

CHAPTER 1: TRANSPORTATION CONCURRENCY – CURRENT PRACTICES, PITFALLS, AND POSSIBILITIES

The 1990 Washington State Legislature passed the Growth Management Act (GMA), a comprehensive framework for urban growth in the state. The GMA came out of a growing realization that current urban policies and unplanned growth were encouraging sprawl, threatening environmental quality, and straining local government infrastructures. Specific to transportation, growth patterns were creating car-dependant, low-density communities with a tendency to experience road congestion. The GMA established a broad mandate for comprehensive planning, calling on local jurisdictions to balance their land-use goals with appropriate provisions for infrastructure and services.¹ Included in the GMA is the requirement that housing and commercial development be concurrent with the development of infrastructure, including water, sewer, and transportation. This concurrency requirement is one tool that the GMA provides to local governments to help them achieve a land-use/infrastructure balance and effectively manage their growth. Concurrency is not an end unto itself; instead it is a requirement that local jurisdictions think carefully about the interaction between land-use goals, transportation infrastructure and service expectations. This chapter overviews the transportation concurrency requirement; explains existing practices within the four Eastside cities of Bellevue, Kirkland, Issaquah and Redmond; and discusses some of the constraints of the existing concurrency framework. It provides the foundation for the report’s in-depth discussions of alternative concurrency measurement systems and policies.

THE TRANSPORTATION CONCURRENCY REQUIREMENT

The GMA requirement known as “concurrency” mandates that a jurisdiction’s infrastructure must keep pace with development.² The concurrency requirement applies to all aspects of a local government’s infrastructure, including roadways, sewers, and water.³ However, the Act only explicitly requires jurisdictions to adopt ordinances that establish a concurrency measurement system for their transportation infrastructure.⁴ As a result, the ability of the transportation system to support new development has become the primary test for whether development and infrastructure are “concurrent.”

The GMA directs jurisdictions to establish level of service (LOS) standards for their transportation systems.⁵ The transportation LOS standards serve as a baseline for determining whether current transportation facilities can accommodate new development. If the new

¹ RCW 36.70A.010 & 36.70A.020.

² RCW 36.70A.070(6)(b).

³ See *Taxpayers for Responsible Government v. City of Oak Harbor*, WWGMHB No. 96-2-0002, Final Decision and Order (July 16, 1996).

⁴ RCW 36.70A.070(6)(b).

⁵ RCW 36.70A.070(a)(iii)(B).

development will cause the transportation system to exceed the pre-determined LOS standards, the jurisdiction *must deny the development* unless transportation improvements and strategies are made to accommodate the development within six years.⁶

SETTING LOS STANDARDS

Jurisdictions must adopt ordinances that set LOS standards for all locally owned arterials and transit routes, but they have considerable discretion in selecting the measurement system and the performance standards. The GMA concurrency requirement provides no parameters for acceptable measurement methods or LOS standards. The statute only requires that the LOS standards be “regionally coordinated,” a determination made by the Puget Sound Regional Council (PSRC) when it reviews the jurisdictions’ comprehensive plans.⁷ In addition, Washington State Department of Transportation regulations endorse a wide range of LOS standards, including “speed and travel time, freedom of maneuver, traffic interruptions, comfort, convenience, geographic accessibility, and safety.”⁸ The lack of specificity in both the statute and its accompanying regulations has led at least two growth management hearing boards to conclude that local governments have “virtually limitless discretion” when setting LOS standards.⁹ Moreover, the Central Puget Sound Growth Management Hearing Board has held that concurrency only requires jurisdictions to establish gauges of transportation performance; it does not dictate what is “too congested.”¹⁰ Thus, local governments have considerable flexibility in designing concurrency measurement methods and LOS standards, including making a policy choice to accept roadway congestion rather than limit development. However, once jurisdictions have set their LOS standards, they must deny any development that would cause the affected transportation facilities to exceed their standards unless they pursue mitigation to accommodate the impacts of development.

⁶ RCW 36.70A.070(6)(b).

⁷ RCW 36.70A.070(a)(iii)(B).

⁸ WAC 365-15-210.

⁹ Richard Settle, “Revisiting the Growth Management Act: Washington’s Growth Management Revolution Goes to Court,” 23 Seattle Univ. L. Rev. 5, 19 (1999). The Western Washington Growth Management Hearing Board concluded that the statute permitted Clark County to adopt a “failing road” LOS standard. See Achen v. Clark County, No. 95-2-0067 WWGMHB, Final Decision and Order (September 20, 1995). Similarly, the Central Puget Sound Growth Management Board upheld Seattle’s LOS standards that permitted considerable road congestion. See West Seattle Defense Fund v. City of Seattle, No. 94-3-0016 CPSGMHB, Final Decision and Order (April 4, 1995).

¹⁰ See West Seattle Defense Fund v. City of Seattle, No. 94-3-0016 CPSGMHB, Final Decision and Order (April 4, 1995).

MITIGATING CONCURRENCY FAILURES

Although jurisdictions are required to deny development that will cause the transportation system to exceed the LOS standards, jurisdictions may nonetheless permit development if “transportation strategies and improvements to accommodate the impacts of development are made concurrent with the development.”¹¹ Generally, this provision is referred to as “concurrency mitigation.” Mitigation allows jurisdictions (and developers) to avoid the harsh result of LOS failure by implementing system improvements that would eliminate the effects of the development on the transportation system—or at least eliminate the effects of the development that are projected to cause LOS failure. Jurisdictions that use the mitigation provision generally require the developer to either scale back the development or fund projects to improve the transportation system near the development site. For example, Snohomish County’s municipal code establishes mitigation measures linked to “trip reduction” credits that developers can implement in order to avoid concurrency problems.

Jurisdictions have considerable flexibility in designing concurrency mitigation efforts. “Transportation improvements and strategies” are broadly defined in the statute to include, among other things, “public transportation service, ride sharing programs, demand management, and other transportation systems management strategies.”¹² The text of the mitigation provision does not directly link the mitigation efforts to lowering the LOS measure below the pre-determined standard. Instead, the statute requires mitigation efforts to “accommodate the impacts of the development” within six years. Jurisdictions are free to work with developers to design any combination of transportation services or system improvements that will accommodate the development. The end goal in concurrency mitigation is a decrease in the LOS measure below the pre-determined standard. The mitigation measures need not remove the particular development’s traffic from the roadway, but they must remove enough traffic—whatever the source—so that the development can be accommodated without causing LOS failure. Standards of “nexus” and “proportionality” established by the U.S. Supreme Court in *Dolan v. Tigard* will almost always be met when dealing with concurrency mitigation because there is a direct gauge of the development’s impacts (the decline in the LOS measure beyond the standard), and mitigation is required only to offset those impacts.¹³

¹¹ RCW 36.70A.070(6)(b).

¹² RCW 36.70A.070(6)(b).

¹³ The “nexus” requirement was established in *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987). In *Nollan*, the United States Supreme Court held that permit conditions must be sufficiently related to the government’s regulatory interests. The Court added the “proportionality” requirement in *Dolan v. City of Tigard*, 512 U.S. 374 (1994). In *Dolan*, the Court held that when governments impose permit conditions, there must be “rough proportionality” between the condition’s requirements and the impacts of the development. Whenever local jurisdictions impose conditions on land use permits, they must be aware of constitutional limits, particularly the “nexus” and “proportionality” requirements of the Fifth Amendment’s takings clause. According to the U.S. Supreme Court, while local governments can place conditions on land use permits, the Constitution requires a “nexus” between the permit conditions and a legitimate regulatory interest. A “nexus” exists where the permit conditions are connected to and further the regulatory interest. Even if there is a “nexus” between the conditions and the regulatory interest, the Constitution also requires that the permit conditions be “roughly proportional” to the projected impacts of the land use development. “Proportionality” does not require a precise mathematical calculation, but jurisdictions “must make some sort of individualized determination that the required [condition] is related both in nature and

It is important to distinguish concurrency mitigation from other tools cities use to accommodate the effects of development, most importantly impact fees. Impact fees are collected from all developers and must only be used for capital improvements. By contrast, concurrency mitigation arises only if a development fails its LOS analysis, and mitigation efforts are not limited to capital improvements. While all four Eastside jurisdictions use impact fees, they use concurrency mitigation to varying degrees. Chapters 2, 4, and 5 explore the possibilities of concurrency mitigation more fully and suggest some ways that jurisdictions could use concurrency mitigation to increase alternative transportation choices.

EXISTING CONCURRENCY STANDARDS AND MEASUREMENT IN THE FOUR EASTSIDE CITIES

All four cities—Bellevue, Issaquah, Kirkland, and Redmond—measure level of service (and thus concurrency) by comparing vehicle use to roadway capacity. This comparison is usually referred to as the “volume/capacity” ratio (v/c). The “volume” side of the ratio is determined by the number of vehicles that use the roadway during the busiest hours of the day.¹⁴ The “capacity” portion of the ratio is determined by “roadway geometry,” essentially the number of lanes, their design, and the roadway’s operational strategy (e.g., signal timing). A v/c ratio below 1.0 means that the roadway’s use is lower than its theoretical capacity. A ratio of 1.0 suggests that the roadway is at capacity. A ratio of greater than 1.0 indicates significant congestion. Each city’s comprehensive plan uses the v/c ratio to determine LOS standards, although the computational methods used to compute v/c and the actual LOS standards selected in each Eastside city vary. The standards establish the highest v/c ratio that will be permitted for a given roadway, intersection, or set of roadway locations at the times of day when congestion is most likely. Bellevue, Redmond and Kirkland’s LOS standards vary by geographic location, requiring better LOS in some zones (usually residential areas) and permitting more congestion in other zones (generally commercial areas). Issaquah’s LOS standards vary by arterial street classification rather than by zone.

The cities regularly measure roadway LOS to determine whether performance standards are being maintained. As of its last LOS report, Issaquah is out of compliance with concurrency requirements. In Redmond, two of seven zones are out of compliance. Bellevue is in compliance, but further development will likely raise compliance issues. Kirkland is in compliance and does not face any immediate compliance problems. The current economic downturn has eased Redmond and Bellevue’s concurrency pressures, but these pressures are likely to increase once the economy picks up.

extent to the impact of the proposed development.” A more complete introduction to proportionality and nexus as it applies to concurrency is given in Append A of this report.

¹⁴ Roadways are busiest generally from 4:00-6:00 p.m., Monday-Friday. This time is frequently known as the “PM peak period.” All four Eastside jurisdictions have set their LOS standards to reflect maximum peak-period use. In determining compliance with LOS standards, Redmond, Kirkland, and Issaquah all measure average vehicle use during 1 hour of the peak period. Bellevue measures LOS compliance by averaging vehicle use during the entire 2-hour peak period.

In addition to general concurrency checks, all four cities conduct an individual concurrency analysis for each development proposal. The cities use a combination of nationally recognized trip generation rates and four-step transportation modeling to project the number of trips that the new development will add to the transportation system and the facilities those trips will use. The cities then add new trips to the volume side of the v/c ratio for each of their LOS measurement locations. If those trips cause the ratio to exceed the pre-determined LOS standard, the development is not concurrent and must be denied, absent mitigation measures.

While the basic methods of concurrency measurement are similar across the Eastside, each city has tailored its LOS standards and its overall concurrency approach to the unique circumstances of the jurisdiction. Kirkland has embraced the GMA's lack of definition regarding LOS standards, has recognized that some congestion will necessarily come with new development, and has set its standards high enough (well above 1.0) so that concurrency laws will not hinder its ability to implement its land-use vision. Issaquah, on the other hand, is currently experiencing considerable growth pressure and significant congestion. Therefore, the city has set its LOS standards so that they prevent new development from exacerbating existing traffic congestion, even if it means limiting development. Redmond and Bellevue have pursued essentially the same approach. The cities began with the assumption that LOS standards should vary throughout the city according to land use, acknowledging the fact that more dense areas of the cities will have higher levels of congestion. However, at the same time, the city officials based their LOS standards on the amount of traffic congestion they believe residents will tolerate. Therefore, the amount and nature of permitted development is influenced as much by the level of congestion city residents are willing to accept as it is by the land-use vision articulated in the city's comprehensive plan. The four cities' different approaches have led to noticeably different results on the ground. For example, in Kirkland, concurrency has been essentially a "non-issue" in implementing the comprehensive plan's development objectives, whereas in Issaquah concurrency has been "the issue" and serves as a significant obstacle to implementation of the comprehensive plan's land-use vision.

THE EXISTING TRANSPORTATION CONCURRENCY SYSTEM: LIMITATIONS AND CONSTRAINTS

Frustrated that Eastside concurrency procedures were hindering the implementation of their comprehensive plans, the four cities undertook this study to identify the major shortcomings of current concurrency practice and to find alternative procedures that could advance the cities' land-use and transportation goals. The issues below are some of the major shortcomings of the current procedures. The proposed alternatives are presented in Chapter 2.

Current measurement methods are auto-focused and don't encourage development of alternative transportation capacity. The volume/capacity ratio approach used by all four Eastside cities (as well as the majority of Puget Sound jurisdictions) considers only the transportation system's capacity to support vehicle traffic. On the volume side, each vehicle is given equal weight regardless of the number of people it carries. Mode-split (the fraction of people accessing the development by each mode of travel) is not an issue, other than the effect it has on the number of car trips generated by a given development. On the capacity side, the number of

lanes, geometric design, and signal timing are considered, but non-automobile aspects of the transportation system, such as the level of transit service, the existence and performance of ride-sharing programs, sidewalk coverage, or bike lanes, are usually not directly considered. In short, when it comes to concurrency in these four Eastside cities, the measure of a transportation system's success is based exclusively on the ability to travel in a single occupancy vehicle. This focus on car travel in concurrency measurement leads to a corresponding focus on vehicle capacity when the transportation effects of development are mitigated. In other words, besides shrinking the size of the development, developers respond by mitigating their traffic volume increases by increasing the capacity side of the ratio. Because capacity is calculated only in terms of auto-carrying capacity, the solutions to the concurrency failure inevitably are car-focused. The fact that the four cities do not have authority to plan or operate public transit routes exacerbates this situation (see a more detailed discussion in Chapter 5). Without a comprehensive picture of the entire capacity of a transportation system—including all modes—concurrency will continue to require development denial or increases in auto-capacity, often through unpopular road-widening projects.

Focus on LOS measurement disguises the fact that, at its core, concurrency is an interaction between land-use goals and transportation expectations. In the GMA, concurrency is discussed in terms of measurement. Cities set LOS standards and then if development will cause the transportation system to exceed the LOS standards, it must be denied. On its face, concurrency seems like an easy measurement problem. As long as cities have LOS standards, concurrency can be determined by a few calculations. However, the focus on LOS measurement obscures the fact that concurrency is really a requirement that cities coordinate their land-use goals and transportation expectations. Ultimately, the LOS standards should be the expression of this coordination, but many jurisdictions have developed their LOS standards without explicitly considering how they will affect their land-use and transportation plans. Generally, cities do not determine when congestion may be useful to implement the land-use plan, given the existing and planned transportation system (e.g., number of lanes of roadway and expected transit service now and over the next twenty years). Consequently, LOS standards are an expression of people's congestion preferences rather than a coordinated relationship between land-use and transportation goals. "Concurrency," therefore, is often the place where land-use plans and congestion preferences collide. And under existing concurrency rules, congestion preferences must win because LOS standards can stop land-use development. A number of concurrency critics have argued that the existing concurrency process is contrary to the goals of the GMA because it forces cities to deny development that is called for in cities' comprehensive plans. However, concurrency does not necessarily require this result. Rather, if LOS standards were established through careful discussion of land-use goals and transportation expectations, concurrency determinations would likely represent an expression of each city's vision.

Most jurisdictions' LOS standards do not evolve over time and therefore do not reflect changing land-use and transportation values. Although some jurisdictions have provided for regular review and revision of their LOS standards, most have chosen LOS standards that remain constant over time. These standards represent, in essence, a negotiated agreement between residents and city officials at a given point in time, with a given set of land-use and transportation values. However, a city's land-use and transportation landscape, as well as its vision and values, do not remain static. Jurisdictions face increasing growth pressure that may

require re-opening the conversation about the LOS standard. By law, each city must accept its share of the region's growth, which from time to time may require a renewed discussion of acceptable LOS standards. Under existing LOS standards (adopted when growth pressures and transportation values were different) a city's acceptance of legally required growth would likely lead to wider roads, something most neighborhood residents strongly resist. However, if cities revisited their LOS standards periodically, in light of changing legal requirements and values, and engaged residents in a discussion of the balance between the land-use vision and transportation expectations, residents might more readily agree to change the LOS standard to avoid wider roads. On the other hand, if the discussion were not tied to changing requirements and values, residents might view revised LOS standards as a sign that the city had broken a compact regarding growth management in their neighborhood.

Regional traffic presents a significant challenge to cities' ability to sustain local concurrency. When analyzing whether new development will be concurrent with transportation facilities, each city generally considers only the effects of that development's traffic on nearby roadways. This local focus neglects the fact that a considerable amount of traffic generated by new development comes from—or goes to—distant destinations, often passing through several jurisdictions on the way. When developing their combined land-use/transportation plans, cities frequently did not account for growth in pass-through traffic. As a consequence, growth in regional pass-through traffic has emerged as one of the most significant challenges to jurisdictions' ability to maintain compliance with their concurrency standards while still permitting land uses called for in their comprehensive plans. In some cases, cities have had to restrict development because regional traffic is overburdening the local system. (Bellevue's experience with development in the Lake Hills community provides one such example.) Exacerbating regional traffic's effect on concurrency is the fact that jurisdictions have few options for reducing the congestion effects of regional pass-through traffic. Cities experiencing the effects of pass-through traffic do not have the power to pursue mitigation from remote developments, and a regional structure of transportation concurrency does not exist. Ideally, regional transportation systems would be managed as a true system, but this would require a higher level of jurisdictional cooperation (in both land use and transportation) than currently occurs. Therefore, cities must rely on inter-local agreements that can be negotiated with neighboring jurisdictions. To date, inter-jurisdictional agreements have been focused on development near jurisdiction borders where obvious traffic effects bleed over onto the nearby streets of another city or county. (BROTS and the Issaquah-King County's impact fee sharing agreement are good examples of these agreements.) The agreements have not tackled a development's effects on traffic a considerable distance from the development site.

SUMMARY

Despite existing problems, transportation concurrency presents an opportunity for local jurisdictions to improve the connection between their land-use goals and transportation expectations. Our investigation of current measurement practices reveals that they are one-dimensional and could be expanded to include other aspects of the transportation system, including services. Expanded LOS measures are entirely consistent with the GMA concurrency framework and would provide cities with an opportunity to accommodate future growth while at

the same time enhancing quality of life. The following chapters present the bulk of our work for the Eastside Transportation Concurrency Project. They include an exploration of alternative measurement systems and transportation policies that would provide the Eastside with an enriched measure of transportation capacity and that could be used to target growth along corridors (or in specific geographic locations) that receive more or better transportation services rather than wider roads.

Chapter 2 of this report describes three LOS measurement alternatives to the v/c measurement system currently used: 1) Enhanced V/C ratio (which includes consideration of transit capacity and other alternative modes of travel), 2) Travel Time corridors, and 3) Regional Mode-Split targets. Chapter 3 describes two ways to implement concurrency analysis to limit the cost and resources required to make concurrency determinations, increase precision of concurrency tests, and make concurrency more predictable and understandable. Chapter 4 discusses the strengths and weaknesses of these proposed measurement alternatives. Chapter 5 explores other factors that affect concurrency—including local control over transit service, funding sources, and regional traffic—and suggests some long-term options that merit further investigation.

CHAPTER 2: ALTERNATIVE APPROACHES FOR DETERMINING CONCURRENCY

The Growth Management Act (GMA) requires that local jurisdictions ensure that new development is concurrent with adequate transportation services and facilities, but the GMA gives jurisdictions nearly limitless discretion to design their level of service (LOS) standards and concurrency measurement process. Jurisdictions should capitalize on the available discretion, designing a measurement process that advances their transportation and land-use goals. If the LOS standards and measurement process are not coordinated with the land-use and transportation objectives of the jurisdiction, concurrency may well become an impediment to the achievement of those objectives.

This chapter describes three intrinsically different approaches to measuring transportation concurrency. They are premised on the assumption that, by employing robust measures of transportation system performance, local jurisdictions can use existing roadways more efficiently and intensively. The three approaches are

1. Enhanced Volume/Capacity
2. Travel Time
3. Regional Mode-Split

Enhanced Volume/Capacity (V/C) adjusts LOS standards upwards if alternative transportation capacity exists, permitting more development where transportation choices are available. Travel Time measures concurrency on the basis of traffic's ability to move along corridors, permitting LOS standards to be set for multiple modes. Regional Mode-Split presents an "outside the box" alternative that focuses on the achievement of regional transportation goals rather than the attainment of localized, facility-based LOS standards.

Like most measurement systems, the proposed alternatives all can be adapted to emphasize different land-use, transportation, and concurrency goals. In fact, in many respects selecting the alternative to meet the city's comprehensive plan goals is the most important part of the concurrency process. The authors often struggled with which adaptation of the alternative to present as the "example case," since each alternative could be used in vastly different ways. For the most part, we chose land-use, transportation, and concurrency goals designed to encourage transportation choice, including placing a premium on transit service and transit-friendly development. However, these goals may not be the ones desired by each Eastside jurisdiction, and they are definitely not required by the proposed alternatives. These same basic techniques could be used to encourage land-use and transportation systems that are pedestrian-friendly, multi-modal, or car-oriented.

Each alternative is explored in a separate section below. Each section includes discussions on 1) setting LOS standards, 2) the measurement process, and 3) concurrency analysis, with various subsections providing additional detail. The focus of these discussions is on implementation—not evaluation—of the three alternatives. Chapter 4 compares the three

alternatives using the criteria provided by the project’s Technical Advisory and Executive Steering committees.

OPTION 1: ENHANCED VOLUME/CAPACITY RATIO

The Enhanced Volume/Capacity (V/C) Ratio, while using the traditional v/c measurement process, provides tiered LOS standards based on whether or not roadways are equipped with alternative transportation modes, such as transit. By using the Enhanced V/C method, jurisdictions make a policy determination to tolerate a higher LOS standard (thus, allowing more vehicle congestion) on roadways where a certain level of transit service is present. This section provides a detailed discussion of the Enhanced V/C alternative, including LOS standards, measurement processes, and specific applications.

LOS Standards Using Enhanced V/C

The biggest change from present concurrency practice proposed under Enhanced V/C is the adjustment of the LOS standards. The measurement process remains essentially the same, but Enhanced V/C allows jurisdictions to recognize transit and other alternative transportation capacity while setting the LOS standard. It is important to note that the measured v/c ratio of cars to roadway capacity *does not change* because of increased alternative transportation choices. Rather, jurisdictions make a policy choice to permit a higher v/c ratio where certain levels of transit service or other transportation choices are present. Therefore, the most important step when implementing the Enhanced V/C concurrency measurement alternative is setting the LOS standard, and in particular, setting the standard so that it encourages the specific transportation system and services desired by the city.

Example LOS Standards

Enhanced V/C provides tiered LOS standards for roadways based on their levels of transportation choices. Using the simplest form of Enhanced V/C, roadways would receive an LOS standard “enhancement” on the basis of the extent of transit service. Those roadways where transit service was below a pre-determined threshold (say, five buses per hour during peak periods) would have a lower LOS standard than roadways where transit service exceeded that threshold. For example:

Standard LOS	LOS if Transit Service (5 buses/hour)
0.90	1.00 (+0.1)

While the above standards incorporate transit into the concurrency decision, the frequency of bus service, by itself, might be an incomplete measure of “adequate” transit service. Therefore, the city might consider other measures of transit quality of service to determine whether adequate transit service existed to increase a roadway’s person-carrying capacity, even if accompanied by an increase in roadway congestion. These measures might include the following:

- HOV lanes or queue jumps on the congested roadway
- Transit signal priority (TSP) on both the buses and the signals of intersections affected by roadway congestion
- Park & ride lots along the transit corridor
- Availability of seats on buses combined with a high frequency of service (e.g., a passenger/seat ratio of below 0.8 and more than five buses per hour) during peak periods.

Including HOV lanes and TSP in the LOS standard would ensure that transit vehicles were not unduly delayed by the vehicle congestion permitted by the increased LOS standard. Moreover, decreased transit delay would increase the attractiveness of transit service, making it an acceptable alternative to the SOV. Park & ride lots along the transit route would concentrate riders and provide an incentive for SOV drivers to consider transit. Seat availability would also increase transit’s appeal, ensuring that riders could find a seat. Including other considerations of transit service quality, the Enhanced V/C LOS structure might look like this:

Standard LOS	Enhanced LOS if Transit Service (5 buses/hour and seat availability)	Enhanced LOS if Transit Priority Equipped (5 buses/hour <i>and</i> a combination of TSP, HOV lanes, park & ride lots)
0.90	0.95 (+0.05)	1.05 (+0.15)

The above three-tiered LOS standard would allow jurisdictions to increase the transit credit where there were additional guarantees of transit effectiveness. But, jurisdictions could also expand the LOS structure to recognize other alternative transportation choices, such as HOV lanes (for carpooling incentives), sidewalks, and bike lanes. For example:

Standard LOS	Enhanced LOS if Transit Equipped (5 buses/hour <i>and</i> a combination of TSP, HOV lanes, park & ride lots)	Enhanced LOS if Transit Plus (Transit equipped <i>and</i> a parallel bike facility exists)
0.90	1.0 (+0.10)	1.05 (+0.15)

The above LOS structures are merely examples of what is possible using the Enhanced V/C alternative. Jurisdictions could (and should) mix and match the measures to create an LOS structure that fits the various land uses throughout the city. For example, a dense area like downtown Bellevue might use a different LOS standard continuum than an area that is primarily residential. The key would be to select measures that accurately described the types of alternative transportation services desired *in each particular location*, and to make sure that the measure selected accurately described the transportation system required to serve the land-use plan adopted in the city’s comprehensive plan.

Enhanced V/C LOS Standards Are Set by Policy Not by Measurement

At heart, Enhanced V/C LOS standards trade increased alternative transportation choices for increased single-occupancy vehicle (SOV) congestion. The Enhanced V/C alternative does not make a technical determination of the amount of additional capacity alternative modes provide to a given roadway. Rather, it involves a policy determination that the alternative modes do provide additional capacity but recognizes that the capacity cannot be measured in a way that fits within the traditional v/c metric. Because the “adjustments” are set by *policy*, not as the result of a specific engineering relationship, each city would have the ability to define the following:

- *What* non-roadway based transportation system facilities and services should be allowed as a trade-off against increased vehicle congestion.
- *Where* those alternative transportation facilities and services should be used to allow additional growth despite vehicle congestion.
- *How much* additional congestion should be tolerated as a result of those facilities and services.

In addition, because the LOS enhancements given for additional transportation choices are a statement of policy, the LOS standards should be carefully set to reflect the transportation alternatives each jurisdiction hopes to encourage. Careful consideration of what types of alternative transportation choices are worthy of higher LOS standards is particularly important, given that mitigation from concurrency failures can provide cities with a way to fund those choices. Because failure of the LOS standard means development must be denied, developers have a significant incentive to mitigate development impacts by providing those services/facilities that would make the roadways eligible for the enhanced LOS standards.

Avoiding False Precision: A Tiered Approach to LOS Standards

Current LOS standards based on v/c ratios create an “all or nothing” system of concurrency in which developments are concurrent on the basis of the estimated numbers of new trips they will generate. Developments that generate fewer trips than the LOS standard permits are concurrent. Developments that generate more trips than the LOS standard permits—even just one more trip—are not concurrent. This system relies heavily on the accuracy of trip generation estimates—estimates that in reality are only informed guesses of the number of new trips a development will generate during the peak periods. Trip estimates for the concurrency analysis are at best a reasonable snapshot of one likely trip generation scenario. However, because roadway volumes vary greatly from day to day, as do the number of trips generated by each development, these “reasonable estimates” should not be viewed as exact or precise. Moreover, the lack of precision should not be translated into unwanted development denials because of the “all or nothing” nature of the concurrency test.

The following example illustrates the problem of “all or nothing” LOS standards. Assume that a roadway has an existing volume to capacity ratio of 1700/1800 or 0.94. Assume also that the LOS standard for this roadway is a v/c ratio of 1.0. If a proposed development is estimated to generate 100 trips on this road, it will remain within the defined standard and will be concurrent. If that proposed development is estimated to generate 101 trips, it will cause the roadway to exceed the standard, and the development will be denied (unless that trip can somehow be “eliminated”). But the reality is that the difference between the trip estimates (100 versus 101 trips) is within the forecasting model’s margin of error. It is simply not possible to state with any certainty that the proposed development will generate 100 or 101 trips, and yet this determination controls whether the proposed development will be permitted.

A developer whose initial trip generation estimate produces an estimate of 101 trips will immediately begin to manipulate the development and/or the trip generation process to eliminate that single “extra” trip. But the focus on eliminating a specific number of trips from modeling estimates loses sight of concurrency’s overall purpose: to make sure transportation facilities can support development. Concurrency analysis should step away from whether development generates 100 or 101 trips, instead focusing on where the development falls within a range of LOS standards.

Tiered LOS standards provide one solution to the current over-reliance on imprecise trip estimates in concurrency determinations. Below a certain point, the roadway’s LOS is clearly acceptable and the development will be considered concurrent without further efforts. Above that point, the tiered structure provides a gradually increasing system of mitigation measures designed to alleviate the effects of the development. Only when roadways affected by the new development are on the high end of acceptable LOS will the “all or nothing concurrency” process be applied. (See Table 1.)

Table 1: Example of Tiered LOS Standards

V/C Ratio	
> 0.7	Development is concurrent
0.7 > 0.8	Development is concurrent if TMA membership
0.8 > 0.9	Development is concurrent if TMA membership and TDM programs
0.9 > 1.0	Development is concurrent if TMA membership, TDM programs, and negotiated development-specific transportation improvements
1.0 >	Development is <u>not</u> concurrent <i>unless</i> developer undertakes specific concurrency mitigation (determined through negotiated agreement with the city) to lower v/c ratio below 1.0.

Perhaps the most important tier for reducing concurrency’s focus on eliminating specific numbers of trips from modeling estimates is the v/c range just below the cut-off point. Developments that fall within this range would have to enter negotiations with the city to mitigate the effects of the development. Developments that barely exceeded 0.9 would be required to perform relatively modest mitigation tasks. But developments that approached 1.0 would be required to perform substantial mitigation to remain concurrent. The goal at this stage of congestion is partly to limit the generation of new vehicle traffic, but perhaps more importantly it is to make sure all developments being constructed in this “partly congested” area are putting in place the programs and/or attributes which will allow successful reductions in traffic volumes later in time as those reductions become more necessary due to continued development.

Consequently, mitigation measures at this “middle” stage of development would be designed through negotiation to limit the travel impacts of development, but would not be focused on removing a specific number of trips from the system. (For example, developments and their tenants might be required to join a TMA or adopt various TDM measures, but would not be required to remove a specific number of trips.) In our example, only when developments exceeded 1.0 would the mitigation measures be directly linked to reduction in trip estimates.

A negotiated concurrency process (rather than an “all or nothing” process) would allow jurisdictions and developers to worry less about the precise number of trips estimated for a given development, focusing instead on the overall impacts of the development on the transportation system. Moreover, it would provide jurisdictions with an opportunity to encourage development designs and other TDM programs that promoted the use of alternative modes of travel.

The negotiation process is recommended because it would allow far more flexibility in designing an outcome that was mutually acceptable to both the developer and the city. The City of Redmond uses a negotiated approach with developers whose projects would exceed

concurrency standards. Negotiated agreements fund capital improvements, ongoing transportation programs, and/or participation in a Traffic Management Association with the purpose of reducing development impacts and maintaining LOS at predevelopment levels. The agreements assure the city that active travel demand management will take place for the life of the development, and they assure the developers that those funds will be spent on TDM efforts relevant to specific development.

Measurement Process

The procedures required to compute and apply the Enhanced V/C alternative are almost identical to those currently used for the existing v/c concurrency process. That is, jurisdictions would use volume counts to measure baseline conditions and use the four-step modeling system to forecast the effects of proposed development. Thus, the Enhanced V/C alternative would change the LOS standards and the concurrency analysis but would not substantially change the v/c measurement and prediction process.

Concurrency Analysis Using Enhanced V/C

There are various ways to test concurrency using the Enhanced V/C alternative, but this report examines just three: 1) zonal, 2) intersection, and 3) location-constrained.¹⁵ These three methods of concurrency analysis are described below. Each description includes an application of the approach to Bellevue's Zone 9 and assumes that the "enhancement" to the v/c-based LOS standard would be based on the frequency of transit service.

1. Zonal LOS Approach

Under the zonal approach, the LOS adjustment would be made for the entire zone rather than for an individual intersection or location. The approach involves setting one "enhanced" LOS standard for the entire zone, dependent on whether a certain number of corridors or intersections are eligible for the transit LOS adjustment. For example, the city could determine that any zone with five or more "transit" intersections would have a higher LOS standard than those zones with less transit service. The v/c calculations would still be made at individual locations, but the entire zone would receive the transit LOS adjustment, rather than just the specific locations where transit service was present.

Example Application

To illustrate how the zonal approach would work, Bellevue's Zone 9 is used as an example. The v/c ratios are one-hour, PM peak hour values taken from the report "Concurrency Update, LOS Snapshot as of May 31, 2001."

¹⁵ Currently, most Eastside jurisdictions test concurrency by using an intersection of v/c ratios combined with a number of allowable "failures" at specific locations.

Example Zonal LOS Standard

Baseline LOS	Enhanced LOS if Transit Service (5 buses per hour headed in a single direction five or more intersections in the zone)
0.90	1.00 (+0.1)

Zone 9 is eligible for the transit LOS standard because bus routes with frequencies of at least five buses per hour transect five intersections. Therefore, the entire zone has a 1.00 LOS standard. (See Figure 1, which shows Zone 9 and the intersections served by transit, as well as the intersections included in the LOS standard.) The enhanced LOS standard increases development capacity in Zone 9. Table 2 compares the zonal approach to the current concurrency process in Bellevue’s Zone 9.

Table 2: Performance Using Zonal Approach

Zone Number	Existing LOS Standard	Transit LOS Standard	Zonal Average V/C
9	0.90	1.0	0.858

As Table 2 demonstrates, the zonal approach increases the development possibilities throughout Zone 9 considerably because it moves the zone from being near the LOS standard to being well below the standard. Under the zonal approach, development in the entire zone is credited for the transit service available at specific locations in the zone. While this approach is the simplest application of Enhanced V/C, it may permit increased congestion in places in the zone where transit service is not present. The second application—intersection LOS—targets the transit credit to the specific intersections that have transit service.

2. Intersection Approach¹⁶

The intersection approach applies the enhanced LOS standard to those intersections that have transit service. In this case, the zone’s LOS standard is based not on the average of intersection v/c ratios but on the individual ratios themselves. The standard is normally stated such that “no more than X locations in a zone can exceed a given LOS.” With Enhanced V/C, the

¹⁶ This approach works for mid-block v/c computations as well as for intersection v/c computations.

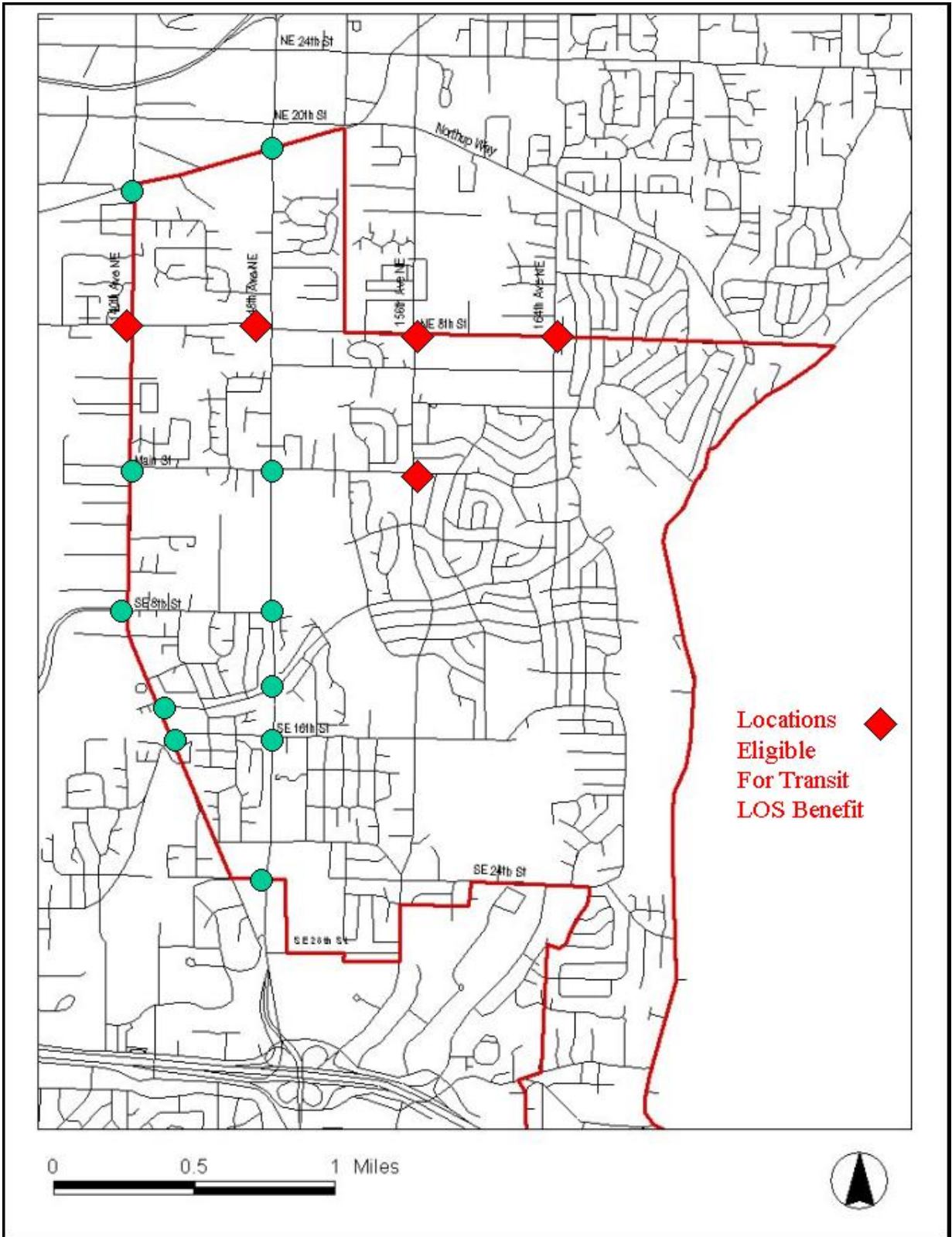


Figure 1: Zone 9 Intersections Meeting Transit Service Frequency Requirement

ratio at each intersection that meets the stated policy criterion is allowed to increase before being considered “over the LOS standard.” Thus, continuing with the transit-based approach used in the previous example, the allowable v/c ratio for any location (intersection) might be set at 0.9, *unless* that location was served by five or more buses per hour, in which case a v/c of 1.0 would be allowed.

Example Application

Again using Bellevue’s Zone 9, the following tables, figures, and discussion demonstrate how the Intersection LOS approach to concurrency analysis would work. As with the previous example, the v/c ratios are one-hour, PM peak values taken from the report “Concurrency Update, LOS Snapshot as of May 31, 2001.”

Example Intersection LOS Standards

Baseline Intersection LOS standard	Transit Intersection LOS standard (5 buses per hour headed in a single direction)
0.90	1.00 (+0.1)

Adjusting Intersection LOS: A transit adjustment of 0.1 is made at each intersection where five or more buses per hour (in a single direction) pass through a given roadway segment or intersection leg. Figure 1 above shows where these intersections are located. Figure 2 shows the v/c values computed by Bellevue for Zone 9 using the TRB Circular 212/1-hour method. The current PM peak period transit usage in the area is used to compute the frequency of bus service. The concurrency requirement is assumed as no more than five intersections in Zone 9 exceeding the LOS standard. Table 3 shows how this would be applied given the five “enhancement eligible” intersections in this example.

Table 3: Performance Using Intersection Approach

	LOS Standard	Number of Intersections	Number of Intersections Exceeding the Standard
Current Approach	0.90	16	5
Enhanced V/C Approach	0.90 1.0	11 5	4 1 (Total = 5)

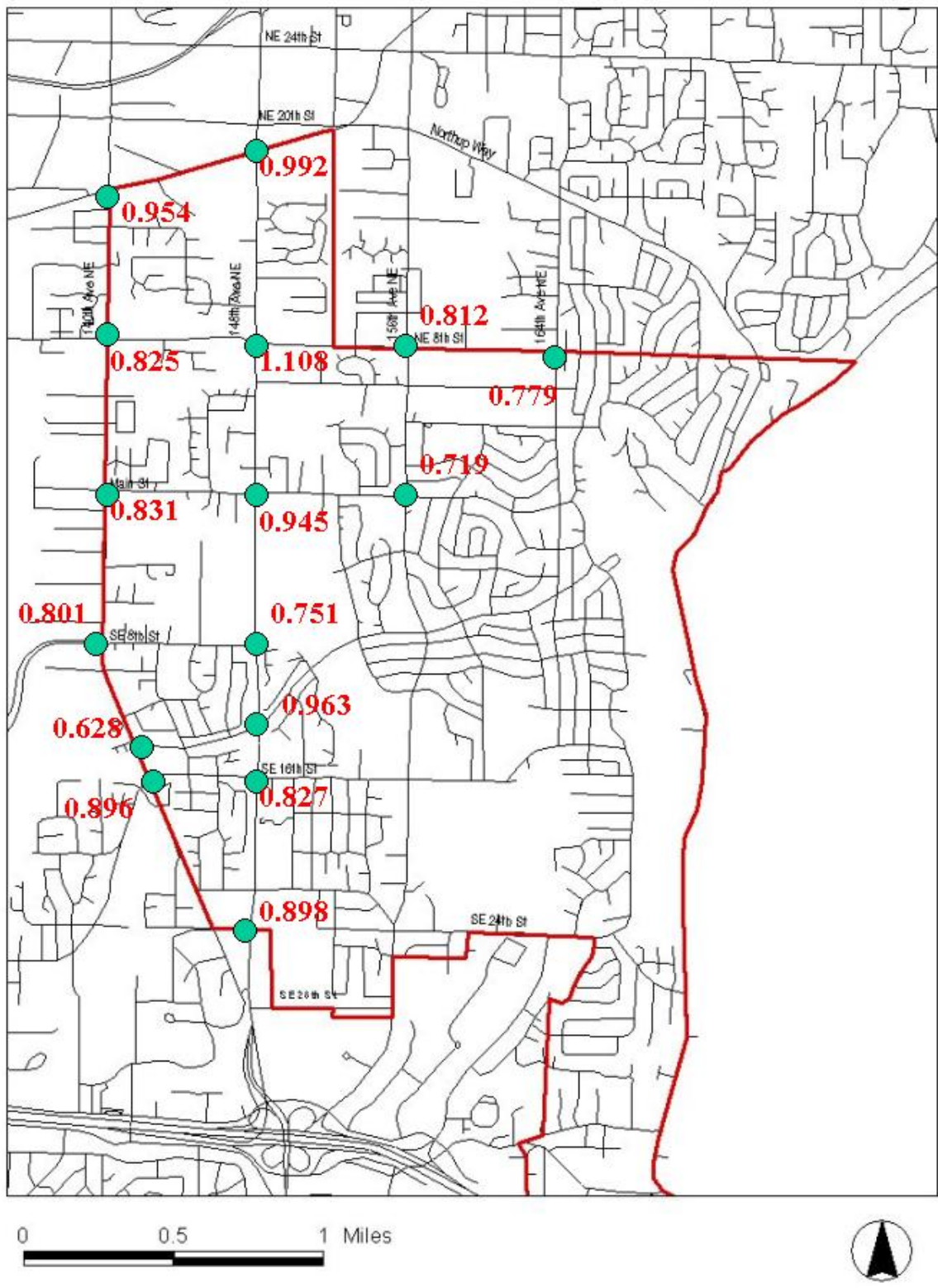


Figure 2: Circular 212 Volume/Capacity Ratios in Bellevue's Zone 9

Interestingly, Table 3 shows that, in this case, relatively little new development potential is gained from this approach to the v/c adjustment. At current levels of transit service, this zone is on the edge of failing the concurrency test, even with the transit LOS adjustment. Only five intersections benefit from the selected adjustment, and four of those intersections are already well below the Enhanced V/C standard. The fifth (NE 8th St and 148th Ave NE) is so far above the standard that the v/c adjustment does not make that intersection compliant. Without increasing transit capacity at additional intersections in this zone, the City of Bellevue would need to concentrate its development in the area of Crossroads and on NE 8th between Crossroads and I-405.

However, even in Zone 9, this method of Enhanced V/C analysis could provide additional benefits by encouraging a developer to help support additional transit service. Mitigation is required where developments fail the concurrency analysis. Under the current v/c approach, developers can only mitigate the impacts of their development by 1) funding roadway projects (such as road widening) or 2) scaling back the development. In contrast, the Enhanced V/C approach provides a third option: developers can fund transit capacity so that more intersections are eligible for the transit adjustment. For example, if a developer (or collection of developers) funded increased bus service along 148th, three additional intersections would become compliant. (See Figure 2 above and Table 4 below.)

Table 4: Performance Using Intersection Approach with Increased Transit Capacity on 148th

	LOS Standard	Number of Intersections	Number of Intersections Exceeding the Standard
Current Approach	0.90	16	5
Enhanced V/C Approach	0.90	8	1
	1.0	8	1 (Total = 2)

3. Location-Constrained Approach

The Zonal and Intersection approaches to concurrency analysis are relatively easy to perform, requiring only modest amounts of staff time. But they provide all new developments within the zone the benefit of the transit LOS standard, regardless of whether the development is near or far from the transit service and regardless of whether the development is likely to generate transit users. By contrast, the Location-Constrained approach applies the enhanced LOS standard only to those developments that are located close enough to the transit service so that at least some of the development’s trips are likely to use transit service.

Eligibility requirements of the enhanced LOS standard could incorporate a number of factors, including the following:

- The development must be within walking distance of a transit corridor (perhaps ¼ mile)
- The development must be within a defined “urban center” where there is a concentration of transit services
- The development must be within walking distance *and* have a “transit-friendly design” (i.e. sidewalks, small setbacks, limited surface parking, etc.).

Geographic proximity alone is likely to increase the chances that the development will produce transit riders, but adding “transit-friendly” design elements to the LOS eligibility requirements provides even more rider incentive. In zones where v/c ratios are bumping up against current LOS standards, the geographic proximity requirement would concentrate new development along transit corridors or in transit-served centers, increasing land-use densities and thus enhancing the viability of transit. And “transit-friendly” design requirements would provide developers with incentives to design non-auto oriented developments, which would further encourage transit ridership and would encourage development consistent with the comprehensive plan. Transit-friendly considerations may include the following:

- If the development is residential or commercial office space, does the site design allow easy access to transit?
- If the development is pure retail, is it likely to serve transit-oriented or pedestrian patrons?

The Location-Constrained approach to the Enhanced V/C alternative would not, by itself, prohibit certain kinds of development. Rather, it would ensure that where roadways were nearing baseline LOS standards, the enhanced LOS standards would be available only to those developments that were likely to take advantage of the jurisdiction’s transit capacity. In essence, cities could use the enhanced LOS eligibility requirements to encourage transit-friendly development concentrated around transit services.¹⁷ At the same time, all other developments, although not prohibited outright, would be held to an LOS standard that assumed that they were auto-oriented.

The Location-Constrained approach would provide developers with powerful incentives to fit their developments within the eligibility requirements in order to increase the size and

¹⁷ The Location-Constrained approach could also be used with LOS standards that address alternative modes of travel. However, care would have to be taken in the design of the incentive system. Modes such as walking are very sensitive to scale, the presence of amenities (sidewalks, weather protection), and the specific mix of land uses present at a location. For example, a city might want to apply a v/c adjustment for walking only within a limited geographic area that corresponded to a specific mixed-use set of developments. The State of Florida has explicitly defined these areas as “Multi-modal Transportation Districts” (MMTDs). To be designated as an MMTD, these districts must be of specific size, contain specific, compatible land uses, and have transportation networks that are compatible with the alternative modes under consideration. This scale might be expanded to reflect an entire mixed-use area (such as an urban center) such as Bellevue’s or Kirkland’s downtown. In such a case, a v/c adjustment within that core area might be adopted and applied *only to intersections within that core area, and only for developments within that core area* that were compatible with the existing mix of land uses.

(likely) the profitability of their development projects. It would also create a concurrency process that reinforced the linkage between the comprehensive plan’s transportation and land-use elements, by providing incentives for developments that met both land-use and transportation goals.¹⁸

If a city adopted location and land use eligibility requirements, the Location-Constrained approach would likely produce situations in which a transit-friendly design would be permitted for a given parcel of land, while a traditional development of equal size would not be permitted. Similarly, a transit-friendly design built within the “designated walking limits” of the transit corridor would be permitted, while the same, transit-friendly development built on a parcel of land outside of the “designated walking limits” would be denied. In this latter case, the “permitted” development would receive permission to build because it would be located on a parcel to which transit service was (or would be) available, thus providing a reasonable alternative to travelers. The “denied” development would be rejected because its location would engender little confidence that modes other than the car would be used to access it. Therefore, it 1) would contribute substantially to a congested situation that already exceeded limits, and 2) would not contribute to the jurisdiction’s transportation choices policy goals.

Example Application

Bellevue’s Zone 9 is again used to illustrate how the Location-Constrained approach would work. As before, the v/c ratios are taken from the report “Concurrency Update, LOS Snapshot as of May 31, 2001.” This example combines geographic location and land-use design requirements with the Transit LOS eligibility requirements.

Example LOS Standard

Baseline LOS Standard	Transit Service LOS Standard (5 buses/hour)	Transit-Equipped LOS Standard (5 buses/hour <i>and</i> TSP or HOV lanes)
No more than 5 intersections can exceed the LOS standard of 0.90	No more than 5 intersections can exceed the LOS standard that is 0.90 if limited transit service, or 1.0 if 5+ buses are present	No more than 5 intersections can exceed the LOS standard that is 0.90 if limited transit service, or 1.0 if 5+ buses are present, or 1.2 if 5+ buses <i>and</i> TSP or HOV lanes

¹⁸ An excellent side benefit of increased land-use/transportation coordination should be increased transit patronage along the corridor, which would in turn provide support for additional transit service, resulting in further increases in transit mode split. This would result in reduced vehicle traffic and congestion on the neighboring arterials and on other arterials in the city. (For example, other travelers already using the corridor would be likely to switch from their car to transit because the added transit frequency supported by the new development would make transit a more attractive travel choice.) The increased transit services would also provide additional mobility to residents and patrons of the transit-friendly developments located near those services.

Transit Service/Transit-Equipped LOS Eligibility: The requirements for transit service LOS eligibility are as follows:

1. Walking Distance: development must be within ¼ mile of a transit corridor
2. Transit-Friendly Design: sidewalks, maximum setbacks, limited surface parking

If the development meets *both* of the above requirements, its concurrency analysis would use the Transit Service or Transit-Equipped LOS standard, depending on intersection classification. The concurrency analysis for all other developments would use the baseline LOS standard.

Figure 3 provides the PM peak, one-hour, v/c ratios for Bellevue's Zone 9 as of May 2001. Figure 3 also shows the number of vehicles per hour that can be added to each intersection before the computed v/c ratio hits the Baseline LOS standard.

Figure 4 shows the transit corridors within Zone 9 that meet the five bus per hour threshold and indicates the hypothetical "transit-equipped" improvements (such as TSP and HOV lanes), making the corridor eligible for the enhanced LOS standards. The gray band around the transit corridor shows the area of Zone 9 within which developments would be eligible for the enhanced LOS standards if the developments also contained "transit-friendly design."

Figure 5 shows the number of vehicles that can be added to each intersection with both the "transit-equipped" enhanced LOS standard and the baseline LOS standards.

A Hypothetical Development: Assume that a developer proposes to build a multi-family residential development that will generate 200 trips in the peak hour at Location A within the enhanced LOS of Zone 9 (see Figure 6). The development qualifies as a "transit-friendly" development, making it eligible for the enhanced LOS standards. The development's trips will be distributed across the roadway network, as shown in Figure 7. Figure 8 shows the new v/c ratios that result from adding these trips to the existing roadway volume and the "new" remaining volume that can be added while remaining below each standard, given that the development falls within the "transit benefit district boundaries." Table 5 shows the effect on the total concurrency determination process.

As shown in Figure 8, the intersection closest to exceeding the enhanced v/c standard is at NE 8th St and 148th Ave NE. Thanks to both significant transit service and a designated HOV lane, this intersection has an adjustment of 0.3 added to its allowable v/c ratio. The result is that despite the addition of 145 vehicle trips because of the new development at Location A, another 95 vehicle trips can still be accommodated while this location remains within the new level of service rule. (Note that if an HOV lane or TSP installation were not present at NE 8th Street and 148th Avenue NE, this intersection would not be eligible for the enhanced LOS standard of 1.2, and thus the development would not be concurrent. However, to attain a positive concurrency status, the developer could help fund one of those efforts as part of concurrency mitigation.)

While the development at Location A is concurrent, if this exact same "transit-friendly" development was proposed for Location B instead of Location A, the development would not be allowable under this concurrency process because the development would be located too far

away from frequent bus service for the city to anticipate that the development would support significant transit use. (See Figure 9.) Consequently, the development at Location B would not be eligible for the transit benefit LOS standards, and the existing v/c ratios would exceed Baseline LOS even before the traffic generated by the development was added to the roadway network

Table 5: Zone V/C Ratios For East Bellevue Including TSP and HOV Lanes

Development Location	LOS Standard	Intersections Failing Standard	Comparison Against Standard
A	0.9 (baseline) 1.0 (Transit Service LOS) 1.2 (Transit Equipped LOS)	5 (of 11) 0 (of 1) 0 (of 4)	(5 failures of 5 allowed) Pass
B	0.9 (baseline) 1.0 (Transit Service LOS) 1.2 (Transit Equipped LOS)	6 (of 16) 0 (of 0) 0 (of 0)	(6 failures of 5 allowed) Fail

As can be seen in this simple set of examples, combining v/c adjustments selected to promote the use of specific alternative transportation modes (in this case transit) with geographic constraints tailored to restrict their use to locations with reasonable access to those modal facilities can allow a city to use transportation concurrency calculations to encourage specific types of developments and development locations.

The particular set of LOS standards, transit benefit policy statements, and existing roadway levels of congestion in the above example would result in a transportation concurrency situation in which the only development permitted in this zone would be in areas designated as “transit benefit districts” (the shaded area in Figure 4). This would be an excellent outcome if the city wished to promote such development in these locations. It would be a poor outcome if the city did not wish to concentrate most development in dense, transit-friendly locations.

This result highlights the need to start with a clear vision of the land uses and transportation systems desired as an outcome. Without this clear vision, it is difficult to design the appropriate performance statistics, policy statements, and level of service standards. Poor selection of any of these is likely to result in incentives provided to developers that encourage land uses that are not desired, or transportation system performance that is sub-optimum.

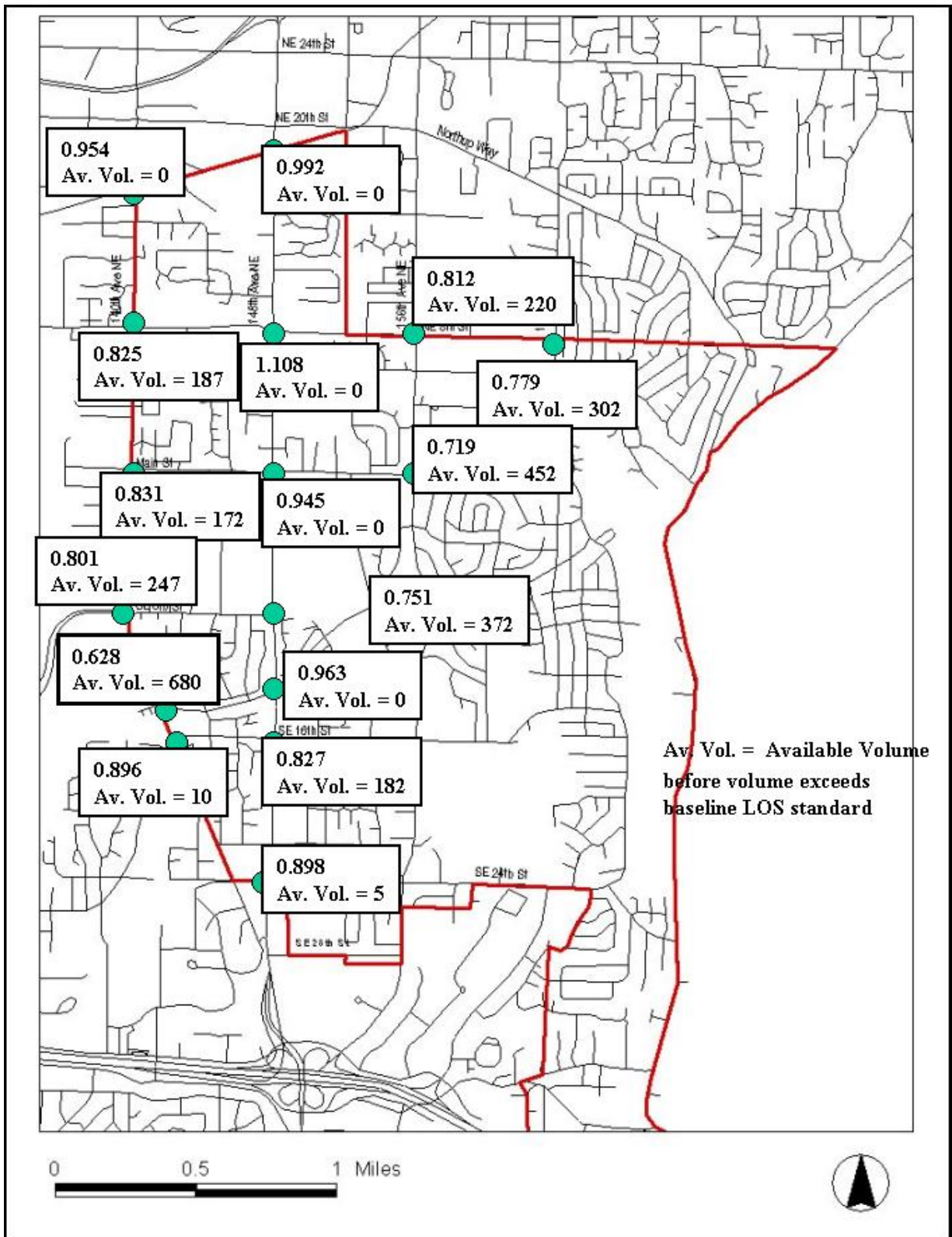


Figure 3: Illustration of Volume/Capacity Ratios and Allowable Volume Growth

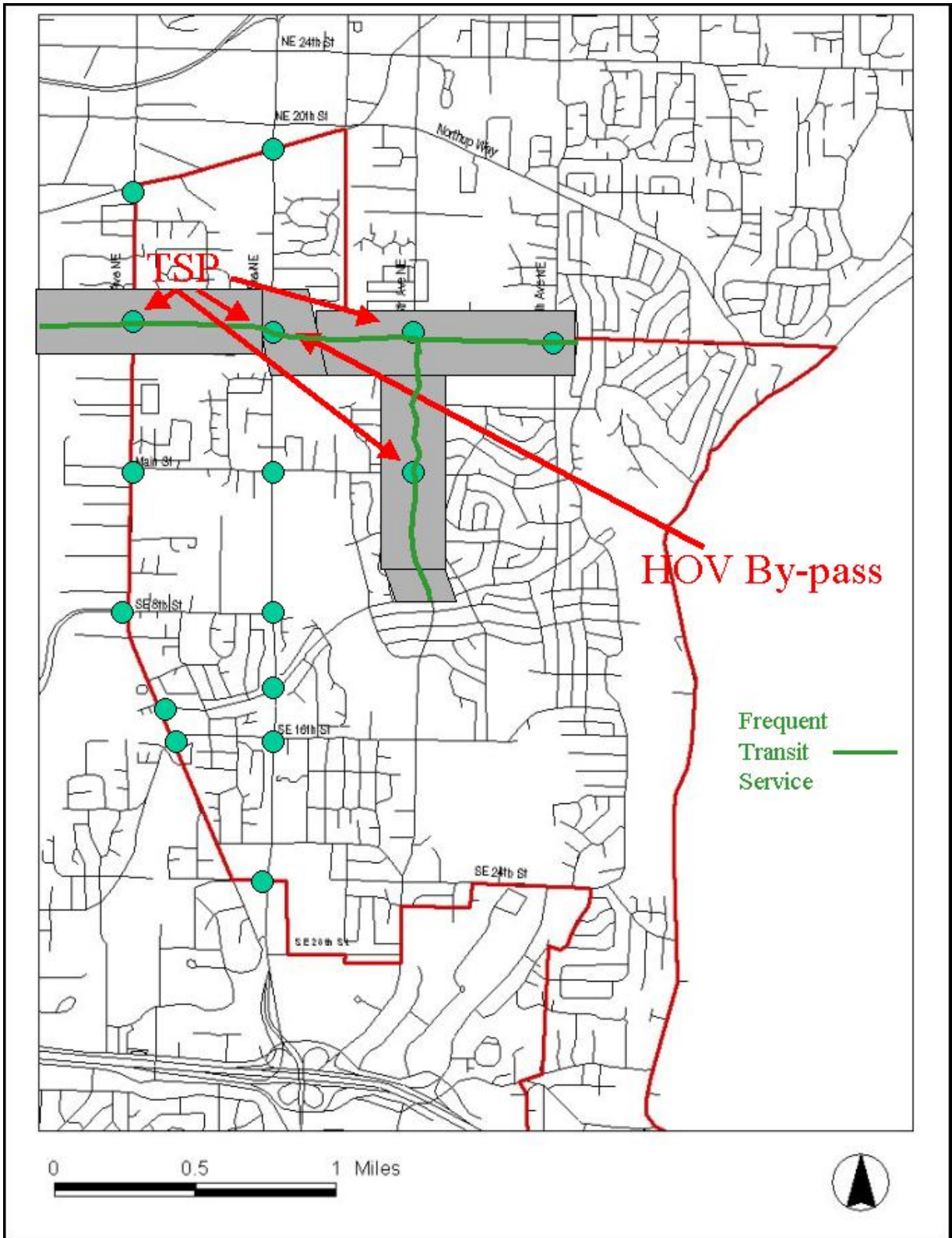


Figure 4: Transit Improvements Included in Enhanced V/C Computation

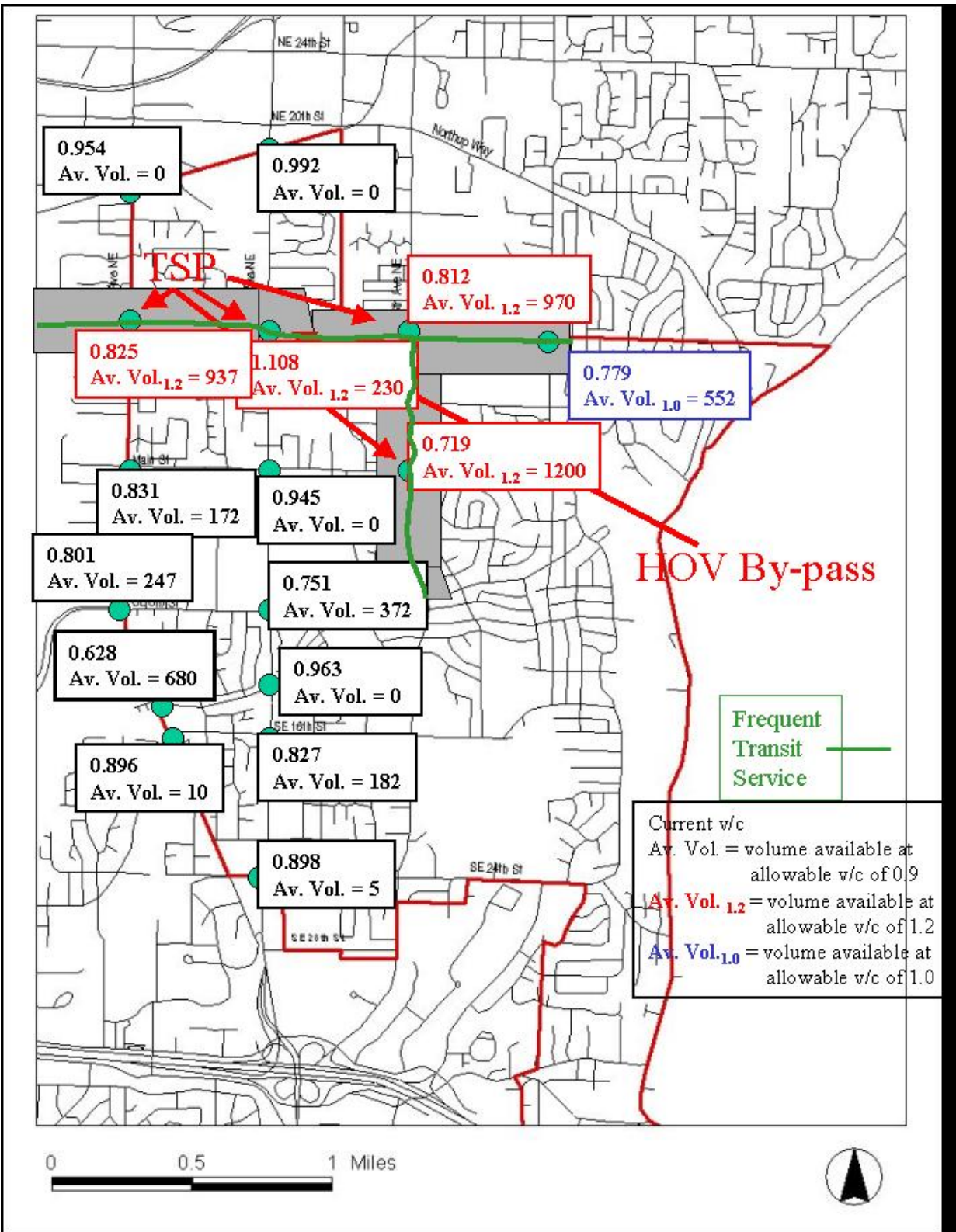


Figure 5: Changes in V/C and Allowable Volume Increases Based on Availability of Transit Improvements

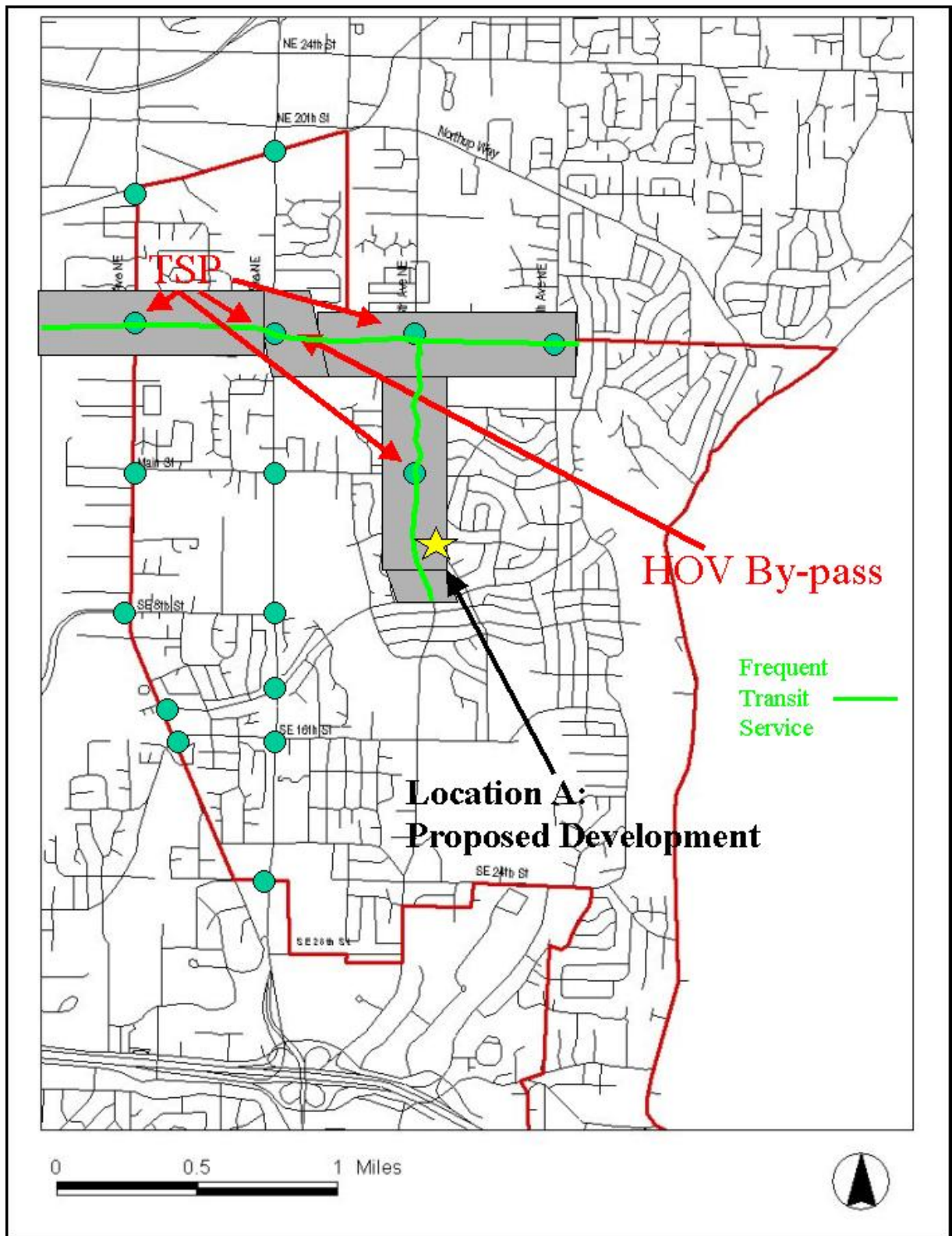


Figure 6: Location of Example Development

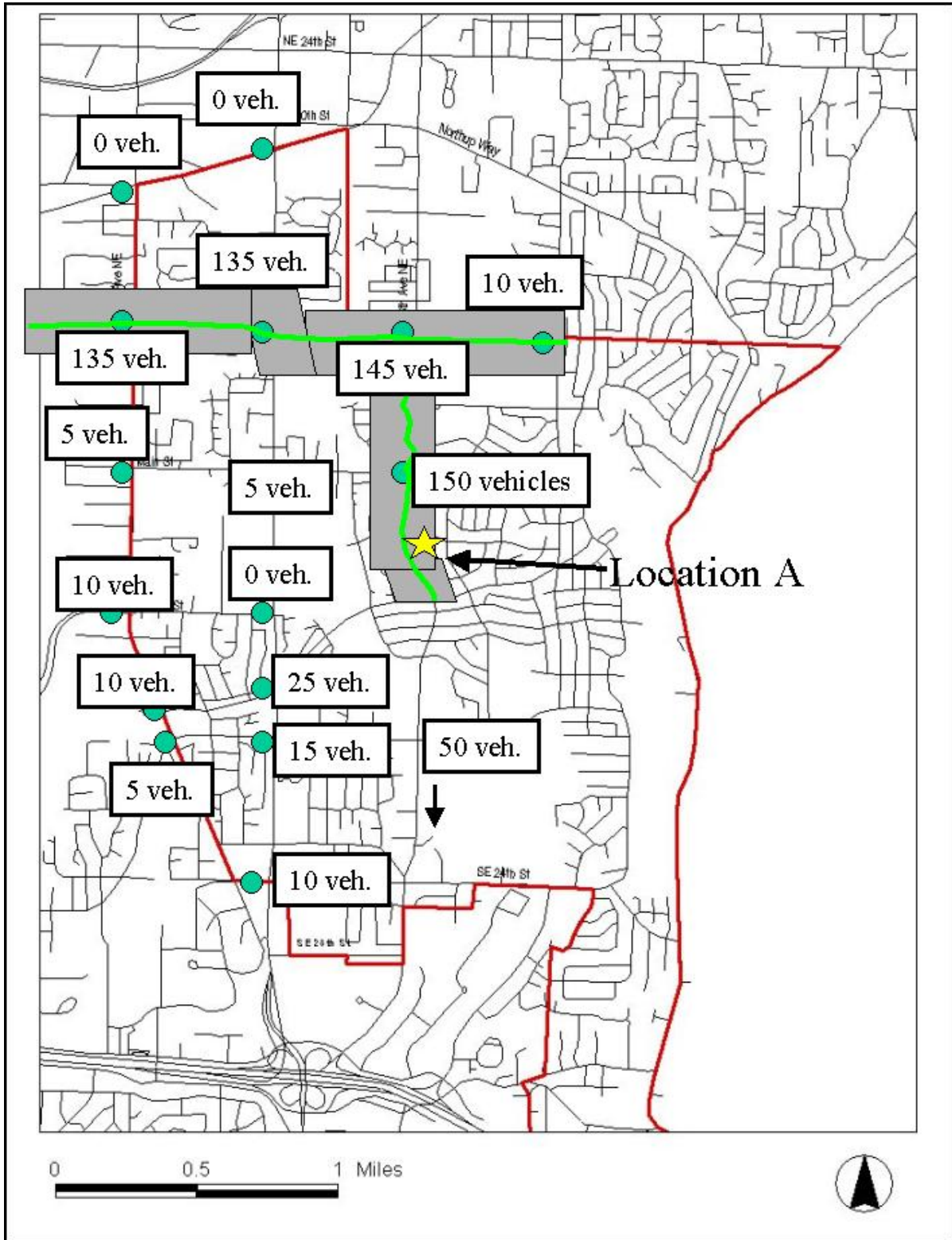


Figure 7: Distribution of Vehicle Trips Generated by Proposed Development

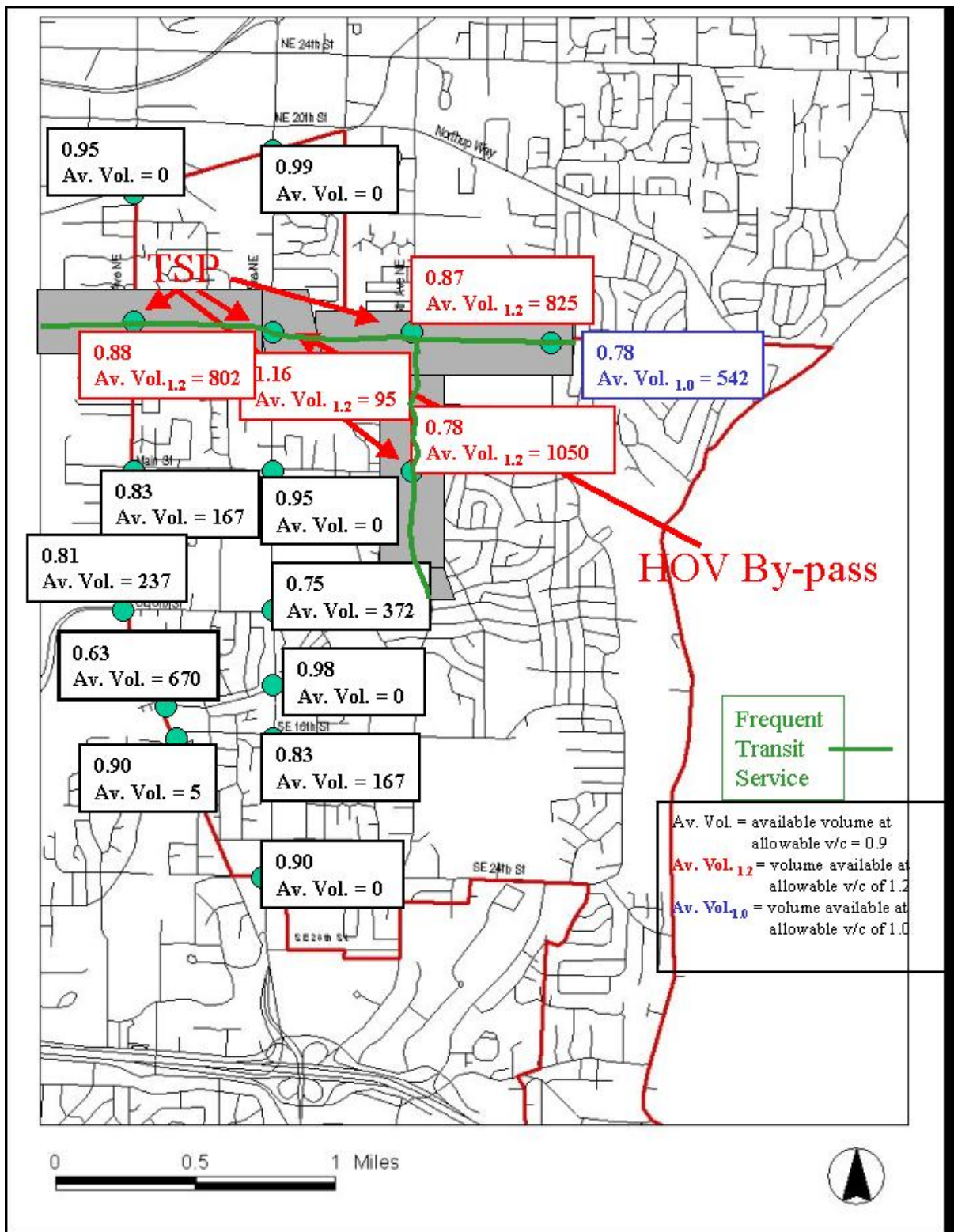
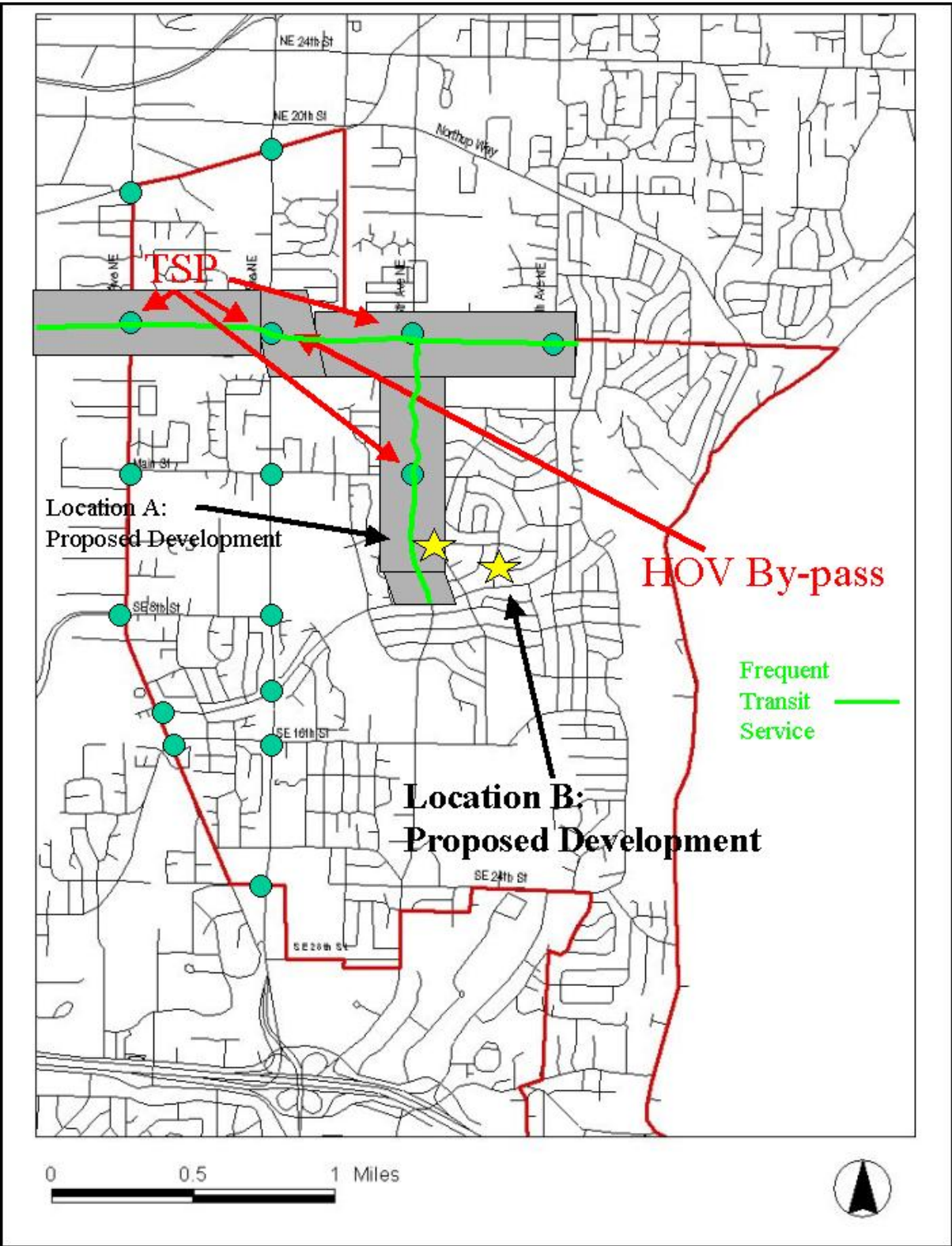


Figure 8: Actual and Adjusted V/C Ratios and Available Vehicle Volumes After Addition of New Development Generated Trips



**Figure 9: Alternative Location of Proposed Development
(Now Outside of Transit Benefit District)**

OPTION 2: TRAVEL TIME

The Enhanced V/C alternative builds on concurrency methods already used by the Eastside cities. This section explores travel time as an alternative concurrency measurement method and represents a significant departure from traditional v/c calculations. Travel time is an obvious choice for measuring transportation level of service because it reflects many Americans' perception of transportation. When asked "How far is it from here to my destination?" many Americans will answer with a measure of time. "Ten minutes from here to there."

Travel time as the measure of currency has a number of advantages over the traditional v/c approach, but it also has limitations. For instance, travel time is advantageous because it is easily explained and understood by the general public; only transportation officials speak about transportation performance in terms of v/c ratios. LOS standards will likely carry more credibility with the public and government officials if they are easily understood and translated into everyday experience. However, clarity may be a double-edged sword. While residents may be willing to sacrifice some transportation performance to permit development without road-widening, once a travel time is associated with that sacrifice, the public may be more resistant to decreased LOS standards. For example, an increase of the v/c from 0.9 to 0.95 is not easily translated into driver experience. But a driver immediately understands the ramifications of an LOS change from 10 miles in 20 minutes to 7 miles in 20 minutes.

Travel Time also counters another drawback to the traditional v/c ratio. Concurrency measurement using the v/c ratio is confined to a specific site, usually an intersection, and does not capture the "flow" of the roadway network. Consequently, a few trouble spots can show heavy congestion even though the vast majority of roadway network is functioning smoothly. By contrast, Travel Time measures movement over a larger geographic area. That is, Travel Time covers vehicle movement along a corridor instead of vehicle volumes at a specific intersection. Measuring movement along a corridor, Travel Time balances the performance of a series of roadway segments and intersections.

Traditional v/c measurements are also inherently car-based. While the Enhanced V/C alternative would provide one way to adjust LOS standards where alternative transportation capacity exists, it would do so through policy adjustments, not measurement solutions. Alternative modes of travel, on the other hand, can be built directly into the Travel Time statistic. Separate Travel Time LOS standards can be set for the various modes, or the modes can be combined into one travel LOS standard through the use of weighted averages. But while car-based v/c ratios are relatively straightforward predictions of car traffic, transportation model limitations make accurate travel time estimates, especially across modes, much more difficult to predict. (Measurement accuracy is discussed further below.)

Travel time can be used as a concurrency measure in two different ways. The first approach, called "Key Center," bases LOS standards based on the time it takes to travel out of the city from a central point. Under the Key Center approach, the concurrency determination is based on the development's effect on travel to and from a pre-determined key point. This approach is currently used by the City of Renton. The second approach, called "Corridor," defines LOS standards for a variety of important corridors throughout the jurisdiction. Using the

Corridor approach, the concurrency determination is based on a development's effects on either the corridors near the development site or the corridors accepting the majority of the development's trips.

The following sections discuss setting Travel Time LOS standards, creating a measurement process, and applying the Key Center and Corridor approaches.

Setting LOS Standards Using Travel Time

As with any approach to transportation concurrency, the first step in designing the measurement program is establishing LOS standards to measure performance. For Travel Time, this means:

1. Selecting the end points of the trip, usually along a corridor, that will be used to calculate travel time
2. Defining which travel modes will be included in the LOS standard
3. If multiple modes are included, determining how the travel times of the various travel modes will be combined into one measure or a single decision point
4. Selecting what travel time for each corridor represents the limit of "acceptable" performance.

While all four steps require careful attention by jurisdictions considering Travel Time, steps two and three are perhaps the most challenging aspects of setting Travel Time LOS standards. All four Eastside cities have expressed a desire to measure more than car traffic when determining concurrency. Therefore, determining whether (and how) to combine multiple modes into a single performance measure is a particularly crucial step and one that is filled with a number of uncertainties.

A variety of multi-modal, Travel Time LOS standards are possible. Travel Time LOS standards could be determined for each mode, for example, providing an auto LOS standard of 2 miles in 5 minutes and a transit LOS of 2 miles in 10 minutes. Or LOS standards could be set by a simple average of the multiple modes. Using the above example, the LOS standard would be 2 miles in 7.5 minutes. The simple average, however, would produce LOS Travel Time standards that were significantly longer than current car performance because buses generally travel more slowly than cars as they stop to pick up and drop off passengers. To reduce the transit bias, a multi-modal Travel Time LOS standard could also be calculated by multiplying travel times by mode-split. For instance, again using the above example and assuming that the car/transit mode-split was 90/10, the LOS standard would be 2 miles in 5.5 minutes ($5 \text{ min} * 0.9 + 10 \text{ min.} * 0.1$). This would provide only a slightly longer LOS standard to account for transit.

The four steps outlined above are explored in detail using the Key Center and Corridor approaches in the Concurrency Analysis section below.

Measurement Process

Once jurisdictions have developed their LOS standards, the next step is to measure existing travel time performance to establish a baseline against which the effects of new developments will be judged. Travel time baselines can be developed in two ways: 1) measurement or 2) estimation. Transportation engineers measure actual travel times along corridors by actually driving them (or, to measure transit, by riding the bus). Transportation engineers estimate auto travel times using transportation system models, relying on many of the same processes that develop v/c estimates. These same procedures are used to predict future travel times given changes in demand and transportation system features. The most accurate concurrency baselines are developed through a combination of both methods, as direct measurement is used to calibrate and verify the accuracy of the estimation procedures being used to predict future performance. Cities adopting Travel Time LOS standards should annually or biennially undertake travel time measurement as a check on the accuracy of the model's estimates.

Baselines developed from estimates also fall into two groups. The most common tool for estimating auto travel time is the standard four-step planning model. However, the accuracy of four-step modeling estimates is limited because the network models used do not contain the roadway details necessary to be highly precise. Among the inputs generally missing from the models are

- actual traffic signal timing plans (cycle length, phasing, offsets)
- geometric roadway details (the presence and length of left turn bays, or the presence and effects on capacity of two-way left turn lanes)
- the size and frequency of mid-block turning movements (e.g., movements into and out of shopping centers).

There are two ways that jurisdictions can deal with the limitations of the four-step modeling process. First, jurisdictions can simply accept the limitations, relying on frequent field measurements to adjust for inaccuracies in the estimates. Second, jurisdictions can use more sophisticated engineering tools to examine all of the roadway factors that affect travel time. The details missing from standard four-step models are present in more sophisticated traffic engineering analytical packages.¹⁹ These detailed packages can be used to predict baseline travel times with a much higher level of accuracy and precision, but they are more expensive to maintain and operate and require a significant investment of staff time to calibrate and use. Simply put, advanced transportation models are an excellent—but costly—way to estimate travel time.

¹⁹ These packages can include simulation models such as NETSIM and PARAMICS, or signal timing programs such as PASSER and TRANSYT, as well as a variety of other traffic engineering models.

Concurrency Analysis Using Travel Time

In many respects, the most difficult aspect of the Travel Time alternative is determining what effect new development will have on travel times. Two concurrency analysis approaches are possible. First, jurisdictions can use trip estimation models to make a one-time determination of the total number of trips that can be added to the geographic areas surrounding the Travel Time corridor before actual travel times reach the LOS standard. This type of concurrency analysis is considered the “new trips allowed” approach. Trips from new developments are then subtracted from the pool of available trips until the standard is met (or until the baseline condition is recalibrated with new estimates or measurements). Second, jurisdictions can use four-step modeling (and any subsequent traffic engineering techniques) to generate new travel time estimates for each new development, comparing those estimates with the LOS standards. This type of concurrency analysis is considered the “development-by-development” approach. These two approaches are explored in the specific applications of the Key Center and Corridor methods of concurrency review.

Example Applications

1. Key Center Approach

The Key Center approach measures concurrency on the basis of travel times along specific corridors radiating outward in all directions from one point in the jurisdiction, usually the central business district. The City of Renton uses the Key Center approach to measure concurrency. Renton sets a citywide LOS standard based on how far (in miles) a person can travel out of downtown within 30 minutes along three different corridors. The LOS standard is a weighted average of miles traveled by three different modes (SOV, HOV, and transit). Renton’s current LOS standard is 19 miles in 30 minutes along each of the three corridors. Renton uses the following formula to calculate its baseline:

$$\frac{(\text{Sum of SOV} + \text{Sum of HOV} + 2(\text{Sum of Transit}))^{20}}{3 \text{ (number of corridors tested)}}$$

After determining the baseline, Renton uses the “new trips allowed” approach to conduct its concurrency analysis. It calculates the number of additional trips that can be accommodated within the city limits before the LOS standard is exceeded. As new developments are proposed, trips are subtracted from the “allowable trips” pool until the pool is empty or the LOS standard is

²⁰ where: **Sum of SOV** equals the total distance traveled by a single occupancy vehicle in 30 minutes on three corridors radiating out from downtown;

Sum of HOV equals the total distance traveled by a carpool in 30 minutes on three corridors radiating out from downtown;

Sum of Transit equals the total distance traveled by a bus in 30 minutes on three corridors radiating out from downtown.

reset. If an insufficient number of allowable trips are available to cover a new development, the development is not concurrent unless mitigation efforts reduce the number of trips or provide for transportation system improvements that decrease travel times. In practice, however, Renton regularly adjusts its LOS standards to keep available trips in the pool to accommodate additional growth.

The Key Center approach used in Renton is most appropriate when a city wants to increase or protect the vibrancy of a specific portion of the city. A city adopting such an approach must identify the key corridors used for accessing a geographic area that will be the basis of the LOS standard and select the travel modes that will be included in the standard.

Setting the Key Center LOS Standard. The LOS standard can be set using a number of different statistics:

- Distance traveled along a corridor in 30 minutes (Renton’s standard)
- Average speed along a corridor
- Travel time from one point to another along a corridor.

No matter what the statistic, the Key Center LOS standard is a combined measure of performance on a number of corridors radiating out from a central point. Assuming the jurisdiction chose travel time as its measurement statistic, the LOS standard would be set by examining current and predicted travel times (given expected levels of development and transportation improvements) and comparing those outcomes with publicly acceptable levels of transportation system performance. Like all other approaches to concurrency, the LOS standard is a negotiated agreement of development and transportation preferences between concerned citizens, their elected officials, and city staff. What emerges from the Key Center approach is a single LOS standard that is applied *citywide*. The concurrency of each development is based on the number of trips it adds to the key center corridors included in the LOS standard.

Concurrency Analysis Using Key Center Approach. Both the “new trips allowed” approach and the “development-by-development” approach can be used to perform the Key Center concurrency analysis. This section further explores the “new trips allowed” approach, while the Corridor section explores the development-by-development approach. However, either method of concurrency analysis can be applied to both Travel Time LOS approaches.

As described above, the “new trips allowed” method of concurrency analysis creates an “available trips” pool. As each development is proposed, trips are subtracted from the pool until it is empty. A crucial component of the “new trips allowed” method is regular (perhaps annual or biennial) updating of the travel time baseline and allowable trip pool. Updating includes refinement of model inputs and recalibration of the modeling system, and it also should include additional field measurement.

Revision of the number of “available trips” is based on how many trips can be added to the model network while maintaining acceptable travel times. This estimate is significantly affected by the assumed location of the new developments, the direction of travel of trips

generated by the predicted developments, and the trips' mode of travel. Predicted vehicle trip volumes are then added to the existing transportation system usage patterns and performance (in travel time) is calculated. Regular model refinement and recalibration ensures that the available trip pool reflects

- changes in the transportation system
- differences between previously assumed development sizes and locations and actual development sizes and locations
- changes in land use in neighboring jurisdictions
- changes in trip making behavior
- any changes in allowable travel time performance.

The recalibration process ensures that the accuracy of the general trip forecasting procedure is maintained.

Drawbacks of Key Center Approach. Because the Key Center approach focuses entirely on movement to and from one part of the city, its concurrency analysis ignores congestion created by new development in areas of the city that are not included in the Key Center LOS standard. By focusing only on a key center, the approach does not necessarily examine a development's most significant transportation impacts. In a small city where traffic patterns are closely tied to the key center, the travel times associated with that key center can be an excellent surrogate for mobility within the city as a whole. But in a larger city, a development that is built far from the key center may have relatively little impact on the defined corridors leading to/from the key center but may create considerable congestion near the development site. If so, the impacts of new development are badly underestimated by a concurrency analysis focused on the development's effect on a key center.

2. Corridor Approach

For larger cities, and especially for cities with multiple centers, the Corridor approach is a more effective Travel Time concurrency tool than the Key Center approach. In fact, the Corridor approach likely is a more appropriate concurrency method for the four Eastside cities. The Corridor approach measures a development's impacts throughout the city on the basis of changes in travel times along major corridors.

The Corridor approach first requires identification of those corridors that will define the LOS standard. At the most comprehensive level, LOS standards can be developed for all major travel corridors within the city. Or LOS standards can be developed for the five or six corridors that are particularly sensitive to development changes. A recent transportation study looked at the possibility of the Corridor approach in Redmond. The study recommended 10 corridors (see Figure 10) on the basis of factors including

- traffic volumes
- travel patterns

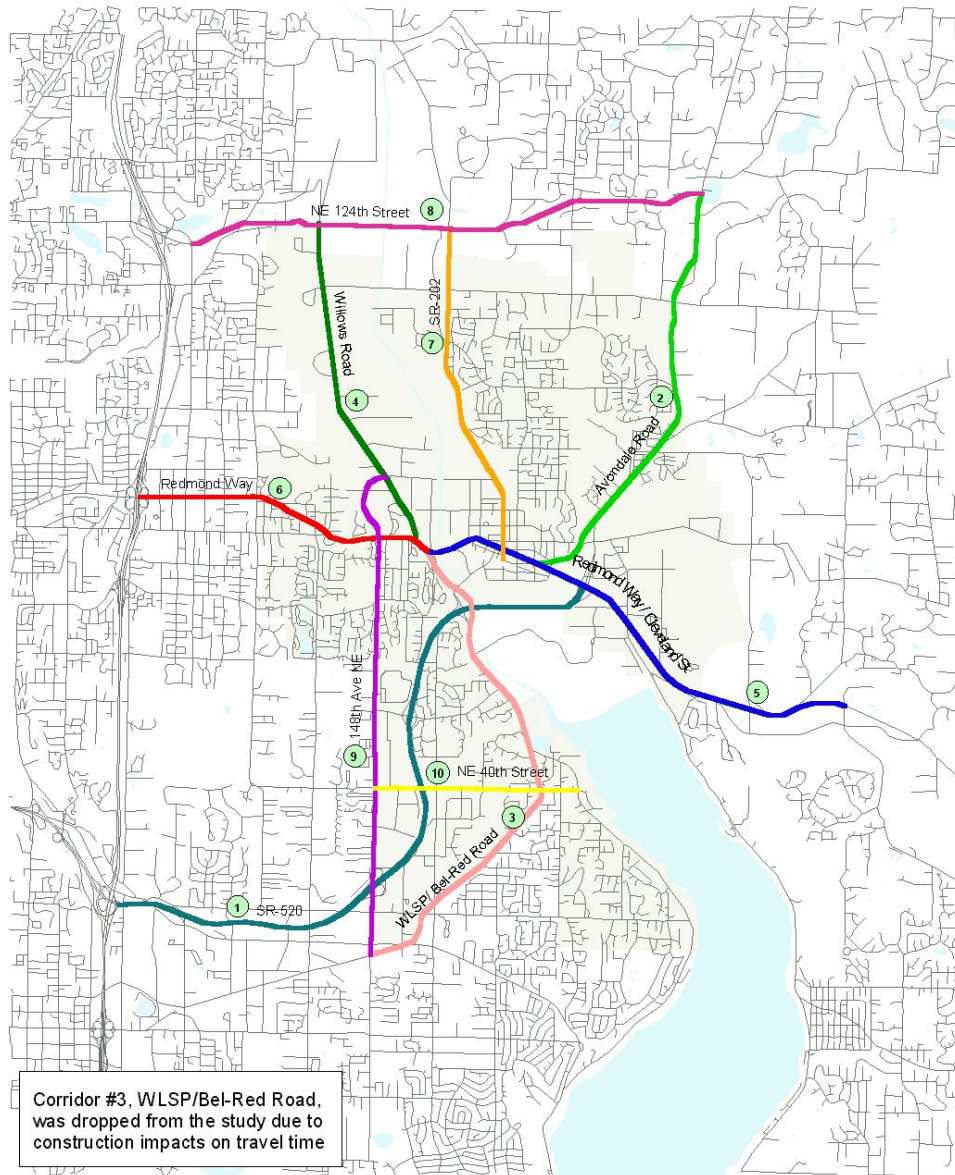


Figure 2
Travel Time Study Corridors
 Redmond Travel Time Study



Figure 10: Potential Travel Time Corridors for Monitoring Transportation Concurrency Using Travel Time in Redmond²¹

²¹ Redmond Travel Time Study, City of Redmond Phase 2 – Forecasting Travel Speeds, May 2002, The Transpo Group, Inc., page 8

- roadway function
- type of adjacent land use
- access management
- traffic operations.

Setting Corridor LOS Standards. Like the Key Center approach, the Corridor LOS standard can use a variety of performance statistics, including

- Distance traveled along a corridor in 30 minutes (Renton’s standard)
- Average speed along a corridor
- Travel time from one point to another along a corridor.

The Corridor LOS standard can also include a variety of travel modes. While the performance statistic should be consistent across corridors, each corridor LOS can incorporate different modes to accurately reflect the transportation service available along that corridor. For example, the ten Redmond corridors shown in Figure 10 have varying degrees of multi-modal capabilities. Transit service is not provided along corridors 7 and 8, but corridors 1, 2, and 9 currently have transit service that could be expanded. No corridors have HOV lanes, but they might be added in the future to expand transportation alternatives. Each Corridor LOS could be adopted to reflect existing capacity or desired capacity. Assuming that Redmond adopted an average speed performance statistic, LOS standards for Corridor 7 (SOV dominant) and Corridor 2 (multi-modal) could be as follows:

	Auto-Only LOS	Multi-modal LOS – Option 1	Multi-modal LOS – Option 2
Corridor 7	PM peak-hour SOV speed must be at least 20 mph		
Corridor 2		PM peak-hour speed based on weighted average must be at least 20 mph Weighted Average: $\frac{(\text{car speed} + 1.5(\text{bus speed}))}{2}$	PM peak-hour speed based on combination of speed and mode-split must be at least 20 mph Mode-split Average: $(\text{average car speed} * \text{mode-split}) + (1.5 * \text{average bus speed} * \text{mode-split for buses})$

On the other hand, jurisdictions can select a common multi-modal LOS for all corridors to encourage the development of alternative modes of transportation on those corridors.

While the above examples use the same performance standard (at least 20 mph), the city could assign a different standard to each corridor on the basis of factors such as

- the acceptable level of congestion within different parts of the city
- the design of the street itself (closely spaced signals tend to result in lower speeds)
- the speed limits of the facility.

Concurrency Analysis Using Corridor Approach. Whereas the Key Center LOS standard is applied to developments citywide, each corridor's LOS should be applied only to those developments that will affect that corridor. Therefore, jurisdictions must assign geographic areas of impact to each corridor. This can be done in one of two ways. In the simplest approach, all corridors within a defined distance of a development (e.g., within 2 miles of a development) are assumed to be affected by that development. In the second approach, four-step planning models are used to determine which geographic areas are likely to generate trips that use each specific corridor. Using technical capabilities available with four-step models, it is possible to determine traffic analysis zones (TAZs) that include the majority of trips along each corridor.²² Using either approach, a proposed development at a single geographic location will likely affect more than one corridor. So, for example, a development in Location A of Figure 6 might affect the corridors of NE 8th Street, 148th Avenue, and possibly 156th Avenue.

After the corridor's geographic area of impact has been identified, the concurrency analysis would be conducted using either the "new trips allowed" or "development-by-development" approach. A development's concurrency would be tested for each corridor affected by that development, and the development would have to pass the concurrency test on each corridor to move forward.

The "new trips allowed" method holds a lot of promise for the Corridor approach and was described in detail in the Key Center section. "Allowable trips" would be computed for each corridor and would be applicable to the groups of TAZs associated with that corridor. This approach would require a substantial up-front planning effort but would greatly simplify the development review process. It would also provide an easy measure of allowable development within defined geographic zones that could be used to improve the predictability of the concurrency process for prospective developers.

The "development-by-development" approach, on the other hand, provides a detailed engineering analysis of the impacts of a specific development. This approach resembles existing concurrency practice that determines the change in v/c ratios for each proposed development. Using the "development-by-development" approach, jurisdictions would calculate the predicted LOS for each new development rather than just subtracting trips from the available pool. Such

²² This is called a selected link analysis.

an analysis would be considerably better at estimating the effects a development would have on travel times along a specific corridor because it would directly account for the specific location and trip making characteristics of that development, but it would also be far more resource-intensive and costly than the “new trips allowed” approach.

OPTION 3: REGIONAL MODE-SPLIT

The last measurement alternative provides a regional approach to concurrency. A regional system of concurrency would likely require changes in state law, but the Regional Mode-Split alternative is one model that warrants further investigation because it recognizes the inherent regional nature of transportation systems. Regional concurrency is still in an exploratory phase. Therefore, this section paints the Regional Mode-Split alternative with a broad brush, suggesting possibilities without getting mired in technical detail. Further investigations of the legal, political, and technical considerations are necessary before specific applications of the Regional Mode-Split alternative can be fleshed out.

The previous two measurement approaches—Enhanced V/C and Travel Time—base their definition of “transportation concurrency” on the performance of specific facilities. The regional approach replaces a facility performance calculation with a measure of how well a region (or sub-region) is achieving a selected transportation policy mandate.

The shift away from a facility-based system would remove concurrency’s current focus on localized trouble spots. While the public may react negatively to such an approach (“How can you permit development when my road is so congested?”), the regional focus could actually be a helpful change because many “local” problems are the result of regional traffic patterns that cannot be “fixed” at an individual jurisdiction level. Nonetheless, regional concurrency might lead to significant localized congestion problems because new developments would no longer be judged on the basis of their impact on local transportation facilities. Before adopting regional concurrency, jurisdictions would have to carefully consider residents’ willingness to give up a focus on local congestion to get a better-functioning regional system.

A regional system of concurrency could be pursued at a variety of jurisdictional levels, including a multi-county region, a single county region, or a sub-region (perhaps the Eastside) within a single county. In general, the larger the region, the more likely that the concurrency system would capture the effects of regional pass-through traffic. For example, if the Eastside alone pursued a regional concurrency system, it would likely be hindered by the inability to account for new trips coming from South King County.

Setting LOS Standards (Goals) Using Regional Mode-Split

Regional concurrency would require a regional decision-making body, such as the Puget Sound Regional Council (PSRC), to establish LOS standards based on joint transportation policy objectives. Unlike current LOS standards that establish the ceiling for allowable growth, regional LOS standards would set a transportation goal, requiring new developments to take steps to meet

that goal. To emphasize the aspirational nature of regional concurrency, this section refers to a “LOS goal” rather than an “LOS standard.”

This section recommends an LOS goal to reduce per capita vehicle miles traveled (VMT) through mode shift. For example, one regional LOS goal might be to increase the share of peak period, non-SOV trips by 2 percent within five years. Therefore, if the region’s current PM peak-period mode-split was 10 percent non-SOV trips, the region would remain concurrent if non-SOV mode-split was 12 percent within five years. After five years, a new LOS goal would be set by the region.

After setting a regional LOS goal, a regional coordinating entity would distribute mode shift requirements to the region’s jurisdictions. All jurisdictions could initially be assigned the same targets, but they could negotiate with one another to adjust the distributions on the basis of local realities. That is, one city could agree to help fund a neighboring city’s transit facility improvements in return for “credit” toward mode shifts that would occur as a result of those facilities. Because not all trips would be as easily shifted from SOV to non-SOV modes, it would make financial sense for cities to work together to fund the projects that would produce the greatest mode shifts.

Measurement Process

Local jurisdictions and the regional coordinating entity would need to periodically measure both the effects of specific developments on mode-split and the degree to which the region was meeting its overall LOS goal. The PSRC, or a similar agency, would be the most likely agency to monitor achievement of overall regional transportation goals. Funding for such an activity does not currently exist and would need to be earmarked from existing or new transportation funding sources. Monitoring of specific development performance would most likely be conducted by local jurisdictions. Developers and employers would be responsible for certifying the trip-making behavior for their developments and companies, and the jurisdictions would enforce an audit or compliance review process to ensure the accuracy of that certification process. Local and regional mode-split monitoring would likely require legislation to provide funding and regulatory authority.

Concurrency Analysis Using Regional Mode-Split

Although the LOS goal would be set regionally, each jurisdiction would adopt specific concurrency rules to ensure that it achieved its share of the mode-split goal. For example, a city might adopt a concurrency ordinance requiring that all new development must have a peak-period mode-split of at least 12 percent. Any new development that could not meet the mode-split would either be denied or would require supplemental mitigation.

As indicated above, an SOV-oriented development could still meet regional concurrency requirements if it mitigated its new SOV trips by funding projects that enabled the necessary mode shift elsewhere. The cost of that mitigation would be whatever was necessary to ensure the additional required mode shift took place somewhere in the region. For example, if the new development generated ten non-SOV trips and 90 SOV trips (10 percent) in the PM peak,

supplemental mitigation would be required to shift at least two more SOV trips to non-SOV modes to meet the Regional Mode-Split requirement. Importantly, because the level of analysis would be regional, the mode shift required for mitigation would not have to be located at the new development but instead could occur in some other location—even in some other jurisdiction.

For example, a developer might choose to fund a park-and-ride lot on the fringe of the metropolitan area that generated a significant mode shift to build single family residential housing in a location that could not be effectively served by transit. Thus, concurrency based on regional mode-split could provide jurisdictions with the ability to approve single family development (where called for in the comprehensive plan), yet it would also provide them with the ability to fund transit where transit was most likely to be used.

By allowing the developer to fund mode shift projects elsewhere in the region, developers could target their investments to the projects that were most cost effective and that would produce the largest number of non-SOV trips. It would also provide excellent financial incentives to build transit-friendly developments, as other builders might actually subsidize their construction as mitigation for SOV-oriented development. In fact, a Regional Mode-Split approach might create a “market” for transportation improvements and land-use designs that would encourage mode shift. A concurrency market for projects that would encourage mode shift would give private developers a vested interest in seeing that the region achieved its LOS goal.

Concurrency analysis using the Regional Mode-Split alternative would not be without its measurement challenges. A rough estimate of a proposed development’s mode-split could be created using four-step planning models. But there would be no guarantee that the estimates would be accurate. Therefore, the regional concurrency approach should include a monitoring requirement in the development permits. That is, developers would be responsible for demonstrating that their developments had indeed achieved the stated mode-split. Developments that did not meet their predicted mode-split would be charged some form of additional mitigation fee. Mode-split monitoring would be particularly important given the economic incentives built into this approach.

In addition to monitoring challenges, concurrency based on mode-shift would require significant research on the amount of “mode shift” credit to give developers for off-site mitigation projects. A transportation study could define the “worth” (in mode shift terms) of new facilities designed to increase transportation choices. Jurisdictions might also need to develop design parameters for the transportation facilities or programs that were eligible for mitigation credit. (For example, mitigation funding would have to go toward a multi-modal project that was already on a jurisdiction’s transportation improvement plan.) Or mitigation projects proposed by developers might be subject to a monitoring program to ensure that they achieved their stated objective, with additional mitigation fees due if the monitoring program showed that the desired mode shift did not occur.

CHAPTER 3: TIMING AND SCALE OF CONCURRENCY DETERMINATIONS

No matter what measurement alternative they select, jurisdictions must separately consider the timing of performance review and the geographic scale of concurrency analysis. Combined, these two factors can have a dramatic effect on the concurrency process. First, they affect the cost of the concurrency determination process. Second, they affect the role concurrency plays in implementing the land-use and transportation goals of the jurisdiction. Third, they affect the precision of the analytical results of the concurrency test (and the resulting sensitivity of the concurrency process as it nears key LOS boundary conditions). Fourth, they affect the ability to measure and understand the regional and inter-jurisdictional impacts of new development. Timing and scale considerations were discussed briefly in Chapter 2, but this chapter treats the options more completely.

TIMING OF TRANSPORTATION SYSTEM PERFORMANCE REVIEWS

To perform a concurrency review for new development, jurisdictions must have a baseline measurement of current roadway performance. These baselines are developed either by measuring actual roadway conditions or by using four-step modeling estimates that have been calibrated against previously collected data on actual roadway performance. Jurisdictions vary in the frequency with which they calculate the baseline. Our review of the available literature found two basic approaches. Some jurisdictions establish baseline levels of service only periodically (often annually), using the baseline to develop an “allowable trip pool” from which they make their concurrency determination. Alternatively, some jurisdictions estimate or measure the baseline in response to each development proposal, making a specific determination about the effect of that proposal on the roadway level of service. Both approaches can be applied to either the Enhanced V/C or Travel Time alternative, and they are described below.

Periodic Measurement of Roadway Performance and “New Trips Allowed” Concurrency Analysis

The “New Trips Allowed” approach to concurrency measurement requires jurisdictions to measure roadway performance on a periodic—yet regular—basis. From the results of that measurement, jurisdictions determine the number of new trips that can be added to the roadway before the LOS standards are exceeded. New development trips are subtracted from the available trips pool. Nationally, Maryland’s implementation of the Adequate Public Facilities Ordinance (APFO) is probably the best example of how periodic performance reviews provide a framework for ongoing development decisions. In Washington State, Renton is a good example of how the “New Trips Allowed” approach can be applied to concurrency analysis. While Renton uses the Travel Time alternative, the New Trips Allowed approach can easily be applied to traditional or Enhanced V/C processes.

The New Trips Allowed approach has a number of advantages over current practice. Perhaps the biggest advantage of this approach is that it significantly reduces the time and resources required to conduct each new development concurrency determination. Moreover, it allows cities to provide concurrency determinations quickly because they require only a brief comparison of the development's trip estimates with the available trip pools rather than a detailed four-step modeling analysis. The quick turnaround is likely to be welcomed by developers, as is the ability of developers to use available trip estimates as an early sizing guide for their development plans. In addition, the reduction in the resources required to perform concurrency analysis allows those resources to be re-allocated to other priority efforts within the jurisdiction.

An important step in the New Trips Allowed approach is the periodic reassessment of the existing level of service, comparing it with adopted LOS standards and recalibrating "available" trip estimates. The reassessment process accomplishes several functions simultaneously:

- It recalibrates the allowable development cap to reflect actual transportation system performance; this includes both correcting for performance differences that result from differences between where expected and actual development has taken place, and adjusting for changes in travel patterns that result from shifting demographic and economic trends.
- It allows the analysis tools used in the planning process (and the outcomes from that process) to reflect changes in planned transportation system infrastructure improvements.
- It allows the jurisdiction to consider whether LOS standards are set at the appropriate level or should be adjusted to reflect changing transportation expectations.

As noted above, the New Trips Allowed approach can be applied to Enhanced V/C or Travel Time LOS standards. Each alternative is discussed below.

Using Enhanced V/C LOS standards, the New Trips Allowed approach would involve the following steps:

1. Assessment of existing roadway level of service, either through field measurement or modeling estimates. The frequency of this determination would depend on how often the jurisdiction wanted to check trip estimates against actual performance, but annual measurement should be sufficient to develop and update trip pools.
2. Identification of "allowable trips" by comparing existing v/c conditions with LOS standards using four-step modeling analysis. Allowable trip determinations should be made for each intersection.
3. Development of a concurrency map that showed the number of trips available at each intersection.
4. Comparison of a new development's trip estimates with the available trips pool. If enough trips were available, the development would be "concurrent" and the trips would

be subtracted from the pool (provided the development met other requirements and was permitted). If insufficient trips were available, the development would be denied unless the city pursued concurrency mitigation or revision of LOS standards.

Step 4 would be repeated for each proposed development. Steps 1 through 3 would be repeated as determined by city policy (for example, annually, as in the case of Maryland's APFO).

There are no significant drawbacks to using New Trips Allowed concurrency analysis with Enhanced V/C measurement. In fact, the process would essentially mirror what takes place under the current development-by-development approach, but by saving and publishing the results of steps 1 through 3, it would reduce the resources required to perform the concurrency analysis.

Applying the New Trips Allowed approach to Travel Time LOS standards would involve essentially the same steps as the Enhanced V/C alternative. However, the available trips would be assigned to corridors rather than intersections. In addition, concurrency reviews made through subtraction of available corridor trips might be less accurate than development-by-development review because of inherent limitations in the four-step modeling process. Specifically, the model would be unable to predict beforehand precisely where along the corridor the new development would take place and, therefore, could not say where traffic would enter the corridor. Consequently, the model would be unable to predict with a high degree of accuracy the new development's actual effect on corridor travel times. As a result, available trip estimates might get out of sync with existing conditions, resulting in unexpected transportation performance. The uncertainty of trip estimates could be limited through more frequent reassessment of existing roadway level of service and recalibration of trip estimate models.

Development-by-Development Measurement and Concurrency Analysis

All four Eastside cities currently perform a detailed transportation impact study for each proposed development, using the study to judge the development's impacts against adopted LOS standards. Development-by-development LOS review and concurrency analysis determinations allow cities to start from current estimates of transportation system performance and forecast only those changes directly related to the proposed development. This approach can lead to excellent, site-specific predictions of transportation performance. It also allows the concurrency analyst to test a wide variety of "minor adjustments" to the transportation system to determine whether those adjustments would allow an otherwise "non-compliant" development to become "compliant." (For example, the analyst can test the effect on the predicted LOS of new signal timing plans or the addition of minor geometric improvements changes in lane striping.)

As a result of this added analytical capability, however, the Development-by-Development approach is more resource-intensive than the New Trips Allowed approach. The detailed analysis required for each proposal slows the process of development review and increases costs. In addition, from a developer's perspective, this approach is less predictable than the New Trips Allowed approach. Often it is only possible to estimate whether a development will be concurrent after considerable trip analysis. By contrast, the New Trips Allowed approach

would allow developers to make pre-application determinations of concurrency on the basis of available trip estimates.

The key benefit of the Development-by-Development approach is that it provides a more precise evaluation of the impacts of each specific development. The estimates are more precise because, unlike estimates from the New Trips Allowed approach, the jurisdiction knows the exact location and access characteristics of the new development. This is particularly important for improving the accuracy of travel time computations.

Summary

Periodically setting development limits in units of “allowable new trips” can reduce the cost of the concurrency review to the local jurisdiction. This savings comes at the cost of some loss in the precision of the estimates used to make the concurrency determination. But when making this trade-off, it is important to realize that all forecasts of travel behavior are at best “reasonable guesses” of transportation impacts, no matter what technique is used. Moreover, travel performance varies significantly from day –to day and over time because of factors that are not incorporated into modeling programs. Therefore, no technique can provide an “exact” prediction of transportation system performance as a result of a new development’s approval. In addition, both approaches use the same basic data sets and analytical procedures. Consequently, choosing between these two techniques is a matter of degree. The New Trips Allowed approach should require fewer resources but produce a somewhat less precise result than the Development-by-Development approach. Neither approach is “inexpensive.” And neither approach is “exact.”

GEOGRAPHIC SCALE OF ANALYSIS

A second consideration to be incorporated into the design of a city’s concurrency approach is the geographic scale of the analysis. There are several aspects of geographic scale that significantly affect the application of concurrency. In general, the smaller the geographic scale selected for analysis, the more detail that can be provided in the analysis and, in many respects, the more accurate the analysis. The larger the geographic framework selected for review, the more effectively the concurrency analysis can deal with issues such as regional traffic impacts and the effects of development across jurisdictional borders.

The problem is that the more detail that is provided and the wider the geographic scope of the analysis, the more expensive and time consuming the analysis, if for no other reason than that the required volume of data and number of mathematical calculations increase. In addition, larger geographic land areas are, by their nature, diverse in their land-use and transportation attributes. Therefore, it is far easier to design and apply LOS standards for more homogeneous geographic areas. Finally, most cities do not consider regional impacts in their review of development impacts and therefore are not interested in spending resources to gain insight into those impacts. Consequently, when a jurisdiction designs concurrency procedures, it needs to understand what it is trying to accomplish through concurrency and structure the analysis accordingly, setting the geographic scale used in the analysis to effectively meet those needs.

Currently, Bellevue, Kirkland, and Redmond divide concurrency analysis into zones, assigning different LOS standards on the basis of the land use of the zone. (Issaquah assigns LOS standards on the basis of the type of arterial.) These approaches work well for the current v/c-based approaches. However, as alternative modes of transportation are dealt with more directly, additional levels of geographic scale may need to be added to the analysis because non-automobile modes of travel are significantly more sensitive to geographic scale than are cars.

For example, if walking is to be considered as part of the transportation system, then a geographic scale compatible with pedestrian trips must be used within the concurrency analysis. This normally means the use of a much more detailed transportation network within a much smaller geographic zone system, since pedestrian trips are very sensitive to the distance that must be walked and take advantage of a variety of pathways. This level of detail is often more than is present in most four-step planning models. Yet without such detail, the effects of walking on mobility cannot be accurately estimated.

One alternative to using smaller zones is to apply geographic limitations within the LOS standard itself. The Location-Constrained approach to Enhanced V/C is an example of a geographically limited concurrency process. One figure used to describe the Location-Constrained approach is presented again as Figure 11. In this approach, proposed development projects would be eligible for the v/c level-of-service “enhancement benefit” only if they were within walking distance of the transit service for which that “benefit” was being given. As a result, the concurrency process would work at two levels: the zonal LOS standard, and “walking distance” to high quality transit service.

Similar geographic constraints exist for most non-auto modes. In general, to analyze the effectiveness of many alternative modes of travel, the concurrency analysis must look at smaller geographic areas and high levels of network detail. Unfortunately, these smaller zones and greater levels of network detail require more data and more complex analysis, and therefore, they tend to be more time consuming and expensive to undertake.

In general, simplification can be successfully achieved by creating small geographic zones that contain specific transportation system and land-use attributes (e.g., a mixed use, multi-modal center), and then selecting transportation system performance criteria tailored specifically to the land-use/transportation goals of that geographic area. This can be done through the policy process and is already done to a certain extent by three of the four cities participating in this study.

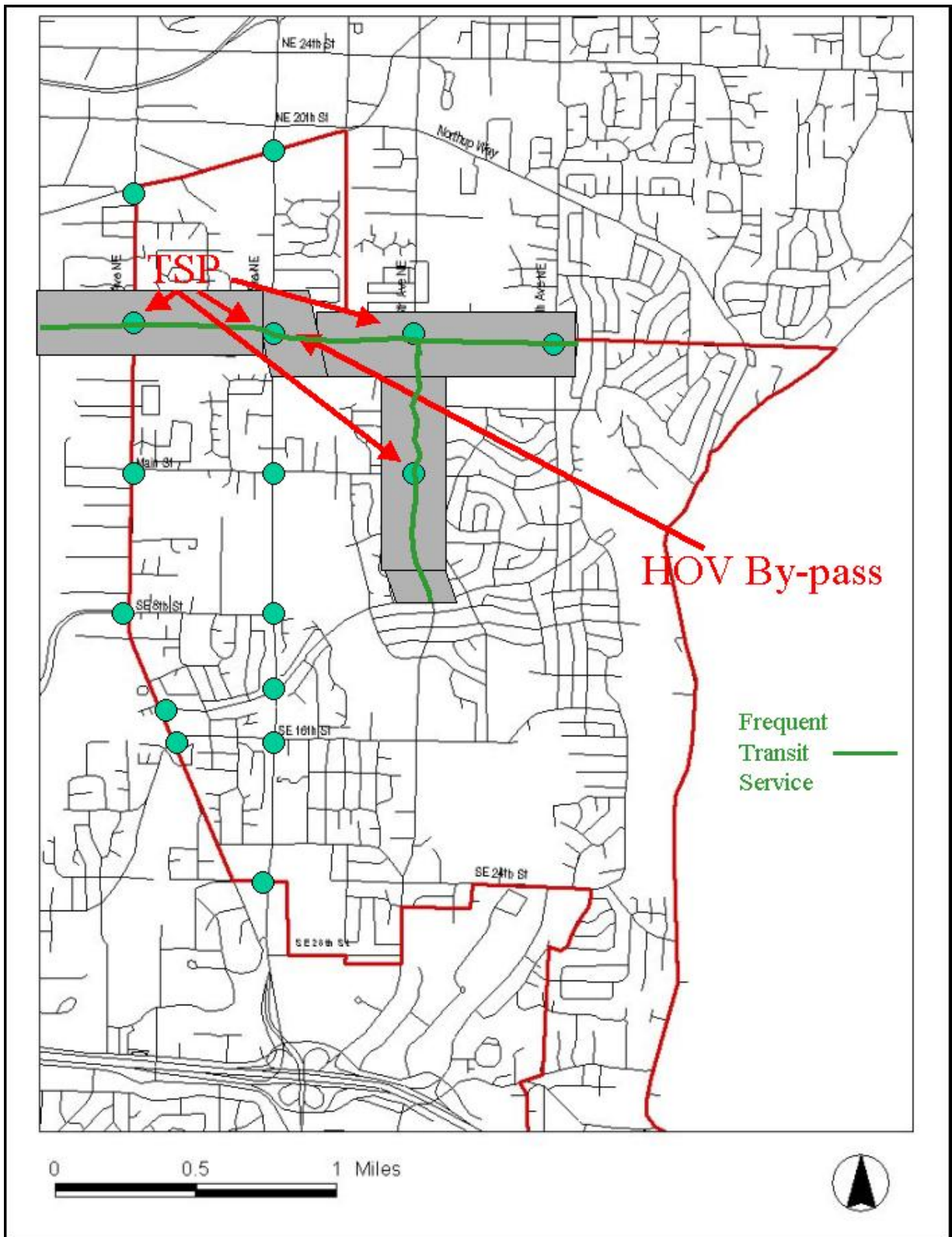


Figure 11: Geographic Area Served by High Quality Transit Service

Where alternative modes are not essential to mobility within a geographic area, smaller zones are not necessary. Consequently, to reduce the cost of collecting and maintaining the data needed to perform the concurrency analysis, geographic areas outside of these specific “multi-modal transportation districts”²³ should be analyzed as part of larger geographic zones, where concurrency performance standards are defined much more simply, usually in terms of roadway congestion. This combination of different geographic scales within the concurrency process would create a more complex process (some small complex zones and some large more simple zones, each using different level of service standards), but it would allow a more cost-effective approach to concurrency without sacrificing a city’s ability to use concurrency as a tool for promoting alternative transportation modes in the locations where they made sense.

As with selecting the appropriate performance statistics and level of service standards, correctly selecting the appropriate geographic scale (or scales) is dependent upon having a clear vision of the land-use/transportation outcome the concurrency process is intended to support.

²³ A “Multi-modal Transportation District” is Florida DOT’s term for small geographic areas where local jurisdictions want to emphasize, and obtain credit for, the mobility provided by the combination of effectively integrated land use and non-automobile transportation systems.

CHAPTER 4: COMPARISON OF ALTERNATIVE MEASUREMENT OPTIONS

The alternative approaches proposed in Chapter 2 are to varying degrees a departure from existing concurrency practice. This chapter explores whether the proposed alternatives would advance the participating cities' objectives. In particular, this chapter compares and contrasts the proposed alternatives with current practice, answering eight questions posed by the project's Executive Steering Committee and Technical Advisory Committee. The eight questions used for evaluation are as follows:

1. Is the alternative multi-modal?
2. Does the alternative enhance the link between land use and transportation?
3. Does the alternative address regional traffic and inter-jurisdictional transportation issues?
4. Is the alternative less resource-intensive than current practice?
5. Is the alternative easy to understand and credible?
6. Can the alternative adapt to land-use and transportation changes?
7. Are the concurrency results of the alternative predictable for developers?
8. Will concurrency violations be the exception, not rule, if this approach is adopted?

In addition to the above questions, this chapter considers two additional questions that have frequently surfaced during the project. Additional questions are as follows:

9. Does the alternative provide ways to fund non-roadway transportation improvements?
10. Can the alternative be adapted to support the widely varying goals of the four cities?

The following sections discuss the three alternative approaches (and their various implementation options) with regard to the above questions and provide a framework for jurisdictions considering revision of their transportation concurrency process. The first five questions are answered with individual evaluations of the three approaches. The last five questions are answered without addressing each approach individually because the Project Team discovered that the answer to the questions lay more with the design of the LOS standards than with the selection of a measurement approach. In addition to the written analysis, Table 6 is a matrix for evaluating the three alternatives and comparing them with one another.

Table 6: Criteria For Evaluating Alternative Approaches To Concurrency

	Multi-modal?	Enhance link between land use and transportation?	Address regional and inter-jurisdictional issues?	Less Resource intensive?	Easier to understand and more credible?²⁴	Adaptive to land use changes?	Predictable for developers?²⁵	Concurrency violations are the exception?²⁶
Enhanced V/C: Zonal and Intersection	3	3	1	1.5	2	2	2-4	N/A
Enhanced V/C: Location-Constrained	5	5	1	1	3	3	2-4	N/A
Travel Time: Key Center	1-3	3	1	1	3	2	2-4	N/A
Travel Time: Corridors	1-4	4	1	1	4	3	2-4	N/A
Regional Mode-Split	5	4	4	1	3	3	1-5	N/A
Current Procedures	1	3	1	2	2	2	2-4	N/A

Rated 1 to 5, where 1 = very poor and 5 = very good

²⁴ Defined as how easily the public can understand and respect the measure, as well as how well the public can understand and respect why a specific development decision was made.

²⁵ This depends in large part on exactly how the city sets up the entire concurrency process, not simply on the measurement system selected

²⁶ Whether concurrency violations occur is a function of the standards selected, not the measurement statistic used. Thus any one of these techniques could result in a system in which concurrency violations occurred frequently or infrequently. Whether they do or don't is simply a function of the levels of service each city allows to occur.

Table 6 (continued): Criteria for Evaluating Alternative Approaches to Concurrency

	Provide funding for non-roadway improvements?	Adaptable to the varying city goals?
Enhanced V/C: Zonal and Intersection	4	3
Enhanced V/C: Location-Constrained	4	4
Travel Time: Key Center	2-3	3
Travel Time: Corridors	2-3	3
Regional Mode-Split	5	3
Current Procedures	1	3

A word of caution is necessary, however. It is difficult to provide comprehensive evaluation of the proposed alternatives because each approach can be implemented in multiple ways and concurrency outcomes may change dramatically depending on how cities set their LOS standards. Moreover, the Project Team necessarily brings with it a certain set of assumptions (for example, that travel time easier for the public to understand than v/c) that may be not be shared by elected officials, city staff, and residents. The Project Team views this chapter as a beginning point for comparison, recognizing that the evaluation is by no means definitive. Each Eastside jurisdiction, guided by unique goals and values, will likely have a somewhat different perspective than the Project Team.

As the above example demonstrates, much of the concurrency challenge lies in setting LOS standards that will enable cities to pursue the land use and transportation visions laid out in their comprehensive plans. For example, though using essentially the same concurrency process, Kirkland never encounters concurrency failures whereas Issaquah frequently does. The key difference between Kirkland and Issaquah is not their measurement process but their LOS standards. Although each of the proposed alternatives has some advantages over current practice, those advantages may not prove helpful if LOS standards are not designed to advance the comprehensive plan. This chapter, therefore, is at times definitive and at time suggestive of how this study’s proposed alternatives would measure up against the ten questions. Where possible, this chapter addresses how changes to LOS standards would alter the effects of the alternative approaches.

IS THE ALTERNATIVE MULTI-MODAL?

All three alternative approaches incorporate multiple modes into the performance standard used for concurrency determinations, but two of the three alternatives incorporate multiple modes through policy rather than measurement decisions. Nonetheless, by incorporating multiple modes into the concurrency LOS standard, all three alternatives allow jurisdictions to include development of alternative transportation capacity (bus routes, shelters, TSP, walkways, and bike lanes) into concurrency mitigation packages.

Alternative 1: Enhanced V/C Ratio

The Enhanced V/C alternative increases LOS standards where alternative transportation choices are present. In its simplest form, the alternative provides for higher LOS standards on roadways with a certain threshold of transit service, but the alternative can also provide credit for other transportation options, such as HOV lanes, bike paths, and sidewalks. The LOS standards are based on a policy determination that transportation choices are part of a transportation system's capacity, even though they are not captured in the traditional v/c metric. In addition, the standards should be based on those services and facilities called for in the city's transportation plan and viewed as necessary for meeting the needs of the adopted land-use plan.

The Zonal, Intersection, and Location-Specific approaches to implementing the Enhanced V/C alternative all rely on policy-based LOS standards that account for non-SOV transportation choices. However, the Location-Specific approach provides additional multi-modal benefits by creating incentives to develop in locations where transportation choices exist. The Location-Specific approach restricts application of the higher LOS standard to locations that are near the multi-modal corridor and to projects that incorporate transit-friendly design. Thus, in areas where actual LOS was nearing baseline LOS standard, developers would have significant incentive to fit their development into the parameters of the higher LOS standard.

Alternative 2: Travel Time

The Travel Time alternative can be designed to be more or less multi-modal, depending on the number of modes incorporated into the LOS standard. For example, Renton uses a multi-modal LOS standard by calculating a weighted average of car, HOV, and transit travel times. Jurisdictions can alter the importance of multiple modes in setting Travel Time standards by changing the equation. Care should be taken when combining transit and automobile travel times because buses are inherently slower than cars. Thus, a straight average of the two modes' travel times will describe corridor performance as being slower than that experienced by motorists. A weighted average attempts to correct for the transit delay in Travel Time standards by adjusting for the inherent biases caused by transit stopping to pick up and drop off passengers. A Travel Time standard based on mode split accurately describes the "average" travel time experienced, but performance will appear to slow down if transit use increases relative to automobile use, even if actual travel times in the corridor have not changed.

Alternative 3: Regional Mode-Split

The Regional Mode-Split alternative measures concurrency on the basis of progress toward a defined, regional transportation goal. This report suggests a regional goal of reducing per capita vehicle miles traveled through transportation mode shift (from SOV to transit, carpool, bike, or feet).

Using this approach, a development's concurrency hinges on its ability to meet or exceed the Regional Mode-Split targets, either at the development site or through off-site mitigation.

DOES THE ALTERNATIVE ENHANCE THE LINK BETWEEN LAND USE AND TRANSPORTATION?

At heart, concurrency measures the coordination between a jurisdiction's land-use plan and its transportation system. A number of today's unwanted concurrency failures are the result of land use plans that call for levels of development far above what the transportation plan promises to provide. These unwanted concurrency failures²⁷ can be avoided, at least in part, if the LOS standards are designed as an explicit compromise between land-use and transportation goals. The extent to which each alternative provides opportunities for land-use and transportation coordination is explored below. However, beyond changes to LOS standards, increased coordination of land-use and transportation goals through changes to the measurement process would be modest for Enhanced V/C and Travel Time because each alternative essentially relies on the same analytical techniques that are currently used to measure transportation impacts. Regional Mode-Split, on the other hand, results in a more indirect linkage between land use and transportation. This system uses market forces to encourage land-use decisions that strengthen the opportunity to use alternative modes but does not necessarily create strong links at the local level.

Alternative 1: Enhanced V/C Ratio

The Enhanced V/C alternative provides jurisdictions with a way to incorporate land-use and transportation goals into the concurrency process by adding considerations other than roadway capacity into the LOS standard. In addition, because the elements that are included in Enhanced V/C LOS standards are set through policy, city leaders have the ability to design LOS standards that will advance their land-use and transportation plans. For example, if a city's comprehensive plan called for greater residential and mixed-use densities and increased transit service, the Enhanced V/C standard would encourage both by removing the concurrency barrier to development and providing incentives for investment in transit service.

²⁷ At times jurisdictions may want concurrency failures as a way to slow growth. For example, it seems that Issaquah is using concurrency failures, in part, to control growth until its land-use and transportation plans are in sync.

In addition, while Enhance V/C standards permit higher densities if transportation choices are present, the Location-Specific approach is designed to use concurrency to channel those densities and transportation choices to explicit geographic areas identified in the comprehensive plan. The approach is designed to identify, on the basis of available transportation system capacity, those land uses (and locations) that should be encouraged, as well as to highlight where development can and cannot be supported by the existing transportation system.

Alternative 2: Travel Time

Like Enhanced V/C, the ability for the Travel Time alternative to enhance coordination between land use and transportation lies in the design of the LOS standard. Depending on the land-use/transportation vision of the city, both the Key Center and Corridor approaches can be designed to advance the comprehensive plan. For example, Renton has chosen the Key Center approach because its comprehensive plan targets development and transportation improvements in the downtown. While the Key Center approach works for Renton, the Corridors approach may be more appropriate for other jurisdictions that wish to coordinate land use and transportation citywide. The Corridors approach would allow a city to use its planning models to carefully define which geographic areas would affect specific corridors. This would allow the concurrency review to focus on the land-use/transportation interactions of most significance and to base LOS standards on the development expectations of that area.

Alternative 3: Regional Mode-Split

The Regional Mode-Split concept approaches the transportation/land-use link very differently. Rather than tying transportation facility impacts directly to a given development, it encourages cities and developers to identify the land-use and transportation developments that will most effectively achieve the regional mode-split targets set by policy. If the alternative transportation incentives work as intended, the outcome should be reduction in SOV vehicle miles traveled and reinforcement of the land uses that support multi-modal transportation systems, but the directive comes from regional goals rather than local plans.

DOES THE ALTERNATIVE ADDRESS REGIONAL TRAFFIC AND INTER-JURISDICTIONAL ISSUES?

Regional pass-through traffic is a consistent impediment to concurrency. The GMA designed the concurrency requirement to focus on local land-use decisions and local transportation systems, yet the transportation system does not serve only local traffic. Every Eastside jurisdiction has felt the effects of regional traffic, though Issaquah and Bellevue may have experienced those effects most acutely. The existing, locally focused concurrency process is not designed to address regional pass-through traffic. Jurisdictions can exclude regional trips from their LOS calculations or raise the LOS standard high enough so that regional trips are effectively excluded from concurrency determinations, but this doesn't fix regional traffic problems; it just permits development at the expense of crowded roads.

Local concurrency measurement may not be the best place to try to fix regional traffic problems. Instead, the Eastside could work together through inter-jurisdictional agreements to fund transportation projects (e.g., a park & ride facility) that would remove trips from the regional network. Cities can also pursue inter-jurisdictional agreements such as BROTS and the Issaquah/King County Impact Fee-Sharing agreement to address traffic effects that affect nearby neighbors. Perhaps the most comprehensive approach would be an inter-jurisdictional effort to coordinate the land use and transportation visions of all jurisdictions on the Eastside and a commitment by each jurisdiction to achieve that regional vision.

Alternative 1: Enhanced V/C ratio

Inherently local, the Enhanced V/C ratio will not ameliorate the actual effects of regional traffic on Eastside roads, but by permitting higher LOS standards where transportation choices are present and encouraging development of alternative transportation choices, it may reduce regional traffic's contribution to concurrency failures. Also, if the Enhanced V/C alternative is successful in increasing transit capacity, regional car trips may shift to other modes, but this shift will likely require neighboring jurisdictions to coordinate their transit systems.

Alternative 2: Travel Time

The Travel Time alternative suffers from the same limitations as the Enhanced V/C approach. While neither alternative prohibits the expansion of concurrency analysis to more than one jurisdiction, they do not directly incorporate any specific inter-jurisdictional attributes. Expansion of the Travel Time approach to any corridor beyond an immediate neighboring jurisdiction is likely to result in a process that is both unwieldy analytically and very resource intensive.

Alternative 3: Regional Mode-Split

The Regional Mode-Split approach is designed to provide a mechanism to limit the effects of regional traffic and to encourage inter-jurisdictional cooperation. The approach steps back, looking at the transportation system regionally rather than as separate systems affected by regional traffic. Focusing on one system, the alternative would not work without a great deal of inter-jurisdictional cooperation. Cities would have to work together to determine where improvements should be made and how to best target resources to achieve regional goals.

IS THE ALTERNATIVE LESS RESOURCE-INTENSIVE THAN CURRENT PRACTICE?

All things being equal, the three alternatives would require an equal or greater level of effort and resources than the current process. However, all things need not be equal. As Chapter 3 described, jurisdictions can vary the timing, scope, and geographic scale of analysis to increase or decrease the level of detail and resources required for each alternative. In fact, by adopting any of the more multi-modal alternatives discussed in this report and by also changing to a yearly

analysis of “New Trips Allowed” rather than a “Development-by-Development” determination of concurrency, jurisdictions can increase the sophistication of their concurrency assessment while still seeing a net decrease in time and money required to comply with concurrency requirements. (See Chapter 3 for a complete discussion of options for the timing and scope of concurrency analysis.)

Alternative 1: Enhanced V/C Ratio

The Enhanced V/C concurrency analysis uses the same four-step model used in current concurrency practice, so aside from the additional effort required to design the new LOS standards, “Development-by-Development” concurrency analysis should require the same amount of effort as current practice. However, a change to “New Trips Allowed” analysis would significantly decrease the ongoing resources required for concurrency analysis. In most cases, the effort required to obtain and apply the “enhancements” would be marginal.

Alternative 2: Travel Time

Travel Time concurrency analysis also uses the same four-step model as current concurrency practice. As a result, it is possible to obtain estimates of travel time for corridors directly from these models at little or no addition cost above that for the current concurrency process. However, these travel time estimates are not terribly precise, and their accuracy suffers from the lack of network detail present in four-step traffic assignment models. “Better” travel time estimates can be obtain by using more detailed traffic models, but these models require more data inputs, as well as more staff and computing resources than are needed for the current v/c analysis efforts. However, even with the more detailed analysis, the resources required can be limited if cities adopt the “New Trips Allowed” approach.

Alternative 3: Regional Mode-Split

It is not clear, without considerable further study, whether the Regional Mode-Split approach would require an increase or decrease in resources. Because the approach does not study the ramifications of development on specific facilities, it is possible that a transportation concurrency review might require fewer resources. However, this approach would also require considerable inter-jurisdictional cooperation, which might demand more staff resources. In addition, technical work would be needed to define the “size” of mode shifts that would be achieved by proposed developer actions. Estimating the cost of that effort is beyond the scope of this project.

IS THE ALTERNATIVE EASY TO UNDERSTAND AND CREDIBLE?

Concurrency processes that are understandable and generally credible go hand in hand, which stems from the public’s ability to relate the LOS standards to their own experience. However, the three alternatives also provide numerous opportunities for cities to use visuals and other communication tools to increase the transparency of the concurrency process.

Alternative 1: Enhanced V/C Ratio

As an indicator of transportation performance, the v/c ratio is not easily equated to resident travel experience and doesn't represent a significant improvement over current practice. LOS standards aside, however, we believe that the concurrency process could be made easier to understand and more credible if jurisdictions used the "New Trips Allowed" approach to concurrency analysis. By using more effective visuals along with this approach, it would be possible to clearly indicate the size and location of allowable traffic volume growth in terms that were easily understood by the public. For example, the visuals would show where and how much new development could be absorbed before concurrency concerns were raised. The visual representation of concurrency could change public discussion from the use of engineering terms such as "v/c ratios" to "how many more cars the intersection can accommodate" and "whether sufficient transit service is present."

Alternative 2: Travel Time

LOS standards based on travel time rather than v/c ratios are easier for the public to understand because travel time is a performance measure that can easily be related to the public's transportation experience. In addition, the Corridor approach promotes LOS standards that explicitly link performance on a given corridor with the development that will take place near that corridor. Credibility is likely to flow from the Travel Time standard's clarity, particularly if the Travel Time standards are accompanied by concurrency maps that project the development that could take place while keeping within LOS standards.

Alternative 3: Regional Mode-Split

LOS standards aimed at mode shift, unlike travel time, are not immediately translatable into residents' travel experience, but residents will understand the policy goal: getting more people out of their cars. The concurrency determination, too, is relatively easy to understand, allowing development that meets mode-split targets through site design or mitigation.

The Regional Mode-Split alternative's credibility may suffer because of doubts about whether regional improvements and policy goals can really improve local traffic. This regional approach may actually suffer from exactly the opposite problem of the current procedures. That is, because it focuses on regional issues, problems occurring locally (and ignored by the regional process) may create an impression that the concurrency system "does not work." For example, it might be a hard to convince East Bellevue residents that additional housing should be permitted in their neighborhood because the developer built a park-and-ride in Issaquah, even though the park-and-ride might succeed not only in reducing total SOV mode-split but also in reducing regional traffic passing through east Bellevue.

IS THE ALTERNATIVE ADAPTABLE TO CHANGING LAND-USE AND TRANSPORTATION CONDITIONS?

For the most part, the answer to this question does not depend on which alternative a jurisdiction selects. Instead, it depends almost entirely on the flexibility of the jurisdiction's LOS standard or the jurisdiction's willingness to change the LOS standard on the basis of new conditions. In all likelihood, no matter what the measurement system, the LOS standard will need to be revisited on occasion to accommodate changing conditions and comprehensive plan goals.

Where LOS standards enhance the link between land use and transportation, revision of the concurrency process will likely be needed less often. But regional traffic (unless it's accounted for in the LOS standard) always has the potential to create concurrency problems and to affect the system's ability to enhance the land-use and transportation connection. In addition, the Regional Mode-Split alternative is less likely to adapt to changing local conditions, though it does account for regional traffic.

ARE THE CONCURRENCY RESULTS PREDICTABLE FOR DEVELOPERS?

Like the above question, the predictability of each alternative rests more with the system of implementation than with the measurement approach itself. Therefore, all of the proposed alternatives could be developed in ways that were predictable or unpredictable.

For example, the "New Trips Allowed" approach (whether using Enhanced V/C or Travel Time LOS) would be highly predictable because developers could quickly determine the development capability of various areas throughout the jurisdiction. By contrast, a system of negotiated concurrency would be less predictable for developers (though it might have benefits for jurisdictions) because concurrency would depend less on "black and white" standards than on how transportation impacts could be mitigated. However, developers might be willing to accept increased uncertainty in exchange for less likelihood of concurrency failure. In addition, if the city worked to carefully describe the types of concurrency mitigation desired and the conditions under which mitigation would be required, developers would gain considerable insight into the eventual costs of the required mitigation, even though the final "mitigation plan" (and thus the cost to the developer) would be subject to negotiation. While developer predictability is a laudable goal, the objectives of concurrency may be best achieved through a process that is more flexible and, thus contains a little unpredictability.

ARE CONCURRENCY VIOLATIONS THE EXCEPTION AND NOT THE RULE?

Once again, the answer to this question lies in the design of the LOS standards, not in the measurement process. This fact is readily apparent by looking at the frequently cited differences between Kirkland's and Issaquah's existing concurrency systems. Kirkland has set LOS standards to effectively eliminate all concurrency violations, whereas Issaquah has set LOS standards that have resulted in what amounts to a building moratorium.

No matter what the measure, concurrency failures are hard to avoid where adopted land-use goals require LOS standards that are higher (thus allowing more congestion) than local residents are willing to accept, especially when those same residents resist the expansion of transportation facilities. Of the proposed alternatives, only the Regional Mode-Split alternative divorces the LOS standards from local congestion preferences. But the alternative's trade-off of local benefits for regional benefits may decrease its credibility as a realistic check on growth.

DOES THE ALTERNATIVE PROVIDE WAYS TO FUND NON-ROADWAY IMPROVEMENTS?

The GMA concurrency requirements permit mitigation to avoid concurrency failure, but that mitigation must lower the existing level of service below the LOS standard. Therefore, although the concurrency legislation permits a wide range of mitigation efforts, jurisdictions can only require mitigation measures that will reduce impacts from the development that are measured in the LOS standard. The typical v/c LOS standard measures vehicle use and roadway capacity. Thus, mitigation efforts are restricted to measures that reduce vehicle use or increase roadway capacity.

All of the proposed alternatives incorporate more than vehicles into the LOS standard, including measures of transit and other transportation choices. In so doing, each alternative opens the door to mitigation measures that are not roadway-based. For example, using the Enhanced V/C alternative, developers could become eligible for a higher LOS standard if they increased transit service along a specific corridor or provided bus shelters (assuming that the availability of bus shelters was written into the "enhanced LOS"). Using the Travel Time alternative, developers could provide TSP facilities along a corridor to increase transit travel times, thereby lowering the corridor's multi-modal average travel time. Using the Regional Mode-Split alternative, developers could offer on-site TDM programs to decrease the SOV mode-split, or they could contribute to a park-and-ride lot that would capture SOV drivers from the region's fringe. These non-roadway mitigation efforts could also be enhanced by implementing the system of negotiated concurrency described in Chapter 2.

CAN THE ALTERNATIVE BE ADAPTED TO SUPPORT THE WIDELY VARYING GOALS OF THE FOUR EASTSIDE CITIES?

Like most measurement systems, the proposed alternatives can all be adapted to emphasize the land-use, transportation, and concurrency goals of each jurisdiction. In fact, in many respects adapting the alternatives to meet the cities' comprehensive plan goals is the most important part of the concurrency process. We struggled with which adaptation of the alternatives to use as the "example cases," knowing that each alternative could be used in vastly different ways. For the most part, we chose land-use, transportation, and concurrency goals designed to encourage transportation choice, including placing a premium on transit service and transit-friendly development. We then adopted example LOS standards that

- encourage development only in places where good transit service already exists

- allow development only when that development is “transit-friendly”
- allow development only when either the design or mitigation incorporated into the development proposal ensures that mode shift will occur.

However, these goals may not be the ones desired by each Eastside jurisdiction, and they are definitely not required by the proposed alternatives. These same basic techniques could be used to encourage land-use and transportation systems that were pedestrian-friendly, multi-modal, or car-oriented.

In fact, in large cities, different measurement statistics can be applied to each “zone” of the city, depending on nature of the transportation system that is needed to serve that zone. Currently, LOS standards change from zone to zone, but they all rely on the same measurement statistic. However, most cities have varying land-use and transportation goals throughout the city, and those goals may be best served by varying measurement statistics. For example, an appropriate concurrency standard in a downtown core area (Bellevue, Kirkland, or Redmond) might include three different modal attributes (cars, transit, and pedestrians) because all three modes were important for mobility within such an area. On the other hand, a concurrency standard in a zone that contained primarily single-family residential units might include statistics for only one or two modes (e.g., cars, or cars and bikes.)

All of the alternative approaches discussed in this report will allow this flexibility. The real key to selecting any one of them, as well as the actual measurement statistics and LOS standards, is *understanding what transportation system is needed to support a specific land-use vision*. With this understanding, jurisdictions should design concurrency programs that enable them to incrementally develop the necessary transportation system.

CHAPTER 5: FUNDING AND REGIONAL CONSIDERATIONS

There are many dimensions to transportation concurrency, ranging from the technical to the more conceptual and policy-oriented. In this chapter we focus on the latter, outlining several directions that local and regional stakeholders could pursue to advance the goal of accommodating new growth and development while improving quality of life and transportation service. These directions include using roads less, funding transit more, and acting inter-jurisdictionally. Each of these broad directions would mean changes in individual attitudes and behaviors, as well as institutional frameworks and financing. None by themselves will change travel behavior or urban form, but Anthony Downs' admonition in *Stuck in Traffic* applies: it takes a thousand chops of the woodsman's axe to fell the tree. Therefore, we present them as a roadmap for discussion and debate now, hoping for action in the short- to mid-term future.

USING ROADS LESS

The most significant variable in analyzing the transportation concurrency equation is roadway capacity. As this report has demonstrated, the options are very simple: *increase* road capacity, *maximize existing* road capacity, or *use less* of it. In our discussion and illustrations of Enhanced V/C we explored increasing the use of existing road capacity by promoting ways to increase the number of people in each vehicle. Here we use similar ideas to explore using roads less. The person throughput of a given roadway not only increases with more HOV traffic, congestion is reduced if fewer SOVs are on the road. Experience over the past few years offers proof of this. Traffic counts on Puget Sound freeways peaked during the economic boom of the late 1990s and have declined along with the economy over the last two years, resulting in less traffic. Recessions are certainly not the best way to reduce traffic congestion in order to remain within concurrency LOS limits. Rewards and pricing could work better.

Rewards

At present there are no rewards for reducing SOV driving and no targets for helping residents know when they are doing a good job of solving either the congestion problem or the halt of new development because of LOS caps. On the contrary, when we build auto-oriented development and front-load the cost of driving by charging up-front for the car, licensing, and insurance but not for ongoing road use, it is only rational that drivers choose to drive more miles in order to maximize their investment, as each additional mile traveled costs less. However, each city, county, or collection of counties through PSRC could establish a vehicle miles traveled (VMT) reduction target for individual car drivers to meet. As an example, let's say that each car driver is asked to reduce annual VMT by 10 percent. Actual miles traveled would be documented during annual vehicle inspections. Drivers reducing VMTs by 10 percent from the previous year would be entered in a lottery drawing with a chance to win prizes from \$1000 to \$10,000 or more. These funds would come from a variety of sources, including developer agreement contributions and related supplemental mitigation funds at the local jurisdiction level, and MPO-controlled funds at the regional level.

Would such a monetary incentive work? What would the size of the award need to be? Would it be politically acceptable to divert funds that could go to road improvements or transit services to individual motorists? Would overall VMT reduction translate into lower v/c readings during peak hour periods? A demonstration program would need to carefully address these kinds of questions during project design and subsequently during its monitoring phase. A local reward/VMT reduction program could be popular with developers if it proved successful because it could reduce expensive requirements to construct road lanes, overpasses, and intersections.²⁸

Pricing

The Puget Sound region currently has a transportation pricing system; it is based on congestion, paid in time through hours spent waiting in peak hour traffic. More explicit pricing regimes are in place in Norway and England and closer to home in New York and California, where motorists make decisions about road use on the basis of a monetary price. The PSRC is conducting a transportation pricing prototype project that is now under design. Charging motorists variable prices to enter cordoned areas or congested roadway segments is technologically feasible and, from an economic perspective, desirable. Politically, it is a difficult sell in a western state with a pension for 'free' roads. Yet variably priced tollways in conjunction with un-tolled alternative roads have proven successful in southern California. Transportation pricing offers a tangible way to not exceed established LOS through an adjustment of rates to keep congestion at the desired level.

FUNDING TRANSIT MORE

An obvious addition to existing concurrency measurement methods is the consideration of alternative transportation choices in the calculation of transportation system capacity. One of the principle benefits of such an approach is that jurisdictions can increase the performance of their transportation system by adding transit capacity (or other alternative transportation choices) rather than an additional lane. However, under current law, county and regional transit authorities, not local governments, control transit service. Specific to the Eastside, Metro and Sound Transit are responsible for planning, routing, and operating transit service. Local governments have little certainty, absent an interagency agreement, that the transit service they might rely on now to approve the development will exist in three, five, or ten years. The likelihood of dramatic decreases in transit service is unknown, but nonetheless, establishing LOS standards that incorporate transit service into the jurisdiction's transportation capacity reduces that jurisdiction's ability to predict capacity over the long term. As a result, cities often find it easier to fund roadway expansion projects rather than transportation services. While the preference for certainty is understandable, this section explores ways cities can increase permanence of transit service by funding it.

²⁸ This approach is adapted from a municipal recycling program. The challenge was how to enforce residential garbage recycling. The answer was to have a single city employee randomly check homeowners' curbside waste stream. If trash was properly separated, the 'enforcement officer' gave the homeowner a check for hundreds of dollars.

The arguments against bus transit are that it is expensive to operate, few people ride it, cities do not control routes and operations, and (because neither its route nor funding is fixed) it is not permanent. The arguments for bus transit are that it enables large numbers of people to get in and out of compactly developed centers efficiently and with minimal environmental impacts, it can keep congestion below LOS standards, and it offers an alternative to costly and politically divisive new road building.

Paying for Transit

Transportation concurrency developer agreements can pay for transit service. Cities can underwrite existing or new Metro routes or contract with third parties such as transportation management associations (TMA) to operate HOV service. Metro bus service is expensive—approximately \$75 per hour, and fare box recovery is only 20percent—but cities and employers can work jointly with Metro to share the cost of new route development and use Flexpasses to add new classes of riders. Cities can impose parking charges on SOVs that can be used to fund new transit alternatives. Redmond dedicates a per employee tax to transportation demand management (TDM) and HOV measures, funding TMAs and Metro Transit bus services. Major employers such as Microsoft and Weyerhaeuser have worked with Metro Transit Development to underwrite new bus and HOV service for its employees. At least one residential development, Overlake Village in Redmond, offers Flexpasses to its tenants.

Each of these examples illustrates existing mechanisms in use that pay for transit service. Developer agreements can be negotiated to define specific amounts of funding (per employee/resident) to be contributed to a local TMA. The TMA can use funds for an array of TDM measures ranging from education campaigns, to vanpool provision, to transit service contributions. TMA funds are not subject to six-year expenditure requirements that cities must meet. Developer agreements, which can include implementation schemes like the TMA examples described above, are an excellent way to generate and manage funds to help support alternative transportation services, while at the same time providing land owners and tenants with incentives to fund effective TDM actions.

Transit-Friendly Land Use

Cities control their land uses, densities, and to some extent, the location of future development. The application of Smart Growth principles of compact, transit-friendly development makes the use of existing and the provision of new transit routes more viable, as it results in increased transit ridership. Continuing low density, land intensive development patterns makes transit less viable. Coordinating land development decisions with transit agency service plans can result in ensured levels of transit service for geographic areas with transit-friendly development zones and can be the most cost effective means of increasing ridership for transit agencies. Bellevue and Metro Transit negotiated an agreement approximately 20 years ago regarding the development of its downtown. As the downtown achieved its density goals, Metro would add transit service. Today the downtown Bellevue Transit Center is one of the county's key hubs, with service every 15 minutes to downtown Seattle, the University District, and Eastside locations. Transit ridership and mode-split are now higher to downtown Bellevue

than any other Eastside location. As Kirkland seeks regional center designation for Totem Lake, similar land-use decisions could link compact, mixed-use development with new bus routes.

Route Permanence

Rail transit offers long-term certainty about station location. Bus transit is flexible, and routes can be changed, thereby reducing the certainty that bus routes can be counted on to mitigate the traffic congestion impacts of new development. While this is undeniably the case in principle, a closer look in practice may shift views on the likelihood and progression of bus route permanence. Metro Transit's current six-year service plan adds 40 percent of new service hours to the east and south county and only 20 percent to the city of Seattle. The six-year plan also identifies a *core network* of routes, which are essentially permanent routes. City land-use decisions that direct development to transit-friendly locations will use the new service hours and reinforce the strength of bus routes that are currently, or that could become, core routes. An analysis of basic routes in urbanized areas shows little change in routing over generations. Therefore, the period of vulnerability is when new routes start. If developments are delayed, poorly designed to support transit, or not associated with other transit-friendly land uses, and if ridership projections are unmet, Metro will drop routes without ongoing subsidies from local jurisdictions.

Effectively designed and integrated, transit-friendly land uses and direct financial support can be used to influence and control the placement of transit service. Yet there are limits to the amount of additional transit service that will be added in the foreseeable future. Therefore, the Eastside cities must be strategic about the number of new bus route corridors they initiate, bring to scale, and underwrite and partner with private developers and Metro or Sound Transit. It is also clear that the combination of well designed land use and local financial assistance provides a win/win situation for both local jurisdictions and transit agencies when it comes to route selection and service provision. Transit agencies therefore have significant incentive to cooperate with local plans that are designed to support transit, as the transit agencies will obtain greater ridership at lower per passenger costs by providing transit service in corridors or urban centers. The use of concurrency in such a strategic fashion could actually provide local jurisdictions with a large measure of control over transit route selection and levels of service. The period of subsidy could be many years but could still amount to less expense than road-widening or denying development. This could make the bus transit option more popular for developers and neighbors alike.

ACTING INTER-JURISDICTIONALLY

We have already discussed at least one form of cooperation amongst jurisdictions—the routing and funding of bus transit service between a city and the county. But there are additional possibilities that could bring advantage to the four Eastside cities. Before going further, it is important to acknowledge that working together sounds easy, but is often very difficult, consuming much time and goodwill. There is nothing inherently beneficial about inter-jurisdictional cooperation except when it is in the mutual self-interest of all the parties. In its wisdom the GMA left each city and county to establish its own transportation concurrency LOS,

but after ten years of living under the act we can see that some activities, such as regional pass-through traffic, are beyond the control of any one jurisdiction. State law enables inter-jurisdictional cooperation. Redmond and Bellevue have developed the BROTS agreement dealing with land use in Overlake, an area that straddles city boundaries, and Issaquah and King County have an agreement to share impact fees at their boundaries. This kind of cooperation can offer advantages at the sub-regional and regional levels in implementing the land-use/transportation balance intended by transportation concurrency.

Developer Agreements

Developer agreements, as previously noted, have the advantages of solidifying commitments for ongoing transportation programs and proactively heading off concurrency failures. Rather than reacting to only those developments that fail concurrency, developer agreements build transportation services along the way, decreasing the likelihood of concurrency failures.

Redmond uses negotiated agreements with developers most intensively of the four cities. Presently, developers are asked to contribute to transportation improvements on a citywide list, although development impacts in any of the four cities could be sub-regional in nature. The existing system of negotiation stops at improvements within the city boundary, yet transit service, roadway, or non-motorized activity could just as well take place in neighboring cities. By more explicit inter-city coordination, developer agreements could mitigate transportation impacts that a given development might induce in more than one city or corridor.

Sub-regional Traffic

Presently, each city can look at the others as the generator of car traffic that tips local LOS over its limits. Each city has a different LOS standard. The four cities could create a *Transportation Benefit District* that would deal with issues of sub-regional significance. For example, the District could set standards and fund improvements to arterials of regional significance such as 148th Ave, a busy street carrying trips between various Microsoft campuses and three cities. Such a four-city compact could pool developer agreements or mitigation funds to underwrite bus transit routes that serve multiple cities over time. It could also be the initiator of a parking tax applied across all four cities, equalizing the political pain (and benefits).

Regional Traffic and VMT

As productive as four-city efforts are, they cannot deal with the scope of the population and traffic of the four-county Puget Sound region. Major interstate and state highways transect Kirkland, Redmond, Bellevue and Issaquah, and people travel from all over the region to visit families, shop at Bellevue Square, or work at Microsoft's campus. A metropolitan region-wide governance entity could set VMT reduction standards or mode-split targets and implement the kinds of mode-split credits or VMT reduction incentives described in this report. The PSRC, the four-county voluntary council and metropolitan planning organization, is an existing organization whose governing board could be encouraged by its members to assume this kind of

regional responsibility for developing and implementing regional approaches to transportation concurrency. The four Eastside cities could initiate the development of a regional VMT reduction program as a working agenda item within the PSRC. PSRC staff are not authorized to take the lead on such an initiative, but they would respond to the will of the membership and its policy board.

An alternative, perhaps longer-term, approach is the formulation of a metro regional government modeled after Portland Metro or the Twin Cities Metro Council. Both have taxing powers and authority to implement development and programs at the metropolitan region level.