

## Capacity, Planning, and Safety Implications of Parkway Widening

The following report was prepared for WLSA's Board of Directors for their deliberations regarding Redmond's 2003 widening project. After a review of project information provided by Redmond, concerns still exist on a number of issues. Pertinent to all segments of the Parkway, the following analysis was intended to address unanswered questions raised by the project, including:

- Would roadway capacity, and thus the volume of traffic, likely to be affected by addition of a bike lane?
- Would induced increases in traffic volume be consistent with the character of the roadway?
- Has accident history been taken into consideration in project design?
- Are there other elements of roadway design that have not been considered?
- Have all elements of sound bike route planning been considered?

**Overall Conclusion: A bike lane will have a detrimental effect on safety, road volumes, and quality-of-life. Professional literature is cited throughout the analysis to validate this finding.**

### Capacity Impacts of Widening For a Bike Lane

**Summary:** Traditional highway capacity analysis techniques take into consideration width of travel lanes and lateral distance to obstructions. Addition of width, either for a bike lane or even edge taper will result in increased capacity and thereby, higher traffic volumes; possibly as high as 20%.

**Analysis:** Traffic engineering evaluation of roadway capacity takes into consideration its physical and operational characteristics. A theoretic or maximum achievable capacity is adjusted to arrive at an estimate of capacity. Such features as terrain, traffic composition, and restrictions are considered. Table 16-14 is presented to demonstrate this. Values shown in the table are the reduction factors to be applied to the maximum service volume to arrive at the capacity estimate. Comparison between 10 ft. lane entries in any row to 12 ft. lanes, for example, differ by as much as 20%.

Further, the proposed widening of the Parkway for a bike lane will effectively increase the width of the roadway by at least 4 ft. Comparing entries within columns in Table 16-14 demonstrates the impacts likely from a widening. For example, if the current lateral clearance to obstructions is 2 ft. and there is a widening to 6 ft. (4 ft. bike lane plus 2+ ft. of pavement taper), the adjustment factors change markedly. For West Lake Sammamish Parkway, the following would apply – 10 ft. lane, operating level of service E, Obstructions on One Side -

(2 ft. clearance) 1,400 Vehicles Per Hour X 0.75 clearance adjustment = 1050 Veh. Per Hour

(6 ft. clearance) 1,400 Vehicles Per Hour X 0.81 clearance adjustment = 1134 Veh. Per Hour

Net Difference in Traffic Volume = 1134 – 1050 = 84 Veh. Per Hour or 8%

**Conclusion:** Adding a bike lane will increase traffic carrying capacity of the Parkway. Given the continued growth in traffic, planned expansion of Microsoft into Issaquah (and resulting traffic interchange between these sites), volumes on the Parkway will increase. This will produce additional traffic demand, increased traffic conflicts/ accident potential, and further neighborhood-quality-of-life degradation.

### **Road Classification Conflict Created By a Widening**

**Summary:** Promoting additional traffic along the Parkway is inconsistent with existing and recently approved land use fronting on the Parkway.

**Analysis:** West Lake Sammamish Parkway has been designated a minor arterial roadway. Such a designation is inconsistent with abutting uses. Sound traffic engineering should be sensitive to the nature of uses and access along the roadway. The proposed project does not reflect that sensitivity.

As noted in section 440.04 of the State's *Design Manual*, "The higher functional classes give more priority to through traffic and less access to local traffic." Harold Marks, in his legendary treatise "*Traffic Circulation Planning for Communities*" (Gruen Associates, 1974), cites the need for spacing of access points along arterials to be at least ¼ mile spacing. Marks also notes –

*"The efficient operation of highways requires the classification of the functions they are to perform and identification of the most effective facilities to perform them. A given type of movement can best be accommodated on facilities specially designed for that purpose; matching design to use helps ensure homogenous flow, which contributes to efficiency and safety."*

*"A functional system of highways must provide for the gradation of traffic flow from the movement function to the access function."*

The frequent spacing of residential driveways, especially along the eastside of the Parkway, shifts the effective function of the road from an arterial to that of local street. Indeed, as shown in the following photos, recent permitted development along the Parkway shows that the cities of Redmond and Bellevue continue to approve new development adjacent to the roadway. The proposed project's traffic increases would violate basic principles of sound transportation planning and engineering.

The westside of the road consists of fewer driveways as well as conventional road approaches, and the City has jurisdiction over the latter. This allows the City to assure maintenance of clear zones, and, in combination, results in fewer points of conflict for non-vehicular traffic.



New Development Demonstrating Conflict of Access Vs. Traffic Functions, Including Cycling

**Conclusion:** Widening the road for a bike lane or even a shoulder will increase traffic accidents through increased conflicts and induced increases in traffic volumes. The discontinuous nature of the lane will produce other problems, as well, as described below.

**Sight Distance – Safety Problems Induced By Widening**

**Summary:** What was to have been a maintenance project shifted to a roadway widening and with it came the responsibility to achieve applicable standards. The selection of the project design speed was arbitrary and capricious. At the time of this report, correction of deficiencies created by the project will not be carried out. Liability would be shifted to the abutting property owner.

**Analysis:** Driveway approaches on the eastside of the Parkway are very steep in many sections, including within the limits of the proposed widening. In addition many are skewed, making it difficult for drivers to easily see on-coming traffic. Adding bike lanes would exacerbate these situations.

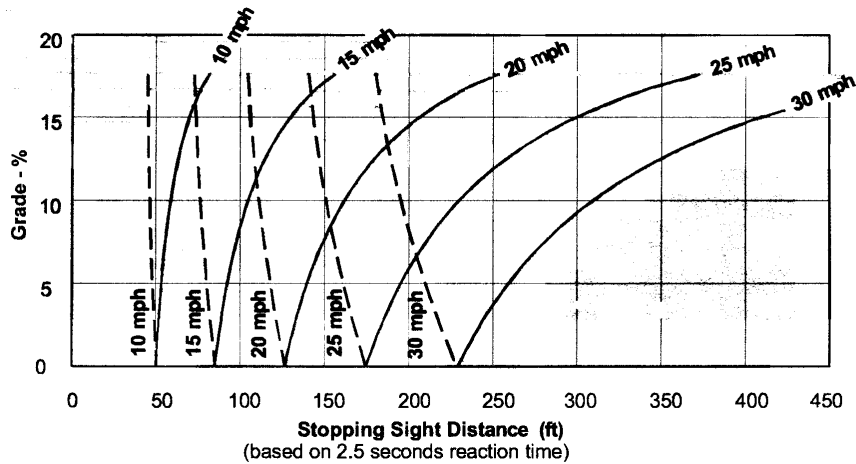


Steep And Angled Driveways Requiring Special Consideration

In memorandums dated as recently as Feb. 10<sup>th</sup> and 14<sup>th</sup> of 2003, staff and the consultant were still deliberating what to use as the design speed. These memorandums are included as attachments.

While they were addressing the intersection of NE 24<sup>th</sup> for evaluation of sight distances, the design speed would apply throughout the project. Most glaring in these memos is that they reflect an attempt to select a design speed based upon budget constraints. This is not appropriate, especially where a widening is involved.

Attesting to this fact is the inclusion of Stopping Sight Distance analysis tools for bicycle facilities in the Washington Design Manual, previously cited.



(Source: “Bicycle Facilities”, WA State DOT Design Manual page 1020-24)

Although stopping sight distance is not usually a consideration at driveways, it becomes an issue along an arterial such as the Parkway where a prudent person can see the existence of steep driveways. In addition, two other factors dictate sight distance consideration:

1. the number of anticipated conflict points, and
2. the disparity between through movement and land use access functions.

Analysis of stopping sight distance is a compound process. A cyclist should be able to stop, should a driver pull into their path. Conversely, a driver about to enter the road should be provided adequate sight triangles to avoid entering, should there be a cyclist. Such analyses were not available, with staff stating that the City only has to reach a “best achievable” level of effort. Cyclists along the project in a new, northbound lane would encounter grades exceeding 5% and could be expected to reach speeds of 30 – 35 mph.

**Conclusion:** Consideration of sight distance is prudent, if not required, in proposing a new lane along an arterial with extensive numbers of steep, skewed driveways. Failure to take this into consideration is tantamount to attempting to shift liability from the City to the abutting property owner.

## Accident History –

**Summary:** A pattern of bicycle accidents is not present as justification to modify the existing facility. Indeed, treatment in the manner under which the City of Bellevue operates its portion of the roadway is preferred from a safety and “Rules of the Road” view point.

**Analysis:** Traffic accident information was not prepared as part of the planning and design for the proposed widening. Included as an attachment is accident information that was only recently provided at the insistence of WLSA and Redmond residents. Also obtained for analysis were records maintained by the City of Bellevue.

The Redmond portion of the facility has had but one bike/ped. accident in five (5) years. The Bellevue data spans a longer period, 12 years, and covers a longer route segment, 5+ miles. Here too, there is no pervasive problem. Indeed, actions by Bellevue to correct alignment problems at Northrup Way have greatly reduced problems at that location as has their provision of supplemental, side street traffic signing, shown below.



Bellevue’s Supplemental Signing On Side Streets

Redmond’s choice of signing and marking of the westside’s 10-ft. shoulder for southbound cyclists forces northbound riders into an illegal status. Few will be seen on the eastside, most opting to ride on the west, likely because volumes of cyclists and pedestrians are low and the conflicts on the east many. For the present volume of cyclists and pedestrians, Bellevue’s “permissive” operation of the 10-ft. west shoulder, in their section of the Parkway, has been successful.

**Conclusion:** A review of accident patterns is a recommended practice in designing bike and pedestrian facilities. Neither this type of analysis nor “forecasts of demand” were prepared.

## **Elements of Bicycle Facility Planning Not Considered in Project Design**

Three references were explored to determine factors that need to be considered in designating bicycle facilities. These included:

- (1) WA Dept of Transportation's "Design Manual", May 2001
- (2) AASHTO's "Guide for the Development of Bicycle Facilities" 1999, and
- (3) The Institute of Transportation Engineer's "Innovative Bicycle Treatments", May 2002

Aspects of these guidelines have not been considered, including:

*Continuity – The proposed network should have as few missing links as possible. If gaps exist, they should not include traffic environments that are unpleasant or threatening to Group B and C (recreational and children) riders, such as high-volume or high-speed motor vehicle traffic with narrow outside lanes. (3)*

*Facilities for bicyclists should also be planned to provide continuity and consistency for all users. Children using a path to get to school should not have to cross a major arterial without some intersection controls, and shoulders and bike lanes should not end abruptly and unannounced at a difficult intersection of busy stretch of highway. (2)*

*An important consideration is route continuity. Alternating bikeways from side to side along a route is generally unacceptable. Designing a route that requires bicyclists to cross the roadway could result in inappropriate maneuvers and/or encourage Rule of the Road violations (1).*

*Bike Lane – If bicycle travel is to be improved, special efforts should be made to assure that a high quality network is provided with these lanes. However, the needs of both the motorist (including residential access) [emphasis added] and the bicyclist must be considered in the decision to provide bike lanes. (2)*

*Shared Use Path – In selecting the proper facility, an overriding concern is to assure that the proposed facility will not encourage or require bicyclists or motorists to operate in a manner that is inconsistent with the rules of the road. The needs of both the motorists and the bicyclists must be considered in selecting the appropriate type of facility. (2)*

*Crash Reduction – The reduction or prevention of bicycle crashes is important. Therefore, the potential for reducing crash problems through the improvement of a facility should be assessed. Plans for constructing new bicycle facilities should be reviewed to identify and resolve potential safety issues. (2)*

*Consider both the impacts caused by adding bicycle traffic and the potential for introducing new accident problems. (1)*

*Signed Shared Roadways – Signing of shared roadways indicates to cyclists that there are particular advantages to using these routes compared to alternate routes. This means the responsible agencies have taken action to ensure these routes are suitable as shared routes and will be maintained. (2)*

**Conclusion:** Consideration of the above points is not reported in project documents. An exclusive bike lane in the location proposed fails to consider the needs of cyclists falling into two of the three rider groups. Accommodating Group A, advanced cyclists (who make up only 5% of the riding public in the US<sup>1</sup>), and failing to consider the needs of Groups B and C (recreational and children) is imprudent. Groups B and C, who will compose the majority of users, would not and should not be expected to use such a facility. Indeed, if present, a lane on the eastside would be an attraction to the latter group, children, who might be faced with make crossing decisions beyond their years and training. To quote the State’s Design Manual, *“In selecting an appropriate facility, ensure that the proposed facility will not encourage or require bicyclists or motorists to operate in a manner that is inconsistent with the Rules of the Road.”*

### **Long Range Considerations for the Parkway**

This portion of the analysis speaks to such issues as –

- Alternative bicycle - pedestrian treatments
- Transit consideration
- Traffic calming techniques

Alternative Bicycle and Pedestrian Treatments – The Redmond study did not include a thorough assessment of alternatives or an adequate determination of potential users. Indeed, proponents of the eastside bicycle lane, who addressed the Redmond Council in lobbying for a bike lane, included as many requesting pedestrian improvements as those in favor of a bike lane.

A wide range of alternatives is reported in each of the documents listed previously<sup>2</sup>. These range from requiring Group A cyclist to ride in traffic as at present, to striping a shoulder (without marking it exclusively for cyclists), to complete separation from travel lanes<sup>3</sup>. Another concept would restrict Class A cycling to the southbound direction, possibly coupling this with a similar restriction on East Lake Sammamish Parkway to create a counter-clockwise route.

An open and comprehensive planning process should be carried out to identify feasible alternatives as well as concomitant impacts, to Lake Sammamish for example, and “fatal flaws” such as the excessive cost that would be associated with extending a widening south of NE 24<sup>th</sup>.

Public Transit – The most recent edition of project plans (90% level) included transit pull-outs (where as, the 30% plans displayed in March did not.) It is unclear why these were added as their addition reflects insensitivity to several issues. First, transit vehicles, once out of traffic, would find it difficult to re-enter traffic in peak hours. Second, the volume of ridership boarding and alighting most likely does not warrant the added expense. Third, though stopping is infrequent, these interruptions in flow

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<sup>1</sup> *Innovative Bicycle Treatments*, Institute of Transportation Engineers, 2002, pg. 115

<sup>2</sup> However, these documents assume a generic-type facility or the intent to create one. That is, they describe an ideal that in the case of West Lake Sammamish Parkway does not exist and perhaps cannot be achieved at reasonable cost. Primary among the anomalies already mentioned is the extensive amount of residential use along a facility inappropriately designated as an arterial. Other factors that may preclude any widening are slope instability or danger of liquefaction.

<sup>3</sup> A secondary benefit of a complete separation by addition of a barrier would be the traffic calming effect of a narrower lane.

actually provide much needed breaks in traffic, creating gaps for driveway and side street drivers to turn onto and off of the facility.

Traffic Calming – So long as the Parkway is designated as an arterial, regulations and traditional engineering practice will dictate towards efforts to expand its carrying capacity. Though subtle and invoked in an incremental fashion (such as adding a bike lane or providing transit turn-outs) increases in traffic will make it less and less desirable an area in which to live. An increasingly elderly population, many founders of the area, will be forced to leave, finding they can no longer negotiate the dangers of traffic on the Parkway.

The true costs of failing to provide an appropriate balance between residents and commuters goes well beyond this would-be maintenance project and have not been considered.

Traffic calming has evolved over the last several decades as a means to balance uses competing for road space and to mitigate neighborhood intrusion. On local streets restrictions and other techniques are now implemented using programs designed in Seattle and Portland. On arterial streets, as mentioned above, existing laws are cited as reason to avoid treatments that would “impede traffic”. However, for the foregoing reasons, it should be recognized that the Parkway is inappropriately designated. It’s primary function should be to provide land use access and traffic collection for its residents, as well as right-of-way for them to enjoy such activities as walking, jogging, and recreational cycling.

Creation of a specific classification of *neighborhood arterial*, though pioneering, should be considered. Short of this, some traditional and less traditional techniques might be applied. Under such a classification a wider range of treatment options would guide municipal staff efforts with supporting policies.

Neighborhood Arterial Traffic Treatments could include:

*Reminder or Pronouncement Signing* – placement of neighborhood entrance signs and periodic signs along the route serve to remind drivers of the nature of surrounding land use. Most will be more cognizant of their obligation to share the road.

*Speed Limits, Signing, and Enforcement* – Maintaining lower speed limits, and not following the convention of setting speed limits based upon prevailing speeds is essential to mitigation of arterial traffic impacts. Failure to sign and enforce these limits, however, is a prescription for failure of this methodology. Use of radar controlled signing is an option that is in place at strategic points in both Redmond and Bellevue along the Parkway. However, with time there will be a loss of “respect” for their warning value – especially without support enforcement.

*Narrow Lanes* – It goes without saying that narrowed lanes are one of the most effective techniques. As shown previously in this report, even the addition of a striped shoulder will create substantial increases in capacity and thus demand. Without accompaniment of other traffic calming techniques, addition of a shoulder should not be considered so long as there are not overriding safety problems.

*Truck Traffic Enforcement* – Like speed limit enforcement, truck enforcement is lacking along the Parkway, with Redmond allowing heavier trucks along their portion of the Parkway. Coordination between the jurisdictions to settle on a lower limit should be encouraged, especially with the expansion of Microsoft to the Issaquah Highlands. This expansion will increase truck traffic

interchange between the two campuses. The City of Issaquah’s conditioning of the development should have recognized these impacts.

*Traffic Circles* – This favored neighborhood calming technique must be used cautiously along West Lake Sammamish Parkway, if at all. The implementation of one by WSDOT at the southern end of the Parkway has had a net positive vote by most Parkway residents, if only anecdotally. However, it does cause some queuing that restricts access and egress.<sup>4</sup> Because they require a wide right-of-way, there are limited locations where traffic circles could be placed on the Parkway.

*Transit* – Several issues arise with transit operation in neighborhood areas. Transit operation has taken its toll on the Parkway. A single bus or truck can impact a road with an equivalent force of thousands of passenger cars. This may be why Redmond’s section of the Parkway is in worse condition than Bellevue’s. Noise and even vibration (transmitted through underground utilities and strata) complaints have been reported where large buses operate in neighborhoods.

That said, transit offers an opportunity for a tool to be added to the “Neighborhood Arterial Traffic Calming Toolbox”. Having buses stop in traffic, though frustrating to drivers, will produce much-needed gaps in traffic further downstream ahead of the bus. The current method of operation along Redmond’s portion of the Parkway should be continued, especially given the low ridership and infrequent stops. As mentioned earlier, the addition of pull-outs are not warranted on a cost basis and attempts to do so reflect an insensitivity to broader needs of residents along the Parkway.

*Traffic Signals* – Like transit or traffic circles, signals are a double-edged sword. Traditional approaches to engineering will push for the addition of turn lanes (a.k.a. “pockets”) when the signal is designed. Their addition, however, will only result in further increases in traffic through an already congested corridor. Redmond’s signal at NE 40<sup>th</sup> was an acceptable design.

*Supporting Policies* – Long overdue is the consideration of traffic impacts to the Parkway by surrounding development. Under Growth Management and Concurrency requirements mitigation of impacts to the Parkway should have been in place years ago. Portland provides excellent examples of programs under which staged traffic calming programs (**with monitoring**) were put in place prior to development approvals. As development takes place on the ridges above the Parkway, the implications to it need to be assessed<sup>5</sup>. Key to this will be the establishment of a level of service (congestion) measure that is not solely based on intersection congestion but one that accounts for quality of life issues such as those faced by West Lake Sammamish residents.

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<sup>4</sup> Unfortunately, as is the case in Bellevue, traditional highway engineers will opt for the addition of road widening for placement of turn pockets on the argument of “safety”. However, the addition of through traffic capacity will result in overall higher societal cost.

<sup>5</sup> The recent sale and subsequent development of a large tract of Boeing property in Eastgate is one such site.

