

## MEMO

**TO:** Steve Schiedel, Belcal Inc.  
**FROM:** Patrick Malloy, P.Eng., Transportation Planning  
**SUBJECT:** Belwood Subdivision Sight Distance Review, Wellington County, ON  
**DATE:** October 7, 2025

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Mr. Schiedel,

WSP Canada Inc. (WSP) has been engaged to provide technical analysis and advisory service to review sight distance and identification of K values along the frontages of the development site in the northwest quadrant of Wellington County Road 19 and 7th Line/Wellington County Road 26 in Belwood, ON. This memo expands on the previous Traffic Impact Study for the site from December 2023.

### K VALUES (VERTICAL CURVES)

To support the sight distance review and to establish the general vertical geometry of the roadways, fitted profiles were developed for both County Road 19 and 7th Line. The profiles were generated from the centreline alignments of each roadway using the provided topographic survey data, supplemented with Provincial LiDAR DTM to extend the profiles beyond the surveyed limits. A series of parabolic curves and tangents were iteratively applied and reviewed to achieve a best-fit approximation of the existing roadway profiles.

The County of Wellington Entrance Policy (2024) does not specify vertical curve requirements for driveways/accesses but states that they should be located under “favourable vision, grade and alignment conditions.” In practice, accesses are best situated along tangent roadway sections, away from the bottoms of steep grades/curves, and not immediately beyond crest curves. This approach supports drainage and illumination design, provides smoother connection geometry, improves stopping conditions during adverse weather (e.g. rain or snow), and generally offers greater sight distances for both vehicles and pedestrians. The *Transportation Association of Canada Geometric Design Guide for Canadian Roads* (TAC) outlines minimum K values for crest and sag curves (Figure 2: TAC 2017, Stopping Sight Distance Vertical Crest Curves and Figure 3) to achieve required Stopping Sight Distances. However, existing roadways may not always meet these values, as their geometry may have been constrained by surrounding conditions. This is particularly common in rural areas where low traffic volumes historically did not justify realignment or reprofiling of a roadway.

It was assumed that 7<sup>th</sup> Line has a posted speed limit of 60 km/h. This assumption was based on the examination of the posted speeds on the roads connected to 7<sup>th</sup> Line as

shown in Figure 1 below. The northern portion of 7<sup>th</sup> Line generally exhibits good geometry and suitable vertical curves. In contrast, the southern portion near County Road 19 contains tighter vertical curves; however, their impact is reduced as southbound vehicles are typically decelerating in advance of the stop condition. Similarly the northbound vehicles are accelerating from stop condition or turning onto 7<sup>th</sup> Line. The portion of 7<sup>th</sup> Line just north of County Road 19 also includes a steep 6% grade, which should be avoided when considering access locations. A reduction in the posted speed limit within the site frontage could also serve as a mitigation measure for the vertical geometry limitations.



*Figure 1: Posted Speed of Connecting Roads*

County Road 19 has a posted speed limit of 50 km/h. The western portion of the roadway generally features smooth curves and gentle slopes. Approaching 7<sup>th</sup> Line, the profile includes a 5% grade into a sag curve followed by an 8% grade continuing east toward 7<sup>th</sup> Line. The lower posted speed limit on County Road 19 reduces the sight distance requirements and the preferred vertical curve geometry compared to 7<sup>th</sup> Line.

**Table 3.3.2: K Factors to Provide Stopping Sight Distance on Crest Vertical Curves<sup>60</sup>**

Design Speed (km/h)	Stopping Sight Distance (m)	Rate of Vertical Curvature K <sup>a</sup>	
		Calculated	Design
20	20	0.6	1
30	35	1.9	2
40	50	3.8	4
50	65	6.4	7
60	85	11.0	11
70	105	16.8	17
80	130	25.7	26
90	160	38.9	39
100	185	52.0	52
110	220	73.6	74
120	250	95.0	95
130	285	123.4	124

Note: <sup>a</sup> Rate of vertical curvature, K, is the length of curve (m) per percent algebraic difference intersecting grades (A),  $K = L/A$ .

*Figure 2: TAC 2017, Stopping Sight Distance Vertical Crest Curves*

**Table 3.3.4: K Factors to Provide Minimum Stopping Sight Distance on Sag Vertical Curves**

Design Speed (km/h)	Stopping Sight Distance (m)	Rate of Vertical Curvature K <sup>a</sup>	
		Calculated	Design
20	20	2.1	3
30	35	5.1	6
40	50	8.5	9
50	65	12.2	13
60	85	17.3	18
70	105	22.6	23
80	130	29.4	30
90	160	37.6	38
100	185	44.6	45
110	220	54.4	55
120	250	62.8	63
130	285	72.7	73

Note: <sup>a</sup> Rate of vertical curvature, K, is the length of curve (m) per percent algebraic difference intersecting grades (A),  $K = L/A$ .

*Figure 3 TAC 2017, Stopping Sight Distance Vertical Sag Curves*

## SIGHT DISTANCE

A sight distance analysis was completed based on the best-fit profiles developed for 7<sup>th</sup> Line and County Road 19. The Wellington County Entrance Policy specifies minimum sight distances of 135 m for County Road 19 (50 km/h) and 165 m for 7<sup>th</sup> Line (assumed 60 km/h). While the policy does not provide adjustment factors for grades, it is considered best practice to allow additional sight distance on downhill approaches. The policy also does not address intersection sight distance requirements for turning movements (e.g. left/right turns); however, guidance from the TAC manual may be applied when evaluating potential access connections.

Posted Speed (km/hr)	Minimum Sight Distance (m)
50	135
60	165
70	180
80	200
90	210

*Figure 4 Wellington County Entrance Policy 2024*

Sight distance requirements are generally satisfied along the northern section of 7th Line. The proposed future properties along this section, which are not part of the current development plan, appear to have adequate sight distance; however, operational and sight distance requirements should be reviewed and confirmed as future development progresses. Approximately 200 m north of County Road 19, a steep grade on 7th Line restricts available sight distance. As noted in the previous report, vehicles traveling northbound in this area are typically accelerating from a stop or turning movement, resulting in operating speeds lower than the assumed posted speed of 60 km/h. Under this assumption, the crest curve at Road E provides sufficient sight distance in both directions. A localized reduction in the posted speed limit, or advanced signage may improve safety and visibility in this section.

County Road 19 provides generally good sight distance within the study area, primarily due to smoother grades and the lower posted speed limit. Street G offers adequate visibility, supported by an existing road connection (i.e. Queen St.) on the south leg. The reduced operating speeds also help mitigate potential impacts from sag curves and headlight limitations under adverse weather conditions. Fifth Street and Road A similarly provide acceptable sight distance, though minor visibility reductions are noted due to roadway profile. All three locations appear suitable for site connections to County Road 19; however, further review of drainage, grading, and connecting road profiles is recommended to support a detailed evaluation.

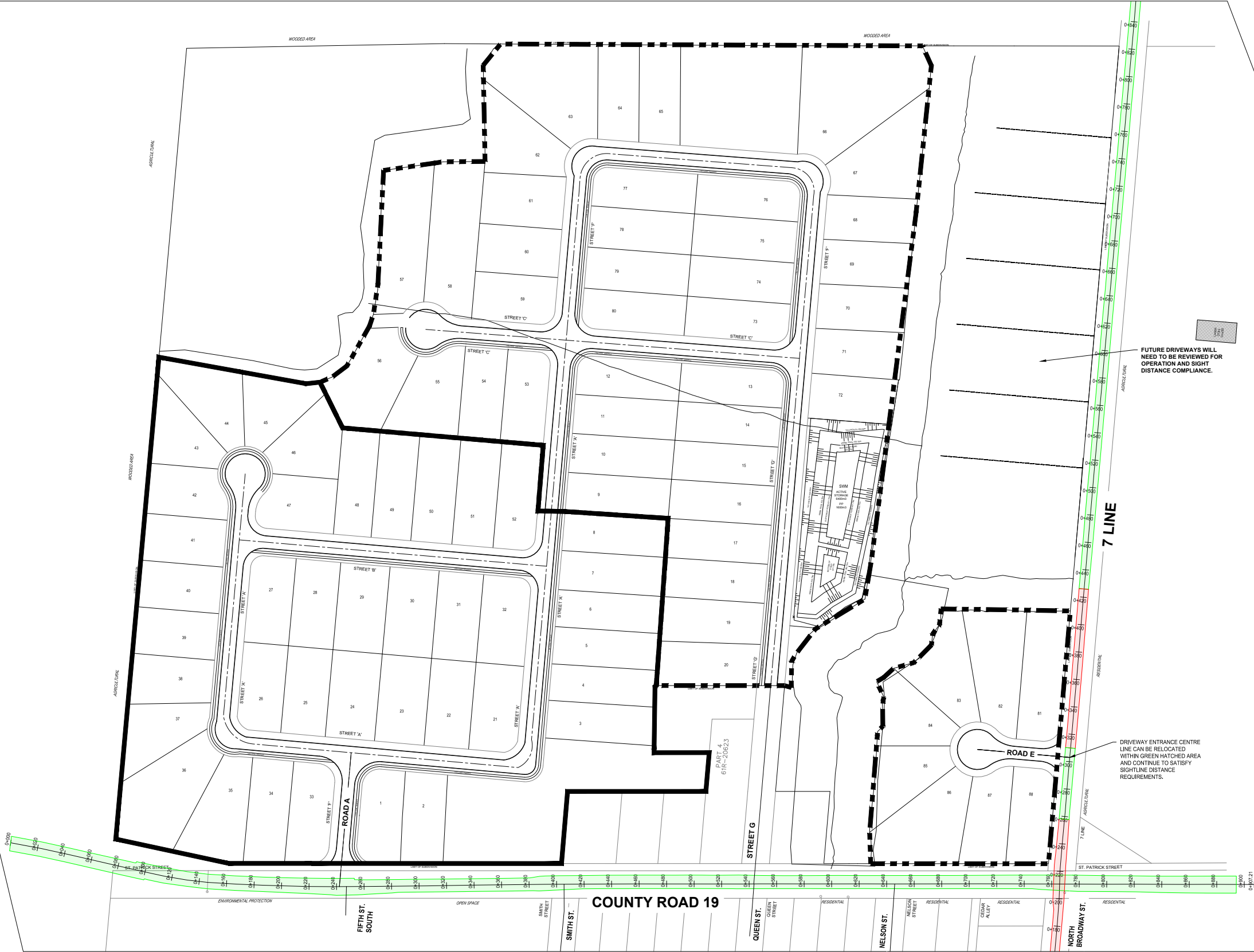
Regards,

Patrick Malloy, P.Eng.  
Transportation Planning

WELLINGTON COUNTY ENTRANCE POLICY		
ROAD	SPEED LIMIT(km/h)	SIGHT DISTANCE(m)
7TH LINE	60	165
COUNTY ROAD 19	50	135

LEGEND

- VISIBLE SIGHTLINE
- OBSTRUCTED SIGHTLINE



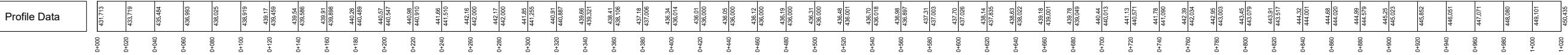
BELWOOD - 7TH LINE &  
COUNTY ROAD 19  
SIGHTLINE ANALYSIS

VERTICAL SIGHTLINE  
ANALYSIS FOR ROADWAY -  
PLAN VIEW



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Consultant File No.	CA0033464.4515
Drawing No.	1





Scale	N/A
Date	2025-10-07
Consultant File No.	CA0033464.4515
Drawing No.	2

LEGEND

- VISIBLE SIGHTLINE
- OBSTRUCTED SIGHTLINE
- TERRAIN CONFLICT
- FITTED ROAD PROFILE
- SURFACE ROAD PROFILE

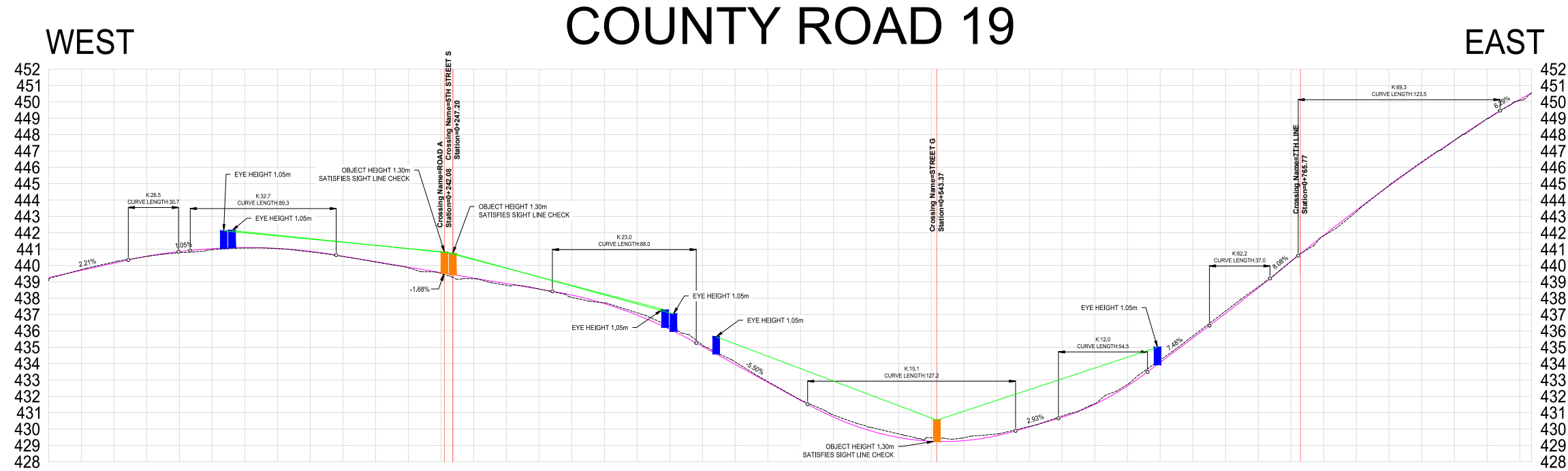
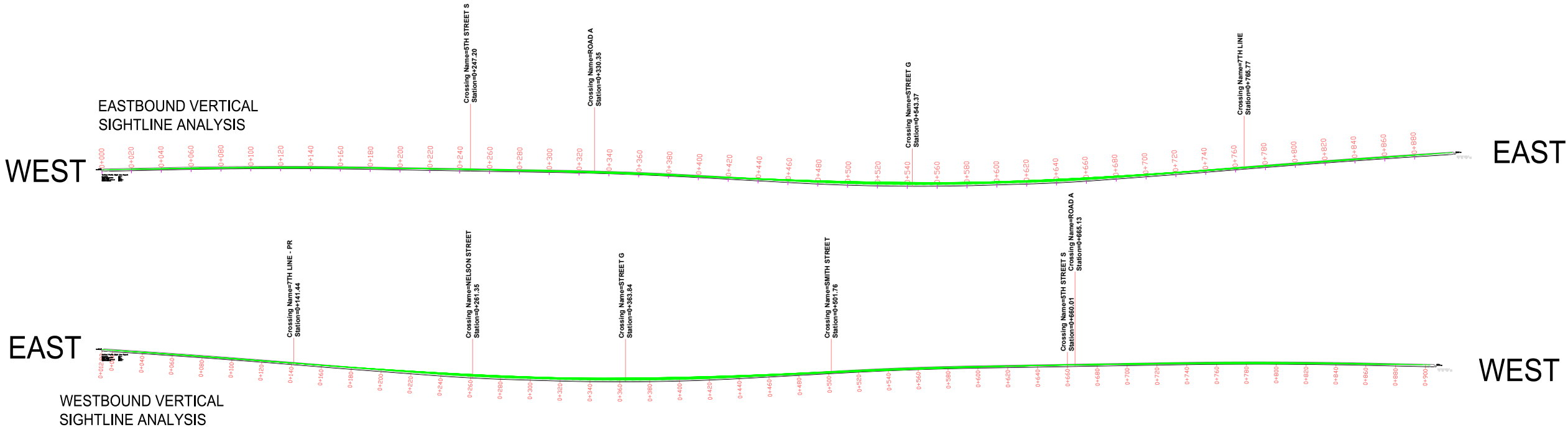
WELLINGTON COUNTY ENTRANCE POLICY		
ROAD	SPEED LIMIT(km/h)	SIGHT DISTANCE(m)
7TH LINE	60	165
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BELWOOD - 7TH LINE &  
COUNTY ROAD 19  
SIGHTLINE ANALYSIS

COUNTY ROAD 19  
VERTICAL SIGHT LINE  
ANALYSIS - FROM  
ROADWAY TO ACCESS



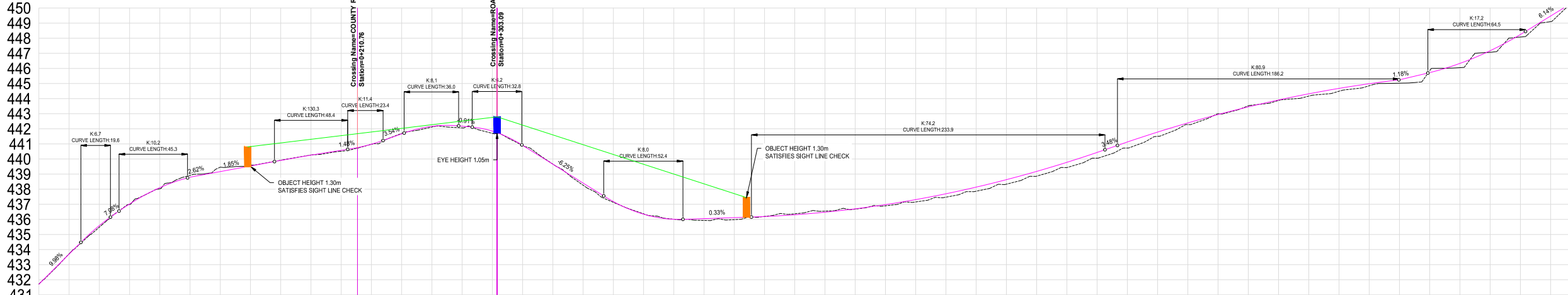
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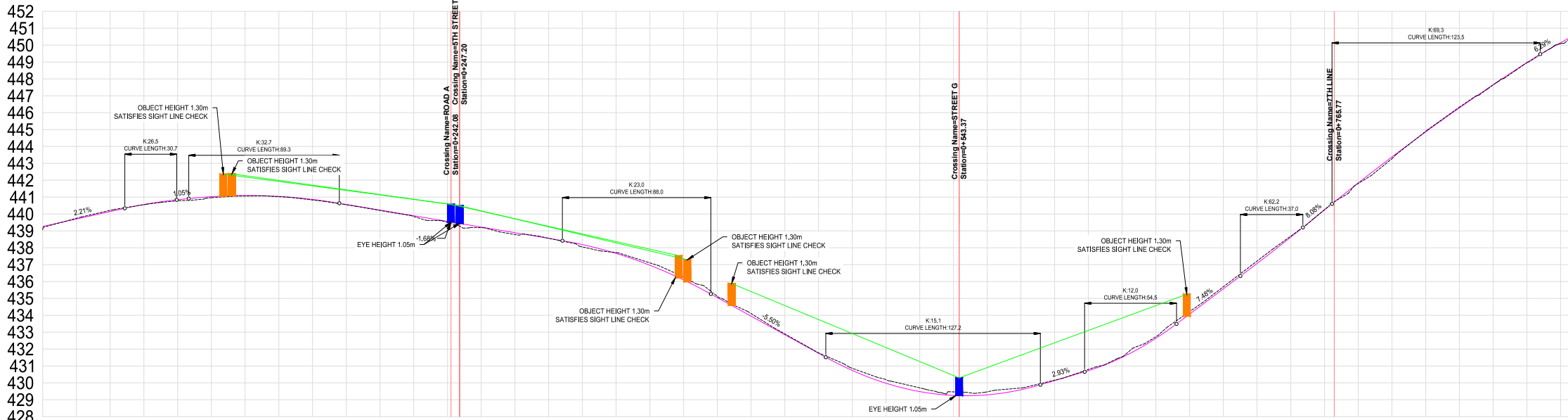
SOUTH



Profile Data	
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0+24	440.28
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0+32	440.910
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0+90	441.16
0+92	441.16
0+94	441.16
0+96	441.16
0+98	441.16
1+00	441.16

## COUNTY ROAD 19

WEST



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0+04	439.76
0+06	438.635
0+08	440.21
0+10	440.55
0+12	440.71
0+14	440.79
0+16	440.08
0+18	440.97
0+20	440.97
0+22	441.08
0+24	441.02
0+26	440.93
0+28	440.724
0+30	440.535
0+32	440.034
0+34	440.21
0+36	440.08
0+38	439.85
0+40	439.358
0+42	439.017
0+44	438.19
0+46	438.003
0+48	438.79
0+50	438.356
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0+70	435.12
0+72	435.179
0+74	434.10
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0+128	447.596
0+129	448.97
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0+131	450.082
0+132	450.536

### LEGEND

	VISIBLE SIGHTLINE		FITTED ROAD PROFILE
	OBSTRUCTED SIGHTLINE		SURFACE ROAD PROFILE
	TERRAIN CONFLICT		

WELLINGTON COUNTY ENTRANCE POLICY		
ROAD	SPEED LIMIT(km/h)	SIGHT DISTANCE(m)
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BELWOOD - 7TH LINE &  
COUNTY ROAD 19  
SIGHTLINE ANALYSIS

VERTICAL SIGHT LINE  
ANALYSIS - FROM ACCESS  
TO ROADWAY



Scale	N/A
Date	2025-10-07
Consultant File No.	CA0033464.4515
Drawing No.	4