffic conditions. Roadways with a better (lower) score are more attractive (and usually safer) for cyclists. Other non-auto oriented measures being developed for use in roadway planning include the Pedestrian Level Of Service (PLOS), which measures walking conditions, and the Latent Demand Score model (LDS), which provides an estimate of "latent" bicycle travel demand (defined as a measure of the relative amount of bicycle travel that would occur on a road segment if there were no bicycle travel inhibitions caused by motor vehicle traffic).

BLOS and BCI evaluation may be useful in several ways:

- 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 network can be determined, and sites needing improvement can be prioritized.
- Alternate treatments for improving bike-friendliness of a roadway can be evaluated.
- Road project selection formulas can include a BLOS or BCI term to encourage implementation of bike planning goals.
- Like auto-LOS standards, minimum threshold values can be set to protect bike/ped projects from construction/roadway alterations.

<u>Bicycle Level of Service Model (BLOS)</u>

The *Bicycle Level of Service (Bicycle LOS) Mode,* developed by Landis et al. (1997)*,* is the statistically-reliable method of evaluating the bicycling conditions of shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the *Model* clearly reflects the effect on bicycling suitability or "compatibility" due to factors such as roadway width, bike lane widths and striping combinations, traffic volume, pavement surface conditions, motor vehicles' speed and type, and on-street parking.

Many urban planning agencies and state highway departments are using this established method of evaluating their roadway networks. The model has been applied by the Maryland Department of Transportation (MDOT), the Virginia Department of Transportation (VDOT), the Delaware Department of Transportation (DelDOT), Florida Department of Transportation (FDOT), New York State Department of Transportation (NYDOT), Maryland Department of Transportation (MDOT) and many others. It has been applied in regions such as Anchorage AK, Baltimore MD, Birmingham AL, Buffalo NY, Gainesville FL, Houston TX, Lexington KY, Philadelphia PA, Sacramento CA, Springfield MA, Tampa FL, Richmond, VA, Northern Virginia, and Washington, DC.

Widespread application of the original form of the Bicycle LOS Model has provided several refinements**.** For example**,** application of the Bicycle LOS Model in the metropolitan area of Philadelphia resulted in the final definition of the three effective width cases for evaluating roadways with on-street parking. Similarly, application of the Bicycle LOS Model in the rural areas surrounding the greater **Buffalo region resulted in refinements to the "low traffic volume roadway width adjustment**" (see below).

<u>Buffalo BLOS example</u>

Bicycle Level of Service	Miles	% of Miles With BLOS	Segments	
A	103.6	18.1	226	
B	92.7	16.2	113	
C	96.2	16.8	109	
D	109.6	19.1	114	
E	102.6	17.9	100	
F	69.1	12.0	50	
Total	**573.8**	**100.0**	**712**	

∗ This is a good example of how BLOS measures are quantified like vehicle LOS measures.

For a more in-depth discussion of BLOS, see**: BLOS.pdf** in

Appendix A

<u>Latent Demand Score Model (LDS)</u>

Developed by Landis (1996), it incorporates both demand and supply factors in evaluating transportation facilities. The LDS model provides an estimate of "latent" bicycle travel demand, defined as a measure of the relative amount of bicycle travel that would occur on a road segment if there were no bicycle travel inhibitions caused by motor vehicle traffic (Landis 1996:18). The LDS model analyzes the trip generation and proximity of activity centers to assess the potential demand for a facility, using probabilistic gravity model techniques (Landis and Toole 1996). The LDS model only considers the demand-side potential of bicycle facilities. Thus, one disadvantage of the model is that current road conditions are not considered. However, using the LDS model with level of service assessments, the Interaction Hazard Score model, or other supply-side methods complement the LDS model and overcome these limitations. Cities throughout the U.S. have used the LDS model to help prioritize the expenditures for current and proposed bicycle facilities.

Another approach at assessing bicycle facilities was formulated by Nelson and Allen (1997) to analyze existing data for 18 U.S. cities (Goldsmith 1992). The research was driven by the question: does providing bicycle facilities mean that people will use them? In other words, this research incorporates a "supply-side" approach to assessing facilities. A regression equation was used to test the research question with somewhat inconclusive results. The most statistically valid finding was the strength of the relationship between the miles of bicycle paths per 100,000 residents and the percentage of commuters using them – as the miles of paths increased, so did usage (as was expected). The researchers use these results to promote that a latent demand for bicycle facilities may only be tapped by providing bicycle facilities, as suggested earlier by researchers at the University of North Carolina Highway Safety Research Center (1994).

The Latent Demand Score method represents one of the most comprehensive techniques for estimating relative travel demand. The most obvious disadvantage to using the LDS is the inability of the model to define potential ridership. Also, because it considers only the demand-side of the equation, it should be combined with the BLOS or BCI.

Bicycle Compatibility Index (BCI)

Developed for the Federal Highway Administration, it is an attempt to promote a methodology that can be widely applied by transportation planners and engineers to determine how compatible a roadway is for allowing operation of both bicycle and motor vehicle traffic (Cambridge Systematics, Inc. 1998c). It incorporates roadway variables with those bicyclists typically use to assess the "bicycle friendliness" of a roadway (Harkey et. al 1998a and b). The BCI selected several independent variables for their model, including: Presence of bicycle lane or paved shoulder and width, presence of a parking lane with more than 30 percent occupancy, type of roadside development, 85th percentile speed of traffic, curb-lane width, curb-lane volume, and other lane volume. The method has good validation techniques that improve its effectiveness and is considered an improvement over BLOS by some researchers (Cambridge Systematics 1998a) upon earlier stress level work of Sorton and Walsh (1994a) and the Geelong Bikeplan Team (1978). It has, however, been criticized for leaving out pavement conditions as an assessment criteria.

For an in-depth discussion of this see:

http://www.hsrc.unc.edu/research/pedbike/98072/index.html

LOS and CEQA

The way it is now:

CEQA – California Environmental Quality Act - under this law, all construction projects in California must not adversely impact the environment. In terms of roadway construction (or any construction affecting traffic flow), this is determined using LOS ratings (A – F, where A represents very efficient road conditions and F = very inefficient), Technically under CEQA, any project pre-determined to lower vehicular LOS to an E or F, requires mitigation efforts to reduce the potential environmental impact and avoid an Environmental Impact Review (EIR) (under the rationale that, slow, inefficient traffic patterns will negatively effect air quality). Unfortunately such a narrowly defined standard ignores any potential *benefits* of a project, such as in the case of transit, bike and pedestrian projects that might provide incentive for less vehicular use. Fortunately there are exemptions to this rule for some bike, pedestrian, and public transit projects. *Unfortunately* for cyclists and cycling advocates, these exemptions do not cover bike lane projects when a traffic lane is to be removed (i.e. "road diets"). Thus, every bike lane project in California of this nature must go through the arduous political, technical and bureaucratic process of skirting the CEQA requirements. There are some examples where local municipalities have adopted their own standards or amended LOS thresholds (see examples below), however these have almost entirely been in regards to transit initiatives. So far the political will to change these standards in regards to bike projects has been lacking. Standards like BLOS and BCI are steps in the right direction but their use is far from widespread and they do not trump LOS requirements. And while San Francisco and a handful of other progressive California municipalities have begun to consider (and done so in certain situations) CEQA and LOS amendments, there has been little in the way of legislation.

What needs to be done:

If San Francisco is to move forward with its Bike Plan and the many new bike lane installations, the current rules of the game must be changed. And while amending the existing LOS standards (lowering the threshold for EIR) might work in the short term, a better solution would be to adopt a new multi-modal model that includes a BLOS component. There is precedent for this, as Palo Alto has shown (see below), and it would go a long way towards expediting the cities' stated goal a more multi-modal transportation system and indeed, a more livable city. Additionally, the advantage of crafting new local standards, as opposed to amending existing ones, would be to taylor the standards in such a way as to help address some unique local transportation and infrastructure issues. For example, San Francisco could implement BLOS standards but, due to exceptionally (relative to other California municipalities) narrow streets and poor pavement conditions, could put greater weight on the lane width and surface condition criteria of the BLOS model. And since it is a geographically compact city with relatively good public transit options, it could easily assign a greater amount of emphasis to the BLOS standards in relation to LOS standards. This might take the form of different threshold levels, so that the BLOS threshold for significance (requiring mitigations) might be a B whereas the threshold for vehicular LOS might be a score of E. This would hopefully have a win-win effect of providing disincentive to drive (from inefficient conditions) and incentive (through better conditions) to bike, or alternatively, walk or take public transit.

Here are a few "real world" examples of cities that have amended or mitigated LOS/CEQA standards to implement a project (or model in the case of Pleasanton) judged to have greater overall potential benefits than negative impacts:

Pleasanton- Uses an alternative to standard LOS methodology, called Quality of Life LOS, to determine the "livability" of residential streets.

- Does not address bike LOS directly, more so pedestrian concerns, but it does represent shift of perspective away from supply oriented and auto-dominant transit planning

- See PleasantonQLOS.doc: Appendix A

Los Angeles –approved light rail project w/ SOC (Statement of Overriding Concern)

- In spite of failed attempts to mitigate projected environmental impacts, project was eventually approved as long-term benefits were determined to be more important than negative short-term effects.

- See LALrvmitigation.pdf: Appendix A

San Jose – exempted TOD (Transit Oriented Development) from LOS requirements under CEQA

Palo Alto- Charleston-Arastradero Corridor project (a "road diet" w/ bike lane implementation) approved w/ mitigated negative declaration

- Also established BLOS standards w/ a threshold level of B, as well as similar PLOS (Pedestrian) standards

- See CharlAras.pdf: Appendix A

Useful web resources for bike/alt. transit planning research

www.vtpi.org

- Victoria (BC) Transportation Policy Institute – probably the best single source for alt-transportation/bike planning research

www.ibike.org

- Good international source for all things bicycle related

www.bicyclinginfo.org/rd/

- Bike planning research and state of the industry

www.ntl.bts.gov/

- Government source for bike, alt.transport planning

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