

**M E M O R A N D U M**

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To: **Gordon Kelsey, PE**  
**Thurston County**

From: **Kevin House, PE**  
**Parametrix**

Subject: **Drivers Sight Distance at Private Approaches and Roadway Intersections**

cc: **Greg Stidham, PE; Dale Rancour, PE; Project File**

Project Number: **214-1837-015**

Project Name: **Yelm Highway Phase 5 Final Design**

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**Introduction**

We have conducted a drivers sight distance analysis at the driveway approaches from private properties and intersections that access Yelm Highway. The side of Yelm Highway that has the sharpest roadway curve (inside of the curve) results in limiting drivers sight distance at driveway approaches and intersections. These locations require additional analyses which are addressed on this memorandum. The original design of the Yelm Highway project was to provide a 12-foot center turn lane, two travel lanes in each direction, and bike lanes, curb, gutter and sidewalk on each side.

The project alternative has been revised to provide a raised median beginning east of Village Drive and ending just east of Stratford Lane, with right-in, right-out restrictions for the residential driveways and intersections. To assist the right-in right-out restrictions, roundabouts are proposed for the intersections of Yelm Highway at Brassfield Street and Boulevard Road with "U" turns on Yelm Highway at the signalized intersections of Henderson Boulevard and Rich Road. This will eliminate the need for driver sight distance in one direction from both driveway approaches and intersections.

**Methodology**

For the private driveways, we used the road approach sight distance guidelines as outlined in Section 920.06 and Figure 920-6 of the WSDOT *Design Manual*. Based on a posted speed of 35 MPH (35 MPH is also the design speed supported by the existing 85<sup>th</sup> percentile speed) and a daily driveway volume of less than 100 vehicles, a minimum sight distance of 230 feet is required to meet standards.

For the minor intersections of Laura Street, Boulevard Extension Road and Stratford Lane, there are two guidelines that we used for analysis. The first guideline was based on Section 910.10 and Figure 910-17a of the WSDOT *Design Manual*. Based on a posted speed of 35 mph, the entering sight distance was calculated to be 437 feet. For the second, we used the guidelines for intersection sight distance, found in Chapter 9 – Intersections, of *A Policy on Geometric Design of Highways and Streets*, 2001, by American Association of State Highway and Transportation Officials (AASHTO). This manual is commonly referred

to as the *AASHTO green book*. The *AASHTO green book* provides federal guidelines for highways and streets, and is widely accepted as the standard to use for sight distance. For Laura Street and Boulevard Extension Road and Stratford Lane, Case B2 – “Right Turn from the Minor Road” was used. Per Exhibit 9-57, for a design speed of 35 MPH, desirable sight distance is 335 feet.

Using the surveyed basemap, and attaching the proposed design to the existing basemap, we were able to prepare a line-of-sight for each driveway in question. For the driveways, line-of-sight was measured from a point taken 10 feet from the back of the proposed curb line, to the edge of traveled way. This meets the requirements of Figure 920-6 of the *WSDOT Design Manual*. For the minor intersections, line-of-sight was measured two ways. For the *WSDOT Design Manual* analysis, the line of sight is described as a point 18 feet setback from proposed traveled way at the intersection (At existing intersections, when sight obstructions within the sight triangle cannot be removed due to limited right of way. The intersection set back may be modified to 10 feet and the time gap (tg) may be reduced by the 2-second perception/reaction time if no accident history – reducing calculated sight distance to 335 for right turn.) For the *AASHTO green book* analysis, the line-of-sight is described as a point 14.4 feet setback from traveled way at the intersection. The results are shown graphically on figures at the end of this memorandum, as well as included in Table 1 and Table 2.

Table 1 – Road Approach Sight Distance for Driveways (1)

ID No.	Location	Parcel Number	Parcel Owner	Obstructions	Sight Distance
1	Sta. 134+00	128-36-130300	Neese	None	370' (2)
2	Sta. 136+40	128-36-130300	Neese	Through Fence	335' (4)
3	Sta. 137+50	128-36-140600	James	Through Fence	335' (4)
4	Sta. 139+65	128-36-140800	Fowler	None	443'
5	Sta. 140+25	0957-0003000	Thompson	None	503'
6	Sta. 144+00	0957-0008000 0957-0007000	Kenney/ Hougan	None (3)	506'
7	Sta. 146+10	0957-0007001 3210-0000100	Petersons/ Hougan	None	370' (4)
8	Sta. 147+90	3210-0000200	Davis	None	335'

- (1) Sight Distance is calculated at 10' back from curb line. (15' from traveled way)
- (2) Roundabout reduced speed would reduce minimum sight distance
- (3) Sight Distance is limited to this distance by a vertical curve
- (4) 10' easement beyond existing right of way

Table 2 – Intersection Sight Distance

ID No.	Location	Intersection	Obstructions	Sight Distance	
				Per WSDOT (1)	Per AASHTO (2)
9	Sta. 148+75	Laura Street	None	400'(4)	382'
10	Sta. 157+90	Boulevard Ext./ 50th Court	None	480' (3)	480'
11	Sta. 159+75	Stratford Lane	None	363'	353'

- (1) Sight Distance is calculated at 18' back from edge of traveled way (unless noted otherwise)
- (2) Sight Distance is calculated at 14.4' back from edge of traveled way to center of traveled way on Yelm Hwy.(unless noted otherwise)
- (3) Sight Distance is met only if this intersection moves approximately 120 feet to the east.
- (4) 10' setback from traveled way

As shown in the Table 1, the road approach sight distance is exceeded for all driveways.

For the intersections, Table 2 shows that intersection sight distance is met per the *AASHTO green book*. The intersection sight distance at Laura Street is met using WSDOT's modifications for limited right of way. The speed assumption of 35 MPH for calculating the intersection sight distance at Laura Street are conservative due to the close proximity of the intersection to the Boulevard roundabout with lower advisory speeds.

One of the reasons for the difference between WSDOT and AASHTO intersection sight distance requirements is based on the following quote from Page 667 of the *AASHTO green book*:

"Field observations indicate that, in making right turns, drivers generally accept gaps that are slightly shorter than those accepted in making left turns."

AASHTO takes this into account; WSDOT does not. Therefore, in the case of the Laura Street, Boulevard Extension road and Stratford Lane intersections, where left turns are prohibited, AASHTO more accurately represents the situation.

## Conclusions

- (1) Based on the road approach sight distance guidelines outlined in Section 920.06 and Figure 920-6 of the *WSDOT Design Manual*, road approach sight distance is met for all driveways along the Hewitt Lake area.
- (2) Based on the intersection sight distance guidelines outlined in Section 910.10 and Figure 910-17a of the *WSDOT Design Manual*, desirable intersection sight distance is met at Laura Street, using modifications for limited right of way plus the close proximity, Boulevard roundabout will reduce speeds.
- (3) Based on the intersection sight distance guidelines outlined in Chapter 9 of the *AASHTO green book*, intersection sight distance is met for all three intersections.

A copy of all applicable WSDOT and AASHTO material and figures showing a graphical representation of the sight distance for each driveway and study intersection are attached.