Attachment C. Transportation Report

Transportation (City of Woodinville)

Transportation
City of Woodinville

January 2007
Revised February 2007

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List of Acronyms

CIP	Capital Improvement Program
City	City of Woodinville
HD	High-Density
LOS	Level of Service
LW	Low-Density

1. Introduction

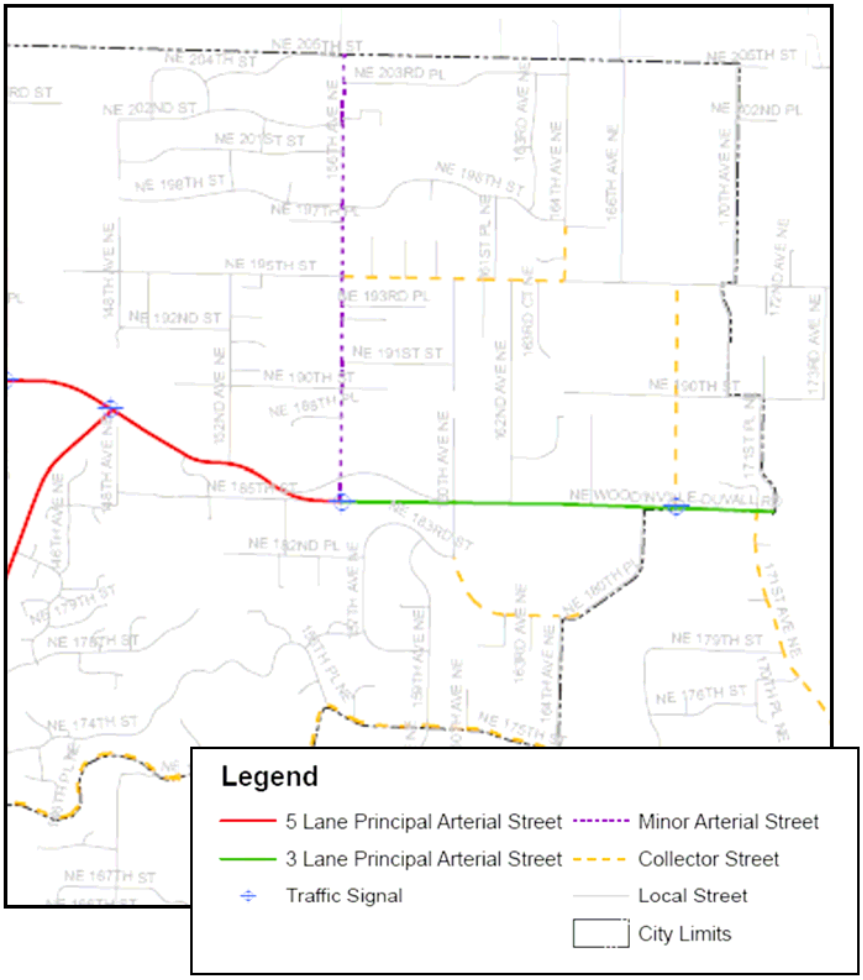
This section reviews the motorized vehicle transportation system within Woodinville's R-1 zone that includes the existing roadway system: physical characteristics, current standards design comparison, intersection level of service, and circulation. It then discusses the potential for future needs and possible alternatives to address any future needs within the R-1 zone.

The R-1 zone is served by one major east-west arterial (Woodinville-Duvall Road), a minor north-south arterial (156th Avenue NE), and several collector arterial roadways. The roadway classifications are shown on Figure 1. All other roadways in this zone are residential classification (shown as local streets). With the exception of Woodinville-Duvall Road, west 160th Avenue NE and the approximately 300 feet of the southern terminus of 156th Avenue NE, all roadways are two-lane road ways. Most trip generators (e.g., trip destinations that attract multiple travelers such as a shopping center) are to the west of the R-1 zone. Included are both employment and shopping/service establishments.

A citywide traffic model had been prepared by the City of Woodinville (City) for a 20-year travel demand forecast as part of the City's Traffic Impact Fee program, adopted in 2004. The deficiencies identified from this effort have been included in the City's Capital Improvement Program and are discussed later in this section.

Most roads within the R-1 zone area were developed under King County development standards (Pre-City incorporation).

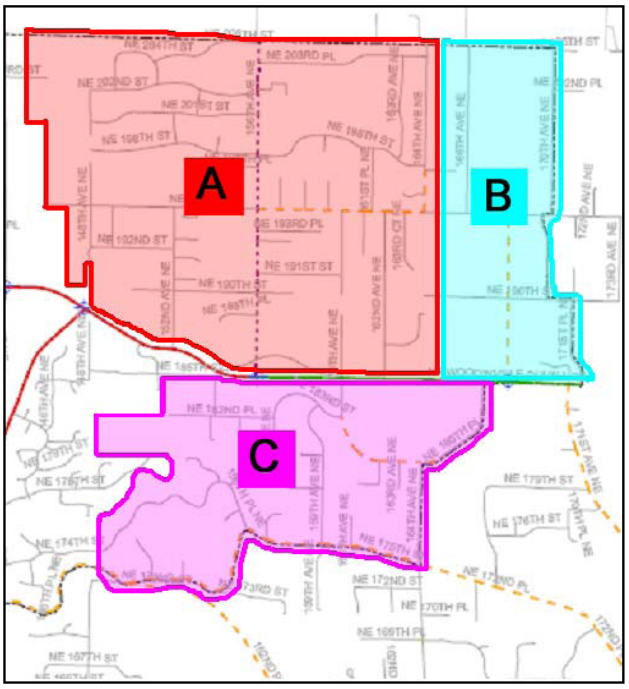
Figure 1. Roadway Classifications



2. Existing Roadway Systems

In the R-1 zone, there are three distinctive roadway systems. These are defined by sharing common arterial/collector service roadways and are shown in Figure 2.

Figure 2. R-1 Area Roadway Systems



2.1. System A

Located in the northwesterly area, most properties are accessed by 156th Avenue NE, which is classified as a minor arterial street. The properties not serviced by 156th Avenue NE are accessed to the south along Woodinville-Duvall Road.

The general characteristics of these roads are asphalt pavement with some areas of gravel shoulders and a mixture of open ditch or open shoulder drainage. The terrain generally has gentle grade changes except at some sections of the far west edge and south-west slope. All grades in this section appear to be below the 15% grade slope standard. The layout is typically long block sections with some gentle curves. Only a very small percentage of streets in this area have curbs and gutters or sidewalks.

Internal circulation is possible in the northwesterly and northeasterly neighborhoods. Most other roadways are non-through streets with the exception of NE 195th Street which has a gate across the public roadway. Ingress and egress travel from these neighborhoods is possible from both the north and south travel along 156th Avenue NE.

Some restricted vertical sight distance[1] conditions have been identified in this area in the northwesterly neighborhoods.

2.2. System B

Located in the northeasterly area, the only City-identified collector road is 168th Avenue NE. However, there are other roadways providing ingress and egress from this area. There is a public school zone within this area.

The general characteristics of these roads are asphalt pavement with some areas of gravel shoulders and a mixture of open ditch or open shoulder drainage. The terrain has gentle grade changes. All grades in this section appear to be below the 15% grade slope standard. The layout is typically long, straight, aligned block sections. Only a very small percentage of streets in this area have curbs and gutters or sidewalks. Most sidewalk sections are in the newer development constructed after the City's incorporation.

Internal circulation is possible but is poor as there is only one route possible in all cases without having to enter onto a major arterial.

One restricted vertical sight distance concern has been identified in this area.

2.3. System C

Located in the southerly area, this area is serviced by Woodinville-Duvall Road to the north and NE 171st/175th Street to the south. Several properties in this area have access directly off Woodinville-Duvall Road and NE 171st/175th Street.

The general characteristics of these roads are asphalt pavement with some areas of paved shoulders along one side and a mixture of open ditch or open shoulder drainage. The terrain has gentle to moderate (hill slope) grade changes. Some grades

[1] Sight distance is defined as the distance in which two approaching vehicles have a visual fix on each other's vehicles sufficient for a safe reaction time for the posted speed limit. A restricted sight distance means that the distance is not sufficient for a safe reaction time.

in this section appear to be the 15% grade slope standard. The layout is typically long block sections with gentle to moderate curve sections. No streets were identified in this area to have sections with curbs and gutters or sidewalks.

Internal circulation is fair.

No sight distance concerns have been identified in this area.

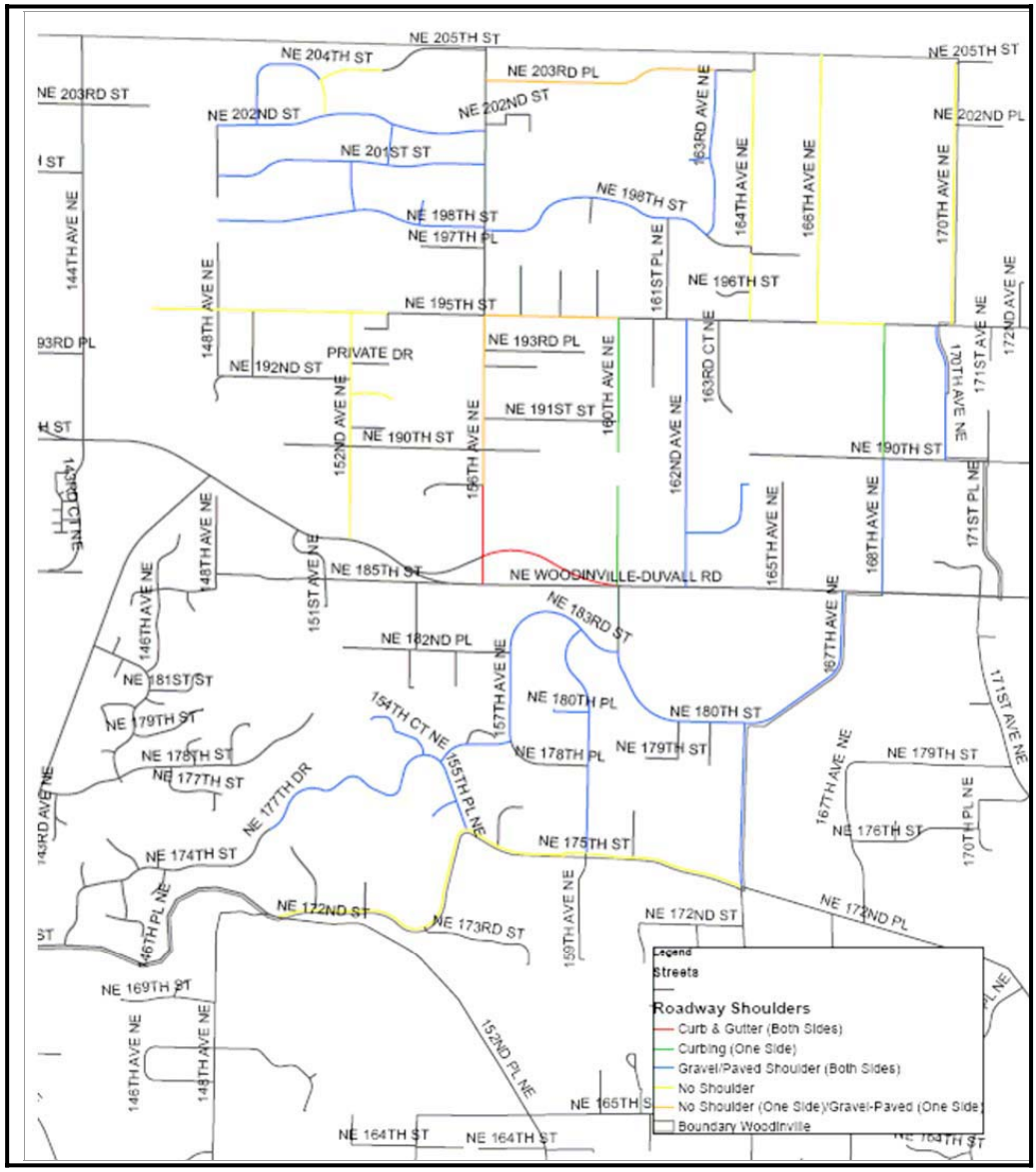
3. Road Standards

The existing roads within all three zones had been reviewed to determine if current road standards are met and, in any sub-standard areas, to assess what measures would be necessary to bring a roadway into compliance. Included is an analysis of the physical cross-section of the existing roadway including shoulders, drainage, and sidewalks (designated walking surface). Variations to the existing standards, such as shoulder material (paved or gravel), location of the walkway (set back or adjacent to roadway lane edge), and drainage system (underground or open ditch) are allowed under current standards and were taken into consideration in this review. Sight distance standards were not specifically reviewed in this document but there are several recognized vertical conditions that are currently under study by the City.

Initial review was performed with a “windshield” inspection of all roads that looked at widths, shoulder treatment, and pedestrian facilities. The condition of the pavement was not taken into consideration since this is a maintenance issue and does not significantly change whether the road meets standards.

The results of this review are shown on the map in Figure 3. The overview found that there is roughly an even split between shouldered and non-shoulder area with only a very small fraction of streets having curbs, gutters, or sidewalks. Most drainage was above ground in either open ditches or shoulder runoff, entering into open spaces off the roadway. Pavement width varied but most travel lane paved surfaces were at least 20 feet wide.

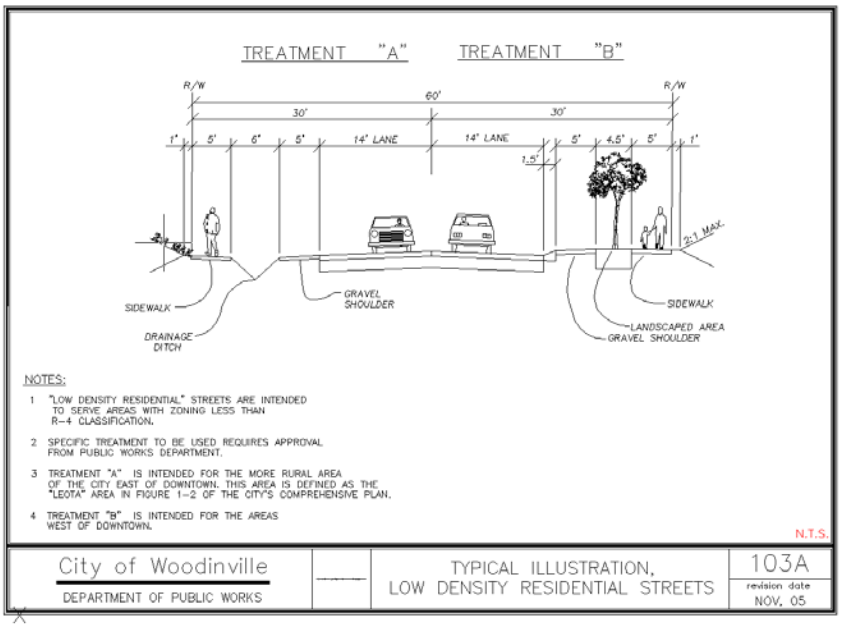
Figure 3. Existing Roadway Conditions



3.1. R-1 Zoning Local Road Standards

Local road standards for areas with zoning less than R-4 classification is defined under the "Low Density Residential Streets" standard 103A. This standard is shown in Figure 4. Typically Treatment "A" is used in the R-1 zone and was used in reviewing the current roadway cross-sections.

Figure 4. "Low Density Residential Streets" standard 103A



3.2. Local Road Findings

Most streets classified as local did not provide any pedestrian facilities. Approximately 50% did have some type of shouldering with about 50% of these areas having a shoulder width narrower than 5 feet. In some areas without shoulders, open ditches were adjacent to the edge of the pavement.

Driving lane widths varied greatly from 10 to 14 feet. Most local roads lanes in System A and System B were narrower than 14 feet in width. In System C, about 30% had driving lanes of14 feet in width.

Based on setting the standard at driving lane width, sidewalk (pathway) being provided on one side, and having a shoulder width of 5 feet (as defined in 103A), the majority of roads are considered to be substandard. Under life safety requirements of a minimum pavement width of 20 feet, the large majority of roadways meet this standard.

3.3. Arterial and Collector Road

These classifications of roadways are established in the Comprehensive Plan and are not specific to land zoning. These types of roadways are shown in Figure 1.

The standards for these roads are:

- 5-Lane Principal Arterial – Figure 5
- 3-Lane Principal Arterial – Figure 6
- Minor Arterial – Figure 7
- Collector – Figure 8

Figure 5. 5-Lane Principal Arterial with Bike Lanes Standards

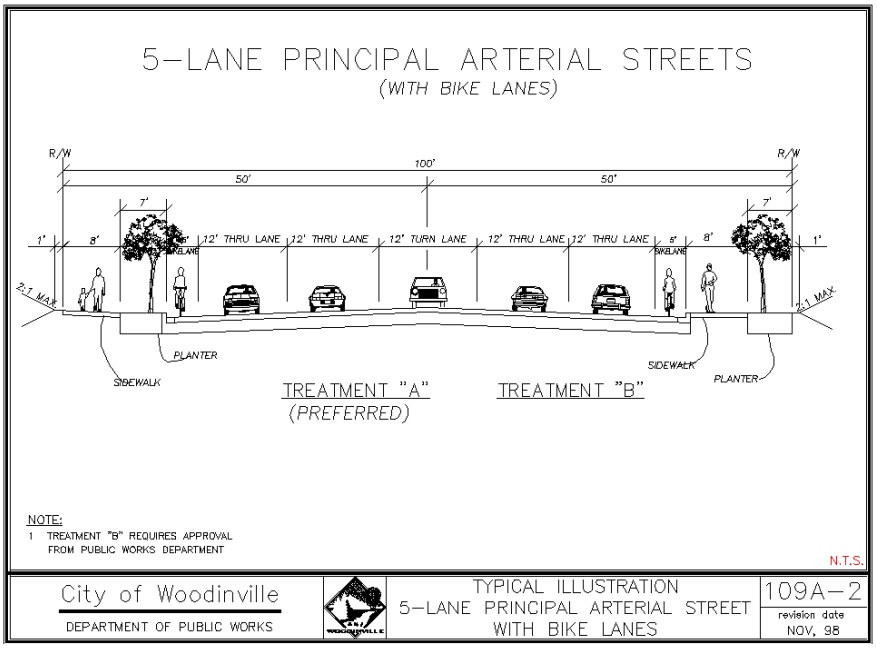


Figure 6. 3-Lane Principal Arterial with Bike Lanes Standards

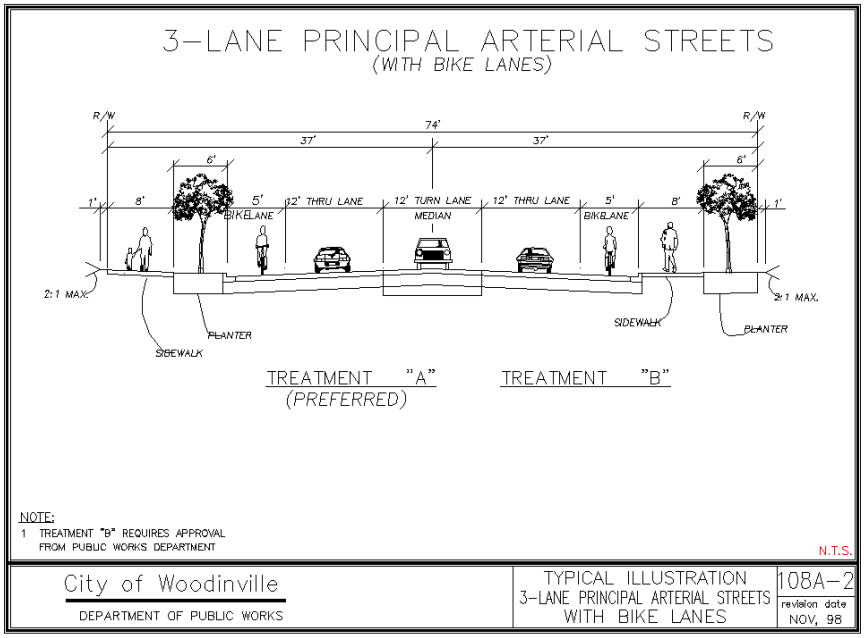


Figure 7. Minor Arterial with Bike Lane Standards

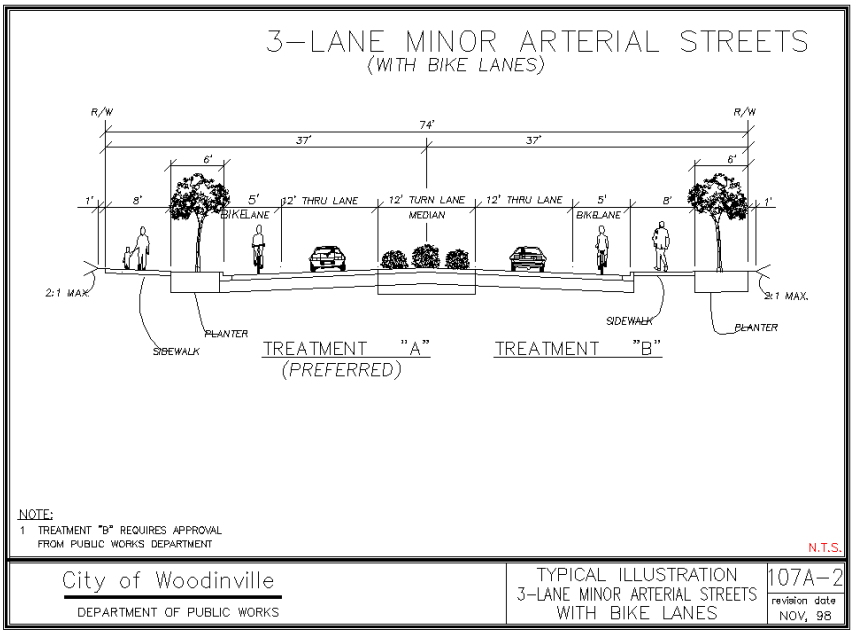
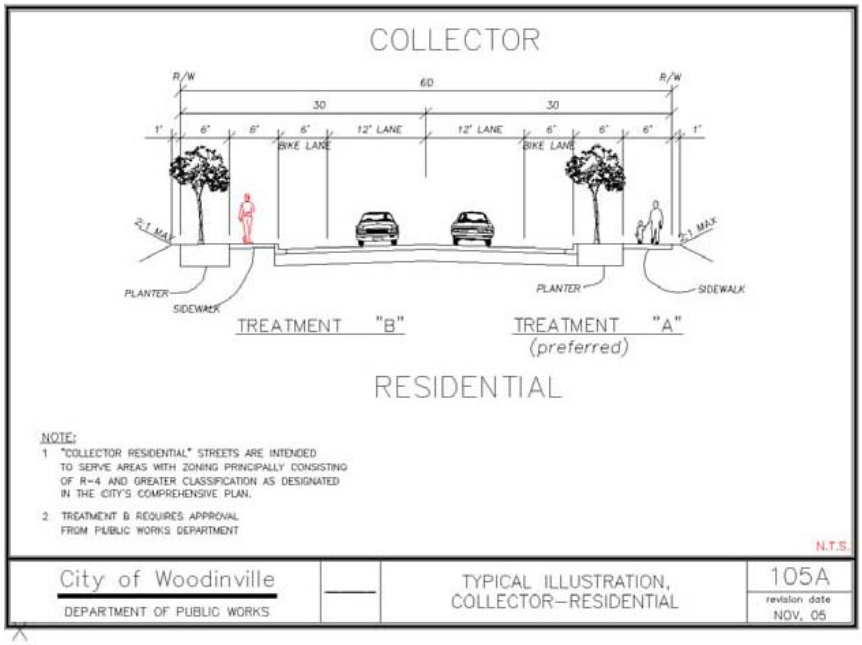


Figure 8. Collector with Bike Lane Standards



3.4. Arterial Findings

Woodinville-Duvall Road, west of 156th Avenue NE is classified as a 5-lane principal arterial designated with bike lanes. The current roadway configuration was performed under a City road improvement project in 1998 and a developer improvement in 2002. The road varies in lane configuration from 3 to 5 lanes. The shoulders are paved providing a mix of use for both bike and pedestrian travel.

This road segment does not meet current standards and has been included in the City's 20-year Capital Improvement Program (CIP). Future improvements are expected to bring the road up to a full 5-lane section over the entire length.

Woodinville-Duvall Road, east of 156th Avenue NE is classified as a 3-lane principal arterial designated with bike lanes. Additional intersection approach lanes and signal improvements were performed at the NE 156th Avenue NE and the 168th Avenue NE intersection under a City road widening project in 1998. The section between these two intersections is 2 lanes. The shoulders are paved, providing a mix of use for both bike and pedestrian travel. This road segment does not meet current standards and has been included in the City's 20-year CIP. Future improvements are expected to bring the road up to a full 3-lane section over the entire length.

156th Avenue NE is classified as a 3-lane minor arterial designated with bike lanes. Additional intersection approach lanes and signal improvements were performed

under a City road widening project in 1998. The section north of the intersection improvements is 2 lanes. The shoulder is paved along the west side of the road providing a mix of use for both bike and pedestrian travel. This road segment does not meet current standards and has been included in the City's 20-year CIP. Future improvements are expected to bring the road up to a full 3-lane section over the entire length.

NE 171st/NE 175th Street and the other collector roads are classified as 2-lane collector residential type roads with bike lanes. Since incorporation of the City, no known travel lane improvements to these roads have occurred. All collector roads are 2 lanes with a mixture of areas of shoulder and non-shoulder sections. The lane widths vary from 10.5- to 12-foot lanes. A few areas have minimal paved shoulders (narrower than 4 feet typically) with no designated area for bike travel. These road segments do not meet current standards. One segment, NE 171st/NE 175th, has been included in the 20-year CIP. Improvements to the other roads are expected at the time of redevelopment frontage improvements. Future improvements are expected to bring the roads up to a full 2-lane section over the entire length with possible turn lanes at key intersections.

3.5. R-4 and Greater Road Standards

Increasing the R-1 zoning to R-4 or higher (more density) affects only the residential road standard classification. Differing from residential road standards, collector and arterial road standards are not established by land use but by the traffic volume capacity needs. These road classifications were initially determined by modeling with a maximum density of R-4 within the R-1 zone area. This information indicates that the designated arterial and collector roads standards have sufficient capacity for future development of the R-1 zone to an R-4. Therefore, no further review of capacity for these classes of roadways is necessary.

In regard to constructability of this classification of roads, there is sufficient right of way for the construction of the full standard for the collector classification roadways. The current adopted arterial road standards, as shown in Figure 5, 6, and 7, cannot be constructed within the existing right of way width in most road sections. How to address this condition is discussed in the Low Impact Arterial Standard section of this report.

In regard to constructability of local roads, there is sufficient right of way, and this is discussed in Local Road Standards section of this report.

3.5.1. Low Impact Arterial Standards

To address arterial capacity and non-motorized facilities features of the current adopted Arterial standards within the existing right of way, a "low impact" standard has been proposed. This is based on a draft standard that was prepared for the City Council during the 2004-2010 CIP to allow for 3 lanes arterial road section within a 60 foot right of way for 156th Avenue NE and Woodinville-Duvall Road. It was also intended to have a minimum impact to adjacent properties and roadside vegetation (i.e. trees).

The Standards, shown in Figure 9 and Figure 10, are proposed standards. Treatment "A" matches the current adopted road standard section while Treatment "B" is the "low impact" section. It is likely that new development adjacent to one of these roadways would be required to construct to Treatment "A". Treatment "B" would like be the section used in the event that improvement were constructed either by the City or by a development as off-sight improvements.

In both proposed standards, the full capacity and function of the current adopted standards can be provided.

Figure 9. 156th Avenue NE with Bike Lane LI Standards

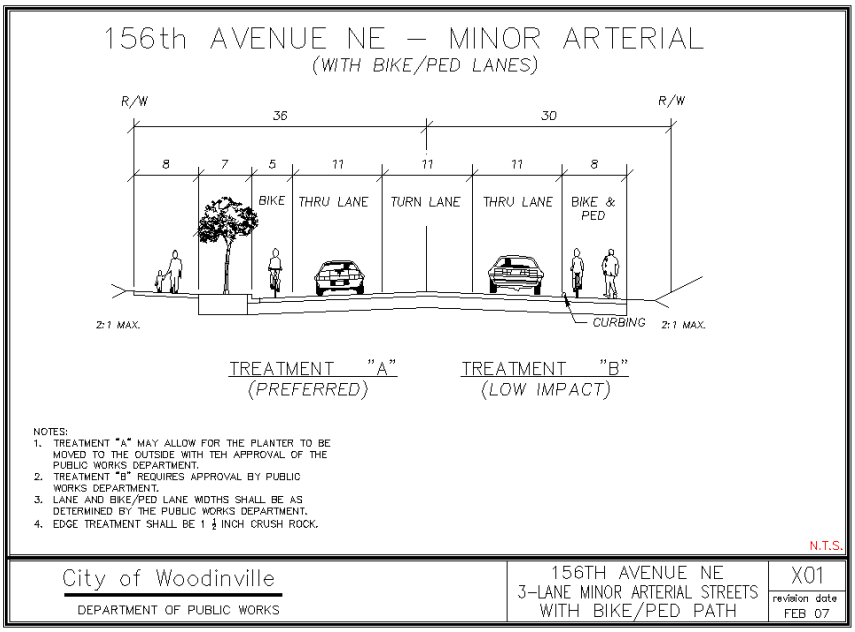
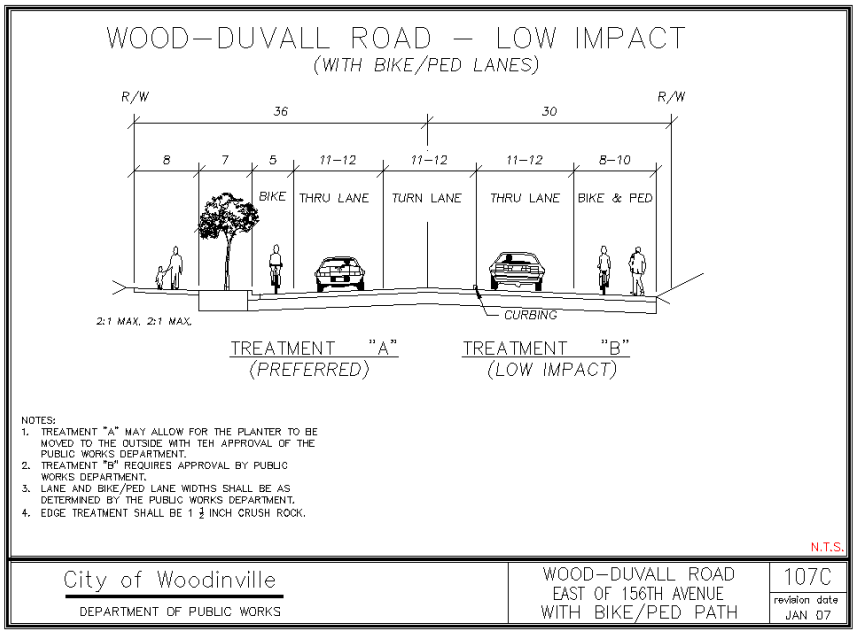


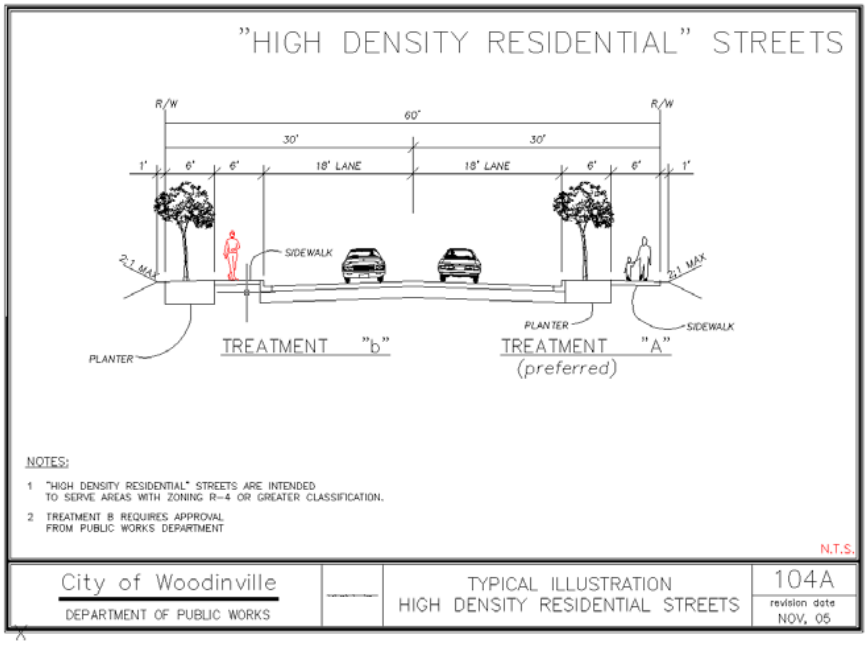
Figure 10. Wood-Duvall Road with Bike Lane LI Standards



3.5.2. Local Road Standards

In zoning of R-4 or higher, local road standards are defined under the "High Density Residential Streets"[2] standard 104A. This standard is shown in Figure 11. A comparison of the low- and high-density road standard is provided in Table 1.

Figure 11. "High Density Residential Streets" standard 104A



The main purpose for the High-Density (HD) road standard is for providing on-street parking and stormwater collection and treatment. It is also a frontage finish identified with an urban neighborhood that allows for a buffer between vehicles and pedestrians and a dressed frontage with a planter strip. In HD neighborhoods, lot size often limits on-site parking space so on-street parking is needed. As a rule of thumb, there is typically one on-street parking space needed for each unit.

Table 1. Comparison of Low- and High-Density Road Standards

Description	Low Density	High Density
Right-of-way	60	60
Pavement width	28	36
Driving lane width	12	11

[2] Under the City of Woodinville Comprehensive Plan, 4 dwelling units per acre is designated at "Low Density Residential" (section 3.4.1 Land Use Designation and Location Criteria). The "High Density Residential Street" is a reference only to this design standard.

Description	Low Density	High Density
Paved shoulder	3	NA
Paved parking	NA	7
Gravel Shoulder	5	NA
Sidewalk	Yes	Yes
Curb & Gutter	No	Yes
Capacity Range (ADT)[3]	800-2,400	800-2,400

Capacity between the Low-Density (LD) and HD standards is very similar and can be considered equal, although typically the HD road can have a slightly lower capacity due to the higher concentration of driveways and on-street parking. Both have similar driving lane widths and typically have similar roadway alignments (both vertical and horizontal).

In summary, the LD and HD road standards are very similar when compared using vehicle carrying capacity. The roadway alignments use the same standard for design and both must meet the same requirement for life safety services. There is a "feel" difference between the two. LD typically provides a more open feeling and is sometime more prone to have vehicle speeding problems. HD roads, when on-street parking is fully used, can create a tunnel effect with a feeling of traveling at a higher speed than actual travel speed and resultant slowing of movement. Conversely, on HD roads when on-street parking is not used, a much wider driving surface is provided, which can be more prone to speeding problems similar to the LD road.

[3] Capacity is an estimated value only and is based on a number of factors that includes driveway spacing and numbers, topography, road alignment, sight distance, road speeds, on-street parking, and land uses. For the purpose of evaluating a residential street, the City uses a peak hour value in the range of 80 to 240 vehicles (800 to 2,400 average daily trips).

4. Level of Service

A measurement used to determine acceptable operations of a roadway system is referred to as Level of Service (LOS). It is standard practice in the transportation industry to measure LOS at intersections. These are the points where some or all vehicle entering an intersection have some delay time passing through the intersection. Table 2 shows the standard used by the City (Highway Capacity Manual 2000).

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service Criteria for Unsignalized Intersections	
Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Due to the low trip volumes within residential neighborhoods, LOS is typically very high (in the range of A or B). Intersections along most local streets would likely see a wait of less than 15 seconds before passing through the intersection.

Where local streets intersect with arterial and collectors, LOS can vary greatly throughout each day. Arterial and collector class roads generally have higher trip volumes, often several times greater than the approaching local street volume. During peak hours and special local activities, it is common to see LOS in the range of C to F.

To review a density change from R-1 to R-4, a model was run for the System A area. This area was selected as the majority of the neighborhood roads have no other option than to access off 156th Avenue NE. System B and System C area have internal route options so the LOS for these areas was not reviewed at this time.

4.1. System A Level of Service projection

The LOS projections for 156th Avenue NE intersections, from the east and west side public local roads, were performed with 2008 as the baseline[4] condition. A 20-year

[4] Baseline is a reference point to provide a comparison against the 20-year LOS forecast.

forecast (2028) was used as the review year for R-1, R-2, and R-4 zoning. This was modeled for the PM peak hour period, which would be considered the worst-case scenario. The model used the City's current developed traffic circulation model and assumed a regional annual growth rate of 2.5% (used for pass-through trips) with approximately 50% of available building lots in the R-1 accessing 156th Avenue NE being developed at the designated zoning. No improvements to either the local or arterial roads were assumed to have been made over the existing conditions. This is believed to be a conservative approach and actual history does not support this rapid a growth rate. Table 3[5] shows the result of this model[6].

Table 3. 156th Avenue NE Public Roadway Intersections Level of Service

Weekday PM Peak Hour	2008 Baseline Conditions			2028 R-1 Zoning			2028 R-2 Zoning			2028 R-4 Zoning		
(156th Ave NE)	LOS[1]	Delay[2]	Leg	LOS[1]	Delay[2]	Leg	LOS[1]	Delay[2]	Leg	LOS[1]	Delay[2]	Leg
NE 204th Street	N/A	N/A	N/A	C	16.9	EB	C	17.6	EB	C	19.0	EB
NE 203rd Place	B	10.1	WB.	C	17.0	WB	C	18.1	WB	C	21.0	WB
NE 203rd Street	N/A	N/A	N/A	C	15.4	EB.	C	15.6	EB.	C	17.5	EB
NE 202nd Street	B	10.2	EB.	C	21.2	WB	D	25.8	WB	D	28.2	WB
/NE 201st Street	B	10.6	EB.	C	24.7	WB.	D	26.8	WB	D	33.7	WB
NE 198th Street	B	11.8	WB	E	40.2	WB.	E	47.6	WB	**F**	**79.1**	**WB**
NE 195th Street	B	12.8	WB	E	37.2	WB	E	42.9	WB.	**F**	**63.8**	**WB**

4.2. Mitigating Level of Service Deficiency

The City's adopted LOS for all intersections is E. Therefore, those intersections that fall below LOS E are considered to be deficient. According to this model under the R-4 zone, NE 195th and NE 198th intersection for westbound will be operating at LOS F (greater than a 50-second delay) during the PM peak hour by 2028 and can be considered to be deficient.

The drop in the LOS is produced from the increase trips on both the local and arterial roadway. With 156th Avenue NE, this is likely the effect of higher volumes of pass-by trips and left-turn movements. It is likely that the LOS can be improved by the addition of turn lanes on both the arterial and local roadways and/or by the installation of a traffic control device such as a 4-way stop.

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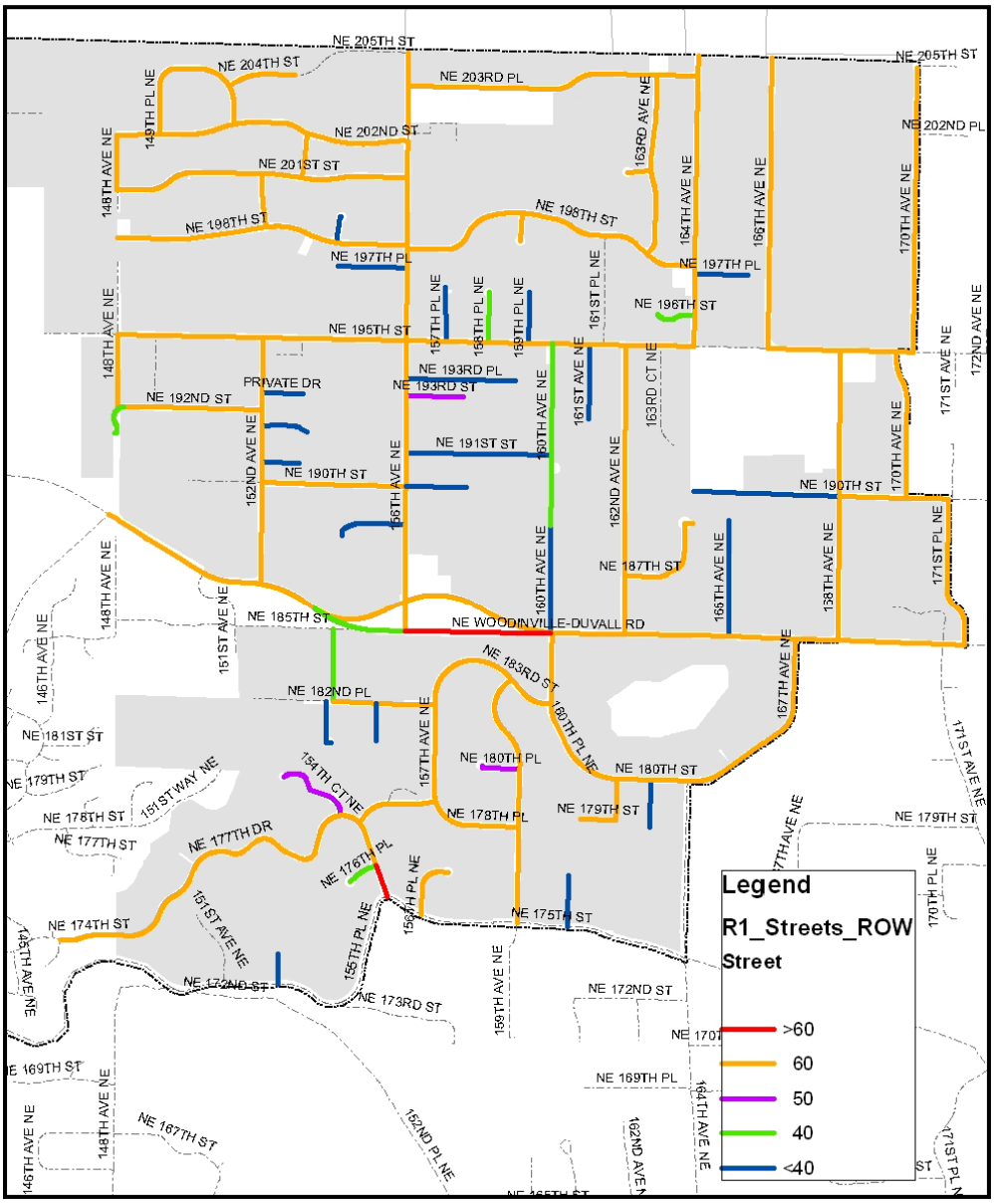
[5] Support information on the modeling is provided in Appendix A.

[6] Two new roads were assumed to be constructed within the 20-year period, under all scenarios, and were included in the modeling. These are NE 203rd Street and NE 204th Street.

Road improvements, necessary for the additional lanes, would involve widening of approximately 12 additional feet (the width of a single travel lane). Physically, this is possible in all of the existing intersections. The only constraint is whether sufficient right-of-way exists or whether additional land would be needed.

To explore this possible constraint, the King County Assessor's map was reviewed for existing right-of-way widths. The results are shown in Figure 12. Based on this information, both NE 195th and NE 198th have sufficient right-of-way to allow for the lane widening.

Figure 12. Existing Street Rights-of-Way



4.3. Relationship of R-1 Transportation Study to Citywide Studies

The scope of the R-1 Sustainable Development Study transportation analysis was specific to the City's current R-1 zone area only and did not include any transportation systems outside of this zone. However, the entire City's road network system was modeled under the City's 2003, 2004, and 2006 Traffic Study which included the R-1 being developed at a R-4 zoning to determine impacts. The current Capital Improvement Plan (CIP) does include projects that would be impacted by development in this area under R-4 and the current Traffic Impact Fee includes new development mitigation payment into these projects. For example, the City's CIP has Woodinville-Duvall Road improvements that will include a dedicated center left turn lane to address back ups during peak and non-peak hours that are typically the result of left turn movement blocking the through traffic.

5. Conclusion

The majority of the roadways within the R-1 zone were developed under King County prior to the City's incorporation. With the exception of newer roads constructed under the City's design requirements, the local streets in the R-1 zone do not meet the City's road cross-section standards. Under the Fire Department Access standard, requiring a minimum paved width of 20 feet, only a few short sections of roadways do not meet this standard.

Future road improvements, for the arterial and collector classified roads, have been identified in the City's long-range CIP and will be systematically reviewed and considered for improvements. It is likely improvements will be performed in several phases along each of these classifications of roadways and as need dictates and development warrants. On local streets, these are likely to occur under special projects (such as a special district for sidewalks) or under development mitigation.

The 156th Avenue NE corridor neighborhood was used to review operational projections for LOS at public road intersections. Using a very conservative traffic circulation model (with 50% of the existing R-1 zone redeveloping at a higher density, an annual growth of 2.5%, and assuming no road improvements) the analysis identified two intersections that would exceed the City's adopted LOS E by 2028. At both locations, the LOS can be brought back into compliance with widening improvements within the existing public right-of-way.

In regard to vehicle capacity, both the City's "Low-Density" and "High-Density" standards provide the same vehicle trip capacity. If additional capacity were needed,

due to physical restrictions within the roadway (such as the need to address a narrow road section), adequate right-of-way currently exists to allow for any needed improvement to address deficiencies.

Several local streets, and one minor arterial, have been identified with vertical sight distance conditions. These instances are currently being taken under review by the City for possible mitigation measures.

Road grades within the entire R-1 zone are all within the City's acceptable standards (under 15%).

Pedestrian and bike facilities are very limited within the entire R-1 zone area. Only Woodinville-Duvall Road has designated shared pedestrian and bike facilities along both sides of the roadway. Most of the developments following incorporation of the City (in 1993) do provide pedestrian facilities. However, these make up a very small portion of the R-1 zone. Of the remaining streets, it is estimated that less than 20% have any type of pedestrian facility and travel by non-motorized means must utilize the edge of the pavement or shoulder area.

6. References Cited

Highway Capacity Manual. 2000.

Appendix A

156th Avenue NE Intersection Analysis (Perteet Inc.)

MEMORANDUM

Perteet Inc.

TO: **Bob Wuotila, Sarah Ruether, and Mick Monken**

FROM: **Joel E. Birchman, PE**

DATE: **January 3, 2007**

RE: **156th Avenue NE 2028 Intersection Analysis**

On December 21, 2006 the staff at the City of Woodinville requested that Perteet perform an analysis of the intersections along 156th Avenue NE within the Wellington neighborhood. The initial results of our analysis were delivered to Bob Wuotila on December 27th and will be further presented in the following text.

Our analysis indicates that if the Wellington neighborhood were to fully develop to an R-4 zone sometime between 2008 and 2028, the intersections of 156th Avenue NE and NE 195th Street, and 156th Avenue NE and NE 198th Street would begin to operate at a Level of Service (LOS) F. In this same time period the other intersections along 156th Avenue NE, north of the Woodinville – Duvall Road, would begin to operate at a LOS "C" or "D". The City's adopted standard is LOS "E".

Due to our efforts to meet your time constraints our analysis is conservative, meaning that we may have over estimated the number of vehicle trips due to the land use changes from its existing condition to full build-out in 2028 with R-1, R-2, and R-4 zoning . Our estimates are reasonable considering that we are trying to project the impacts that may occur in the year 2028. However, many of the parameters that affect our findings may change substantially over the next twenty years (i.e. changes in driving patterns and characteristics due to increases in the price of fuel). This potential over estimate will be explained in the description below.

The following steps were used to develop the potential impacts to the intersections along NE 156th Avenue north of the Woodinville – Duvall Road and south of the King – Snohomish County line. These impacts are resulting from full build-out (assumed to occur by 2028) of the Wellington neighborhood with R-1, R-2, and R-4 zoning:

1. We estimated the maximum gross number of potentially buildable lots in the Wellington neighborhood by performing a lot by lot inventory. This inventory accounted for non-buildable areas due to environmental conditions and lots because of their configuration or existing improvements may not subdivide into

additional lots. This number was developed during the Steward and Associates R-1 Zone Sustainable Development Study. For the Wellington neighborhood that accesses onto 156th Avenue NE there are an estimated 816 potentially buildable lots at 4 dwelling units per acre. This is assuming that Wood Trails and Montevallo are developed as proposed as single family R-4 lots.

2. To determine the number of dwellings developed in the future that may use 156th Avenue NE, vacant and redevelopable properties were reviewed and the gross acres discounted for roads, public facilities and market factors (e.g. property owners not interested in selling property). These discounts reduced buildable lots by fifty percent. The estimated number of living units in 2028, or full build-out, and using 156th Avenue NE, is 408 with an R-4 zoning.
3. Using the latest edition of the Institute of Transportation Engineers *Trip Generation Manual* (ITE Manual) the estimated number of units (Single Family Residential) would generate 1.01 PM peak hour trips per unit.
4. After determining the number of PM peak hour trips, they were then assigned to tripsheds for each intersection along 156th Avenue NE. A tripshed is used to define an area of homes whose travel routes are likely to access NE 156th Avenue at a particular intersection, or directly from a lot onto NE 156th Avenue.
5. It is assumed that residents from the new homes will have relatively the same vehicular travel patterns as the current residents within the Wellington region. Once these trips were assigned to a particular tripshed the movements of the trips within the tripshed were assigned for each intersection, using the following criteria:
    a. These trips were assigned using information from the ITE Manual for vehicles entering and exiting each tripshed.
    b. They were further broken down by the percentage of pass-through vehicles during the PM peak hour currently coming from or to the north on NE 156th Avenue, and the percentages of pass-through vehicles coming from or to the south on NE 156th Avenue. (i.e. at the NE 156th Avenue and 195th Street NE intersection the percentage of existing PM peak hour pass-through vehicles approaching the 195th intersection from the north is forty percent [230/(230+340)], see the Wood Trails – Montevallo FEIS Analysis Figure 3.5-2(A) which is attached).
6. It was further assumed that an R-2 zoning at full build-out would generate half the number of turning movements of a R-4 zoning, and a R-1 zoning would generate, again, half as many as a R-2 zoning. This assumption probably produced a higher than likely numbers for both the R-1 and R-2 zoning scenarios. The number of new trips for the R-2 and R-1 zone is believed to be on the high side because it includes an estimated, larger than likely, number of small existing lots subdivided into two or more new lots. The number of new lots created from small lots with the R-4 zoning is more than two or more times the number of new lots created under the R-2 scenario. The same is also true for the R-2 scenario versus the R-1 scenario.
7. The current traffic volumes plus volumes from pipeline projects (permitted Snohomish County projects identified within the Wood Trails – Montevallo FEIS) were used for the base year (current plus pipeline) to determine the pass-through

2028 traffic volumes. The Puget Sound Regional Council developed a growth rate of 2.5 percent per year, to get to the 2028 pass-through volumes.

8. The 2028 pass-through plus Snohomish County pipeline volumes were then added to the full build-out volumes generated within the Wellington neighborhood to get a total 2028 turning movement volume for each intersection along NE 156th Avenue. A LOS analyses was then performed for the seven intersections (five existing and two proposed) for full build-out of a R-1, R-2, and R-4 condition. The result of our LOS analysis is presented on the following page.

2028 Full Build-Out Conditions LOS Summary

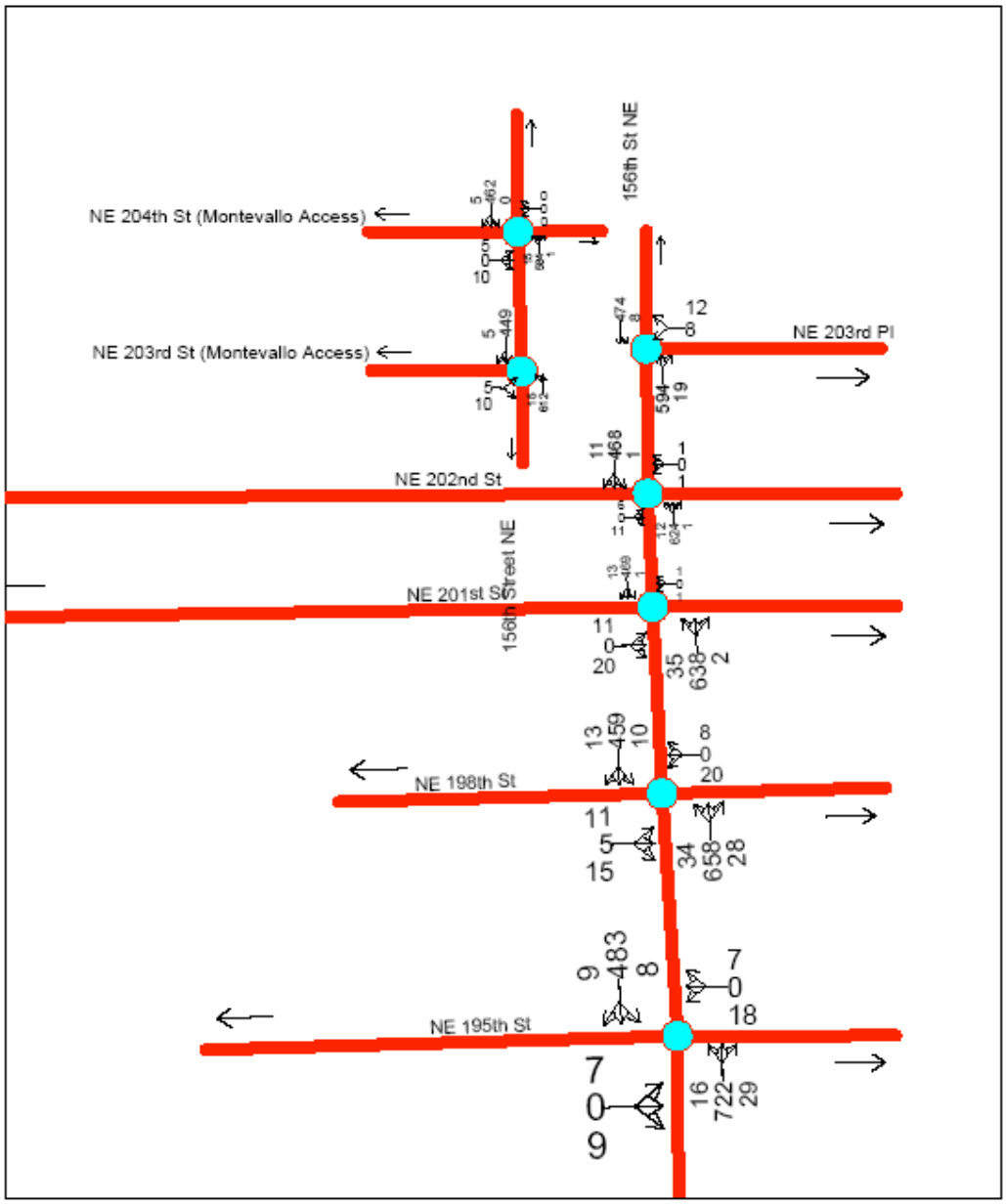
Weekday PM Peak Hour	2008 Baseline Conditions			2028 R-1 Zoning			2028 R-2 Zoning			2028 R-4 Zoning		
	LOS	Delay	Leg	LOS	Delay	Leg	LOS	Delay	Leg	LOS	Delay	Leg
156th Avenue NE/NE 204th Street	N/A	N/A	N/A	C	16.9	EB App.	C	17.6	EB App.	C	19.0	EB App.
156th Avenue NE/NE 203rd Place	B	10.1	WB App.	C	17.0	WB App.	C	18.1	WB App	C	21.0	WB App.
156th Avenue NE/NE 203rd Street	N/A	N/A	N/A	C	15.4	EB App.	C	15.6	EB App.	C	17.5	EB App.
156th Avenue NE/NE 202nd Street	B	10.2	EB App.	C	21.2	WB App.	D	25.8	WB App	D	28.2	WB App
156th Avenue NE/NE 201st Street	B	10.6	EB App.	C	24.7	WB App.	D	26.8	WB App	D	33.7	WB App.
156th Avenue NE/NE 198th Street	B	11.8	WB App.	E	40.2	WB App.	E	47.6	WB App	F	79.1	WB App.
156th Avenue NE/NE 195th Street	B	12.8	WB App.	E	37.2	WB App.	E	42.9	WB App.	F	63.8	WB App.

Providing proposed solutions or mitigation where intersections along NE 156th Avenue will be operating below the City's adopted minimum LOS E in 2028, are beyond our scope of services at this time.

Attached, as appendices, you will find tables that we developed to determine the trips and turning movements for each intersection as well as the Synchro output files for each intersection and land use zoning scenario.

We would be happy to meet with you, the CAP, Planning Commission, and Council to present our findings.

Map - Woodinville-Sutainabilty Study
Volumes 12/26/2006



2028 PM Peak Hour - R1 Zoning
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Woodinville-Sutainabilty Study
25: NE 204th St (Montevallo Access) & 156th Street NE — 2028 PM Peak Hour - R1 Zoning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	10	0	0	0	15	584	1	0	462	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	11	0	0	0	16	635	1	0	502	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1173	1173	505	1184	1176	635	508			636		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1173	1173	505	1184	1176	635	508			636		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	98	100	100	100	98			100		
cM capacity (veh/h)	169	189	571	161	188	478	1062			948		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	0	652	508
Volume Left	5	0	16	0
Volume Right	11	0	1	5
cSH	318	1700	1062	948
Volume to Capacity	0.05	0.00	0.02	0.00
Queue Length 95th (ft)	3	0	1	0
Control Delay (s)	16.9	0.0	0.4	0.0
Lane LOS	C	A	A	
Approach Delay (s)	16.9	0.0	0.4	0.0
Approach LOS	C	A		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

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Woodinville-Sutainabilty Study
2: NE 202nd St & 156th St NE

2028 PM Peak Hour - R1 Zoning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	6	0	11	1	0	1	12	624	1	1	468	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	0	12	1	0	1	13	678	1	1	509	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1223	1222	515	1234	1228	679	521			679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1223	1222	515	1234	1228	679	521			679		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	98	99	100	100	99			100		
cM capacity (veh/h)	156	177	564	149	176	452	1051			913		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	18	2	692	522
Volume Left	7	1	13	1
Volume Right	12	1	1	12
cSH	293	224	1051	913
Volume to Capacity	0.06	0.01	0.01	0.00
Queue Length 95th (ft)	4	1	1	0
Control Delay (s)	18.1	21.2	0.3	0.0
Lane LOS	C	C	A	A
Approach Delay (s)	18.1	21.2	0.3	0.0
Approach LOS	C	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

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Woodinville-Sutainabilty Study
5: NE 195th St & 156th St NE

2028 PM Peak Hour - R1 Zoning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	0	9	18	0	7	16	722	29	8	483	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	0	10	20	0	8	17	785	32	9	525	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1390	1398	530	1392	1388	801	535			816		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1390	1398	530	1392	1388	801	535			816		
tC, single (s)	7.1	6.5	6.2	7.2	6.6	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.1	3.4	2.2			2.2		
p0 queue free %	93	100	98	82	100	98	98			99		
cM capacity (veh/h)	116	138	553	111	135	376	1028			807		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	17	27	834	543
Volume Left	8	20	17	9
Volume Right	10	8	32	10
cSH	209	139	1028	807
Volume to Capacity	0.08	0.20	0.02	0.01
Queue Length 95th (ft)	5	14	1	1
Control Delay (s)	23.8	37.2	0.5	0.3
Lane LOS	C	E	A	A
Approach Delay (s)	23.8	37.2	0.5	0.3
Approach LOS	C	E		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

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Woodinville-Sutainabilty Study
29: NE 203rd St (Montevallo Access) & 156th Street NE

2028 PM Peak Hour - R1 Zoning

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	10	15	612	449	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	11	16	665	488	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1189	491	493			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1189	491	493			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	98	98			
cM capacity (veh/h)	207	582	1075			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	682	493
Volume Left	5	16	0
Volume Right	11	0	5
cSH	362	1075	1700
Volume to Capacity	0.05	0.02	0.29
Queue Length 95th (ft)	3	1	0
Control Delay (s)	15.4	0.4	0.0
Lane LOS	C	A	
Approach Delay (s)	15.4	0.4	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

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Woodinville-Sutainabilty Study
3: NE 201st St & 156th St NE

2028 PM Peak Hour - R1 Zoning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	11	0	20	1	0	1	35	638	2	1	469	13
Peak Hour Factor	0.89	0.92	0.89	0.92	0.92	0.92	0.89	0.89	0.92	0.92	0.89	0.89
Hourly flow rate (vph)	12	0	22	1	0	1	39	717	2	1	527	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1334	1334	534	1356	1340	718	542			719		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1334	1334	534	1356	1340	718	542			719		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	100	96	99	100	100	96			100		
cM capacity (veh/h)	128	148	550	118	146	429	1032			882		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	35	2	758	543
Volume Left	12	1	39	1
Volume Right	22	1	2	15
cSH	253	185	1032	882
Volume to Capacity	0.14	0.01	0.04	0.00
Queue Length 95th (ft)	9	1	2	0
Control Delay (s)	21.5	24.7	1.0	0.0
Lane LOS	C	C	A	A
Approach Delay (s)	21.5	24.7	1.0	0.0
Approach LOS	C	C		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

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Peak Hour Turning Volume Movements

Approach Direction	Movement	2008 FEIS No Action PM PH (w/o WT & MV)	2028 w/ 2.5%/Yr Base Growth: No Action PM PH w/o WT & MV Only Thru Traffic Growth	WT & MV Action PM PH (no WT & MV growth)	No Action PM PH + w/ WT & MV Action PM PH	R-1 Project PM PH	R-1 Total PM PH	R-2 Project PM PH	R-2 Total PM PH	R-4 Project PM PH	R-4 Total PM PH
156th Ave. NE / NE 204th St.											
SB	RT	N/A		5	5	0	5	0	5	0	5
	Thru	265	434	5	439	23	462	45	484	90	529
	LT	N/A									
WB	RT	N/A									
	Thru	N/A									
	LT	N/A									
NB	RT	1	1		1	0	1	0	1	0	1
	Thru	345	565	5	570	14	584	28	598	55	625
	LT	N/A		15	15	0	15	0	15	0	15
EB	RT	N/A		10	10	0	10	0	10	0	10
	Thru	N/A									
	LT	N/A		5	5	0	5	0	5	0	5
156th Ave. NE / NE 203rd Pl.											
SB	RT	N/A									
	Thru	260	426	25	451	23	474	45	496	90	541
	LT	5	5		5	3	8	6	11	11	16
WB	RT	10	10		10	2	12	4	14	7	17
	Thru	N/A	0		0	0	0	0	0	0	0
	LT	5	5		5	3	8	5	10	10	15
NB	RT	15	15		15	4	19	9	24	17	32
	Thru	335	549	31	580	14	594	28	608	55	635
	LT	N/A									
EB	RT	N/A									
	Thru	N/A									
	LT	N/A									

Approach Direction	Movement	2008 FEIS No Action PM PH (w/o WT & MV)	2028 w/ 2.5%/Yr Base Growth: No Action PM PH w/o WT & MV Only Thru Traffic Growth	WT & MV Action PM PH (no WT & MV growth)	No Action PM PH + w/ WT & MV Action PM PH	R-1 Project PM PH	R-1 Total PM PH	R-2 Project PM PH	R-2 Total PM PH	R-4 Project PM PH	R-4 Total PM PH
156th Ave. NE / NE 203rd St.											
SB	RT			5	5	0	5	0	5	0	5
	Thru	265	434	15	449	0	449	0	449	92	541
	LT	N/A									
WB	RT	N/A									
	Thru	N/A									
	LT	N/A									
NB	RT	N/A									
	Thru	350	574	15	589	23	612	46	635	67	656
	LT			15	15	0	15	0	15	0	15
EB	RT			10	10	0	10	0	10	0	10
	Thru	N/A									
	LT			5	5	0	5	0	5	0	5
156th Ave. NE / NE 202nd St..											
SB	RT	10	10		10	1	11	3	13	5	15
	Thru	255	418	27	445	23	468	46	491	92	537
	LT	N/A				1	1	2	2	3	3
WB	RT	N/A				1	1	1	1	2	2
	Thru	N/A					0		0	0	0
	LT	N/A				1	1	2	2	3	3
NB	RT	N/A				1	1	3	3	5	5
	Thru	345	565	42	607	17	624	34	641	67	674
	LT	10	10		10	2	12	4	14	8	18
EB	RT	10	10		10	1	11	3	13	5	15
	Thru	N/A					0		0	0	0
	LT	5	5		5	1	6	2	7	3	8

Approach Direction	Movement	2008 FEIS No Action PM PH (w/o WT & MV)	2028 w/ 2.5%/Yr Base Growth: No Action PM PH w/o WT & MV Only Thru Traffic Growth	WT & MV Action PM PH (no WT & MV growth)	No Action PM PH + w/ WT & MV Action PM PH	R-1 Project PM PH	R-1 Total PM PH	R-2 Project PM PH	R-2 Total PM PH	R-4 Project PM PH	R-4 Total PM PH
156th Ave. NE / NE 201st St..											
SB	RT	5	5	7	12	1	13	2	14	3	15
	Thru	260	426	20	446	23	469	46	492	92	538
	LT	N/A				1	1	3	3	5	5
WB	RT	N/A				1	1	2	2	3	3
	Thru	N/A				0	0	0	0	0	0
	LT	N/A				1	1	2	2	4	4
NB	RT	N/A				2	2	4	4	7	7
	Thru	355	582	37	619	19	638	39	658	77	696
	LT	15	15	18	33	2	35	3	36	5	38
EB	RT	10	10	9	19	1	20	2	21	3	22
	Thru	N/A				0	0	0	0	0	0
	LT	5	5	5	10	1	11	1	11	2	12
156th Ave. NE / NE 198th St..											
SB	RT	5	5	6	11	2	13	4	15	7	18
	Thru	255	418	23	441	18	459	36	477	72	513
	LT	5	5		5	5	10	10	15	20	25
WB	RT	5	5		5	3	8	6	11	12	17
	Thru	0	0		0	0	0	0	0	0	0
	LT	15	15		15	5	20	9	24	18	33
NB	RT	20	20		20	8	28	16	36	31	51
	Thru	360	590	50	640	18	658	36	676	72	712
	LT	15	15	16	31	3	34	5	36	10	41
EB	RT	5	5	8	13	2	15	3	16	6	19
	Thru	5	5		5	0	5	0	5	0	5
	LT	5	5	5	10	1	11	2	12	4	14

Approach Direction	Movement	2008 FEIS No Action PM PH (w/o WT & MV)	2028 w/ 2.5%/Yr Base Growth: No Action PM PH w/o WT & MV Only Thru Traffic Growth	WT & MV Action PM PH (no WT & MV growth)	No Action PM PH + w/ WT & MV Action PM PH	R-1 Project PM PH	R-1 Total PM PH	R-2 Project PM PH	R-2 Total PM PH	R-4 Project PM PH	R-4 Total PM PH
156th Ave. NE / NE 195th St..											
SB	RT	5	5		5	4	9	8	13	15	20
	Thru	265	434	31	465	18	483	35	500	70	535
	LT	5	5	0	5	3	8	6	11	12	17
WB	RT	5	5	0	5	2	7	4	9	7	12
	Thru	0	0		0	0	0	0	0	0	0
	LT	15	15		15	3	18	5	20	10	25
NB	RT	25	25		25	4	29	9	34	17	42
	Thru	385	631	66	697	25	722	50	747	99	796
	LT	10	10		10	6	16	12	22	23	33
EB	RT	5	5		5	4	9	7	12	14	19
	Thru	0	0		0	0	0	0	0	0	0
	LT	5	5		5	2	7	5	10	9	14

Splits

Trip Watersheds to 156th Street between intersections and each intersection											
	East/West		R-4 Zoning	1.01	Trips Entering Shed			Trips Exiting Watershed			C
	Watershed	Gross	Number of Lots	Trip/home	63%			37%	40%	60%	
		No. of Lots	that will develop	Net Trips	Split	40%	60%	Split	to North	to South	
			(Gross X 50%)	PM PH	Total	to North	to South	Total			
156th Ave. NE / NE 204th St	N/A		0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 203rd Pl.	East	88	44	44	28	11	17	16	7	10	
156th Ave. NE / NE 203rd St			0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 202nd St.	East	25	13	13	8	3	5	5	2	3	
	West	43	22	22	14	5	8	8	3	5	
156th Ave. NE / NE 201st St.	East	36	18	18	11	5	7	7	3	4	
	West	27	14	14	9	3	5	5	2	3	
156th Ave. NE / NE 198th St.	East	160	80	81	51	20	31	30	12	18	
	West	53	27	27	17	7	10	10	4	6	
156th Ave. NE / NE 195th St.	East	91	46	46	29	12	17	17	7	10	
	West	121	61	61	38	15	23	23	9	14	
between intersections											
WD to 195		145	73	73	46	18	28	27	11	16	
195 to 198		21	11	11	7	3	4	4	2	2	
198 to 201		6	3	3	2	1	1	1	0	1	
		816	408								
			R-2 Zoning								
156th Ave. NE / NE 204th St	N/A		0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 203rd Pl.	East	44	22	22	14	6	8	8	3	5	
156th Ave. NE / NE 203rd St			0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 202nd St.	East	13	7	7	4	2	2	2	1	1	
	West	22	11	11	7	3	4	4	2	2	
156th Ave. NE / NE 201st St.	East	18	9	9	6	2	3	3	1	2	
	West	14	7	7	4	2	3	3	1	2	
156th Ave. NE / NE 198th St.	East	80	40	40	25	10	15	15	6	9	
	West	27	14	14	9	3	5	5	2	3	
156th Ave. NE / NE 195th St.	East	46	23	23	15	6	9	9	3	5	
	West	61	31	31	19	8	12	11	5	7	
between intersections											
WD to 195		73	37	37	23	9	14	14	5	8	
195 to 198		11	6	6	3	1	2	2	1	1	
198 to 201		3	2	2	1	0	1	1	0	0	
		412	206								
			R-1 Zoning								
156th Ave. NE / NE 204th St	N/A		0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 203rd Pl.	East	22	11	11	7	3	4	4	2	2	
156th Ave. NE / NE 203rd St			0	0	0	0	0	0	0	0	C
156th Ave. NE / NE 202nd St.	East	7	4	4	2	1	1	1	1	1	
	West	11	6	6	3	1	2	2	1	1	
156th Ave. NE / NE 201st St.	East	9	5	5	3	1	2	2	1	1	
	West	7	4	4	2	1	1	1	1	1	
156th Ave. NE / NE 198th St.	East	40	20	20	13	5	8	7	3	4	
	West	14	7	7	4	2	3	3	1	2	
156th Ave. NE / NE 195th St.	East	23	12	12	7	3	4	4	2	3	
	West	31	16	16	10	4	6	6	2	3	
between intersections											
WD to 195		37	19	19	12	5	7	7	3	4	
195 to 198		6	3	3	2	1	1	1	0	1	
198 to 201		2	1	1	1	0	0	0	0	0	
		209	105								

Trip Watersheds to 156th Street between intersections and each intersection

	East/West Watershed	Gross No. of Lots	**R-4 Zoning** Number of Lots that will develop (Gross X 50%)	1.01 Trip/home Net Trips PM PH	Trips Entering Shed 63% Split Total	40% fr North	60% fr South	Trips Exiting Watershed 37% Split Total	40% to North	60% to South	Comment
156th Ave. NE / NE 204th St.	N/A		0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 203rd Pl.	East	88	44	44	28	11	17	16	7	10	
156th Ave. NE / NE 203rd St.			0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 202nd St..	East	25	13	13	8	3	5	5	2	3	
	West	43	22	22	14	5	8	8	3	5	
156th Ave. NE / NE 201st St..	East	36	18	18	11	5	7	7	3	4	
	West	27	14	14	9	3	5	5	2	3	
156th Ave. NE / NE 198th St..	East	160	80	81	51	20	31	30	12	18	
	West	53	27	27	17	7	10	10	4	6	
156th Ave. NE / NE 195th St..	East	91	46	46	29	12	17	17	7	10	
	West	121	61	61	38	15	23	23	9	14	
between intersections											
WD to 195		145	73	73	46	18	28	27	11	16	
195 to 198		21	11	11	7	3	4	4	2	2	
198 to 201		6	3	3	2	1	1	1	0	1	
		816	408								
			R-2 Zoning								
156th Ave. NE / NE 204th St.	N/A		0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 203rd Pl.	East	44	22	22	14	6	8	8	3	5	
156th Ave. NE / NE 203rd St.			0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 202nd St..	East	13	7	7	4	2	2	2	1	1	
	West	22	11	11	7	3	4	4	2	2	
156th Ave. NE / NE 201st St..	East	18	9	9	6	2	3	3	1	2	
	West	14	7	7	4	2	3	3	1	2	
156th Ave. NE / NE 198th St..	East	80	40	40	25	10	15	15	6	9	
	West	27	14	14	9	3	5	5	2	3	
156th Ave. NE / NE 195th St..	East	46	23	23	15	6	9	9	3	5	
	West	61	31	31	19	8	12	11	5	7	
between intersections											
WD to 195		73	37	37	23	9	14	14	5	8	
195 to 198		11	6	6	3	1	2	2	1	1	
198 to 201		3	2	2	1	0	1	1	0	0	
		412	206								
			R-1 Zoning								
156th Ave. NE / NE 204th St.	N/A		0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 203rd Pl.	East	22	11	11	7	3	4	4	2	2	
156th Ave. NE / NE 203rd St.			0	0	0	0	0	0	0	0	Counted in WT & MV turning movements
156th Ave. NE / NE 202nd St..	East	7	4	4	2	1	1	1	1	1	
	West	11	6	6	3	1	2	2	1	1	
156th Ave. NE / NE 201st St..	East	9	5	5	3	1	2	2	1	1	
	West	7	4	4	2	1	1	1	1	1	
156th Ave. NE / NE 198th St..	East	40	20	20	13	5	8	7	3	4	
	West	14	7	7	4	2	3	3	1	2	
156th Ave. NE / NE 195th St..	East	23	12	12	7	3	4	4	2	3	
	West	31	16	16	10	4	6	6	2	3	
between intersections											
WD to 195		37	19	19	12	5	7	7	3	4	
195 to 198		6	3	3	2	1	1	1	0	1	
198 to 201		2	1	1	1	0	0	0	0	0	
		209	105								

Appendix B

Transportation Frequently Asked Questions

Appendix B: Transportation Frequently Asked Questions

Staff response is shown in *Italics.*

#1 Do traffic results account for proposed plats in the R-1 zone?

The 2008/2028 Perteet model for traffic flow along the 156th Avenue NE corridor did take into consideration proposed preliminary plat developments to date. The results indicated that no roadway improvements were needed except at the 195th and 198th intersection. In regard to proposed plat developments, there was a traffic model prepared that is covered in a 2006 Final EIS (FEIS) issued by the City. Please see the City's website for more information: www.ci.woodinville.wa.us.

#2 Would a change from R1 to R4 impact traffic in downtown Woodinville (e.g. NW 175th St.)?

The scope of the study was specific to the City's current R-1 zone area only and did not include any transportation system outside of this zone. However, the entire City's road network system, which included NE 175th Street, was modeled under the City's 2003, 2004, and 2006 Traffic Study, which include the R-1 being developed at a R-4 zoning to determine impacts. The current Capital Improvement Plan (CIP) does include projects that would be impacted by development in this area under R-4 and the current Traffic Impact Fee includes new development mitigation payment into these projects.

#3 How will increased development change road character? How will adding more traffic impact Woodinville Duvall Road?

Zoning from R-1 to R-4 would result in more trips generated within Woodinville. Residential streets and the collectors have the capacity to handle the additional trip volume but could result in a change in the "feel" of the local streets, especially during peak hours. The arterials and collector road would see an increase from the additional trips from an R-1 to a R-4 zoning. From modeling, the collector (156th, 168th, and 171st/173rd/175th) roads have shown to have the capacity for R-4. Wood-Duvall does not currently have the capacity during peak hours but has been included in the City's current CIP to address future capacity needs under projected R-4 generated new trips.

#4 How will traffic affect Woodinville-Duvall Road lengthy backups and potential for accidents?

The road is traveled several time during all days by the Police and Public Works staff and back ups has not been observed to be a problem except during peak hours. During peak hours, in the morning and evening, Wood-Duvall has long queue lengths of several hundred feet (300 to 500 feet). It has not been

observed to have back ups of miles during the peak and non-peak hours except during a blockage occurrence.

Back ups along Wood-Duvall during peak and non-peak have been observed to typically be the result of left turn movement blocking the through traffic. This has also been the cause of most accidents, when vehicles fail to stop for a left turning vehicle, resulting in a rear end accident. The City's CIP has Wood-Duvall improvements that will include a dedicated center left turn lane to address this condition.

#6 How can 156th Ave, a steep road, take additional traffic?

156th Avenue NE grade does not present a capacity problem future traffic under R-4 zoning. From modeling, there are two intersections, where one of the four legs is projected to exceed the City's current adopted of level of service (LOS). These can be mitigated with minor improvements to address these deficiencies within the existing right of way. When the road is designed for future improvement, this is expected to occur to address any bottleneck conditions and would be designed to current standards that would be expected to address road conditions of concern.

#7 How will increased density on NE 195th St. affect safety for cars and pedestrians on 195th?

NE 195th Street was designed under King County and did not include pedestrian facilities. This is a common condition throughout King County including areas within the City outside of the R-1 zone. It is common throughout the region to have pedestrian using the edge of the pavement for travel and most northwest motorist drive appropriate for this condition. Also, no injuries between vehicles and pedestrians along NE 195th are known to be on record with the City.

#8 Should there be a subarea plan in place defining a roadway network for the R-1 area so that development/traffic has an improvement plan?

City CIP plans address arterial and collector improvements. City road standards do address local street spacing and design cross sections. Circulation is often addressed over time as development applications are received. A circulation plan in advance of development proposals is a good suggestion for future consideration no matter the density. A circulation plan would not be necessary for this R-1 zone study, but the City could consider it in future work programs.

#9 How will levels of service change at 198th and 195th on 156th at higher densities?

The LOS as defined in the study shows that one leg of both of these intersections would exceed the City's current LOS and would require improvements. The needed improvements to bring them back to an acceptable City standard LOS would be minor and could be provided within the existing right of way limits.

#11 How will the City access the R-1 area during emergencies or weather events?

The difference between an R-1 to and R-4 is not expected to significantly increase the number of road miles and the demand for road services, such as a weather event. See Capital Facilities Report appendices for information from the Fire District about emergency responses.

#12 Access to Wood-Duvall Rd from 156th seems to increase each month as well as traffic volumes since Costco opened. How will the City address this?

The 156th/Wood-Duvall intersection is largely impacted from by pass through trips which results in peak-hour back ups for southbound 156th Avenue AM trips. This intersection is included in the City's CIP for future improvements and may be included under concurrency that would require future City development to contribute into improving its LOS.

#13 How can 198th St. accommodate traffic from any new neighborhood built?

Under current City LOS standards, NE 198th has the capacity for the increased volume from an R-1 to and R-4. Modeling shows that future development may increase one of the approach legs to a LOS F by 2028 if no improvement are performed for any of the approach legs at 156th. It is possible to bring the LOS back into compliance with minor turn lane improvement along NE 156th Avenue. These improvements can be performed within the existing right of way.

#14 Can the City remove the bollard that blocks 195th St and improve road access from 201st through that street to both schools?

The bollards were placed by the City in 2005 to stop "cut through" driving around the gates and onto the pedestrian walkway. This are a safety feature and it is unlikely that these would be removed unless an alternative safety feature could be provided.

The two gates, which are intended to block off through vehicle travel, were placed prior to the City under King County. The gate along NE 195th, (most westerly), was installed to stop traffic from using NE 195th, east of 156th NE, from using this as a route to drop off and pick up students. The east gate was installed to prevent trespassing onto private land and using as a "cut through". Only the westerly gate is under the jurisdiction of the City. Under City governance, the opening of this gate has been approached several times but due to pressure by the neighborhoods in the area, it has remained closed.

#15 How can the City retain the character and environment while trying to build adequate roads to accommodate growth?

The City has a standard that is close to the existing character of the roads in many of the neighborhoods with the exception of providing a pedestrian walkway. This standard is identified for R-1 zoning but has been allowed for higher density development within the R-1 zone under a deviation.

#17 Where is the detailed model data? What is the proposed mitigation for 156th as traffic increases?

The data used to model 156th Avenue NE is included in the appendix of the Transportation Report (prepared by Perteet Engineering). 156th Avenue NE is identified within the City Standard for future

improvements to handle the anticipated growth and would be considered as the proposed mitigation. The modeling did assess the future growth through 2028 and showed that two of the neighborhood intersection at 156th NE will have one approach leg each exceed the City's adopted LOS. In both cases, the LOS can be brought back into compliance with the adopted LOS with minor intersection improvements. These improvements can be performed within the limits of the existing right of way. See http://www.ci.woodinville.wa.us/events/moratoriuminfo.asp*, Attachment C, Transportation Report for more information.*