

APPENDIX F
SENSITIVITY ANALYSIS TEST

Murphy Road Corridor Project

Sensitivity Test of Future Traffic Conditions

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This memorandum describes future transportation conditions, deficiencies, and needs along and adjacent to the Murphy Road corridor under a future “high growth” land use scenario. This alternate land use scenario was explored as a sensitivity test for the Murphy Road preferred alternative. The objective of the sensitivity test was to identify whether the recommended Murphy Road corridor transportation improvements would be adequate to address a greater level of growth than what is currently anticipated in the Bend Metropolitan Planning Organization (MPO) regional travel demand model.

Methodology and Assumptions

The Bend MPO’s travel demand model assumed moderate growth rates along the corridor, to include development along the corridor and in the larger area of southeast Bend. The travel demand model (referred to in this memo as “base case” land use) includes recent and anticipated development projects, and assumes growth consistent with the City’s comprehensive plan.

Several members of the Murphy Road Corridor Study Technical Advisory Committee (TAC) met in November 2006 to determine what specific areas in southeast Bend could experience development in addition to what was assumed in the regional travel demand model. This “potential additional development” was translated into households and jobs organized by Traffic Analysis Zone (TAZ), in order to be reflected in the regional travel demand model. Additions were then reviewed by the City of Bend, the Oregon Department of Transportation (ODOT), and the Bend MPO. The revised changes to the base case scenario that resulted from this exercise are listed below by TAZ. The location of these TAZs is illustrated in Figure 1.

- TAZ 472 - Modify land use from RL (Low Density Residential) to RM (Medium Density Residential) and provide the maximum number of housing units based on RM zoning (21.7 housing units/acre)
- TAZ 492 - Modify household units based on maximum RM density, currently established at 21.7 housing units/acre

- TAZ 556 – Modify land use to RS and modify household units to 6.6 units/acre and increase employment to 50 people/acre (based on Steven Tract Master Plan)
- TAZ 557 – Modify land use to RS and modify household units to 6.6 units/acre and increase employment to 50 people/acre (based on Steven Tract Master Plan).

The net difference in households and jobs by affected TAZ are provided in Table 1 below. Overall, the high growth land use scenario added more than 2,300 households and almost 50 jobs to the southeast Bend area.

TABLE 1
 2030 Land Use

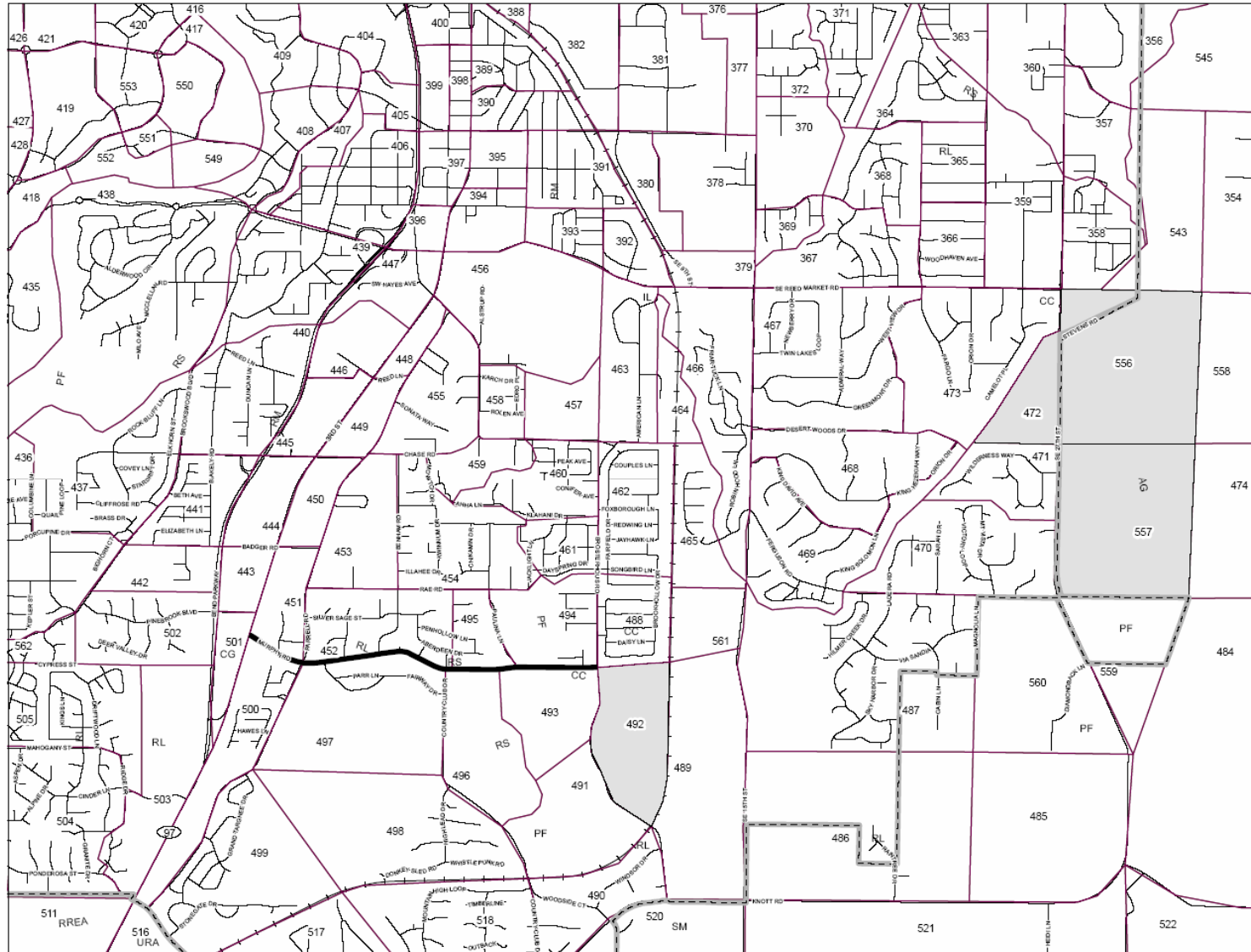
TAZ	High Growth Zoning	2030 Base Case		2030 High Growth Scenario	
		Households	Employment	Households	Employment
472	RM	148	6	787	6
492	RM	2	95	1,086	95
556	RS	753	330	934	188
557	RS	480	0	921	188
TOTAL		1,383	431	3,728	477
NET DIFFERENCE				2,345	46

ODOT’s Transportation Planning and Analysis Unit (TPAU) modified the 2030 base case with the expected growth land use scenario (referred to as “Murphy Crossing Only” scenario) and the high growth land use scenario. The Murphy Crossing Only scenario differs from the future No Build in that it considers Murphy Road extended to Brookwood Boulevard on the west and to 15th Street on the east. Please refer to Technical Memorandum 5.1 Future Conditions and Deficiencies for more information on this analysis scenario.

Model Forecast Results

Peak PM hour future roadway volumes were estimated by TPAU through the Bend MPO EMME/2 travel demand model for the high growth land use scenario. Volume difference plots were created to determine the level and types of impacts that occurred due to each scenario. Green bars represent areas where the first scenario is larger than the second scenario and red bars represent roadway where the second scenario is larger than the first scenario. Raw EMME/2 travel demand model volumes were used to develop the volume difference plots for the following two scenarios (see Figures 2 and 3).

Figure 1: TAZs Impacted by High Growth Scenario



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- 2030 High Growth Scenario (-) 2030 No Build
- 2030 High Growth Scenario (-) 2030 Murphy Crossing Only

Figure 2: 2030 High Growth Scenario (-) 2030 No Build

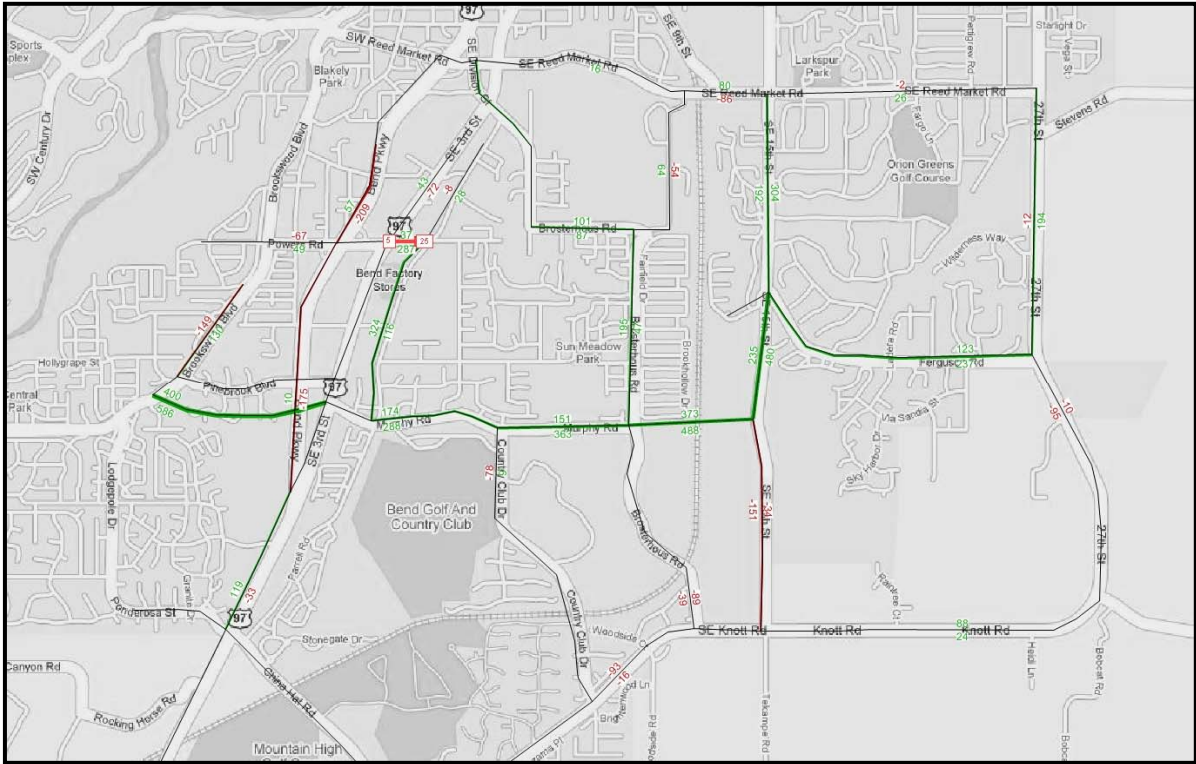
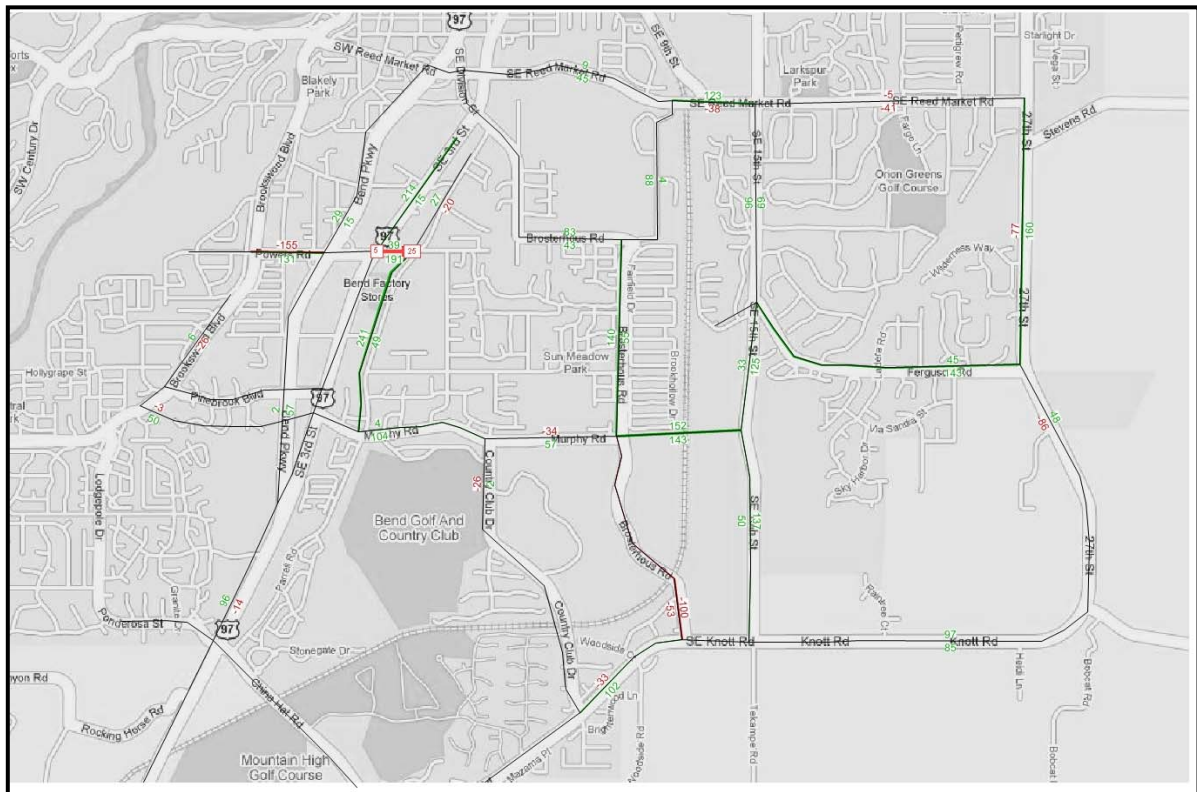


Figure 2 shows a moderate increase in traffic along Murphy Road between Brookwood Boulevard and 15th Street between the future high growth land use scenario and the future no build. Traffic increases are more pronounced in the eastbound than in the westbound direction, and at the east and west ends (between Brosterhous and 15th, and between Brookwood and 3rd) than along the existing corridor. The high growth land use scenario also creates additional traffic along Parrell Road, along 15th Street north of Murphy Road, along Ferguson Road, and along 27th Street north of Ferguson Road. Traffic appears to shift from the Parkway to Murphy Road between the highway and Brookwood Boulevard.

Figure 3 illustrates the delta difference in traffic volumes between the high growth land use scenario and the 2030 Murphy Crossing Scenario.

Figure 3: 2030 High Growth Scenario (-) 2030 Murphy Crossing Only



As shown in Figure 3, traffic volume differences between the future base case scenario and the future high growth land use scenario were slight along Murphy Road, between a decrease in traffic by 34 vehicles (westbound direction between Brosterhous and Country Club) and an increase by 152 vehicles (in westbound direction between 15th and Brosterhous). Traffic increases along Brosterhous Road north of Murphy, and along Parrell Road north of Murphy. Traffic increases are also seen along Ferguson east of 15th, and along 27th Street north of Ferguson.

Traffic Analysis Results

A PM peak hour operational analysis was conducted for all 14 study area intersections for the 2030 *Build - Murphy Crossing and Extension Only* “High Growth” scenario using the Synchro (version 6) traffic analysis software package. Future turning movement volumes were obtained by post-processing raw turning movement volumes from the Bend MPO EMME/2 travel demand model according to standards described in National Cooperative Highway Research Program (NCHRP) Report 255.

Table 2 shows the results of the analysis. The 2030 *Build - Murphy Crossing and Extension Only* “High Growth” scenario is expected to have four intersections that do not meet the City of Bend’s traffic operational requirements, 15th St./Ferguson Rd., 15th St./Knott Rd., 15th St./Murphy Rd., and 27th St./Ferguson Rd.

Figure 4 shows turning movements volumes, level-of-service results and intersection channelization for all study intersections.

TABLE 2
Intersection Operational Analysis Results

Intersection	2030 No Build				2030 Build: Expected Growth				2030 Build: High Growth			
	Control Type [^]	V/C Ratio ¹	Delay (sec/veh) ²	LOS	Control Type	V/C Ratio ¹	Delay (sec/veh) ²	LOS	Control Type	V/C Ratio ¹	Delay (sec/veh) ²	LOS
Powers Road at Bend Pkwy(SB Ramps)	TWSC	0.55	21.4	C	TWSC	0.72	30.7	D	TWSC	0.82	39.0	E
Powers Road at Bend Pkwy (NB Ramps)	TWSC	0.57	14.7	B	TWSC	0.38	30.8	D	TWSC	0.58	14.1	B
Parrell Road at Powers Rd.	TWSC	0.25	10.5	B	TWSC	0.42	12.3	B	TWSC	0.79	25.3	D
SE 15 th Street at Ferguson Rd.	TWSC	0.18	25.4	D	TWSC	0.30	50.9	F	TWSC	>1.50	>100	F
US 97 at Ponderosa Dr./China Hat Rd.	TWSC	0.53	19.0	C	TWSC	0.53	23.0	C	TWSC	0.55	25.1	D
Knott Road at SE 15th St/Tekampe Rd.	TWSC	>1.50	>150.0	F	TWSC	0.56	35.2	E	TWSC	1.47	>100	F
Brookwood Blvd at Pinebrook Blvd.	TWSC	0.51	35.4	E	TWSC	0.25	14.5	B	TWSC	0.26	12.8	B
SE 3rd Street at Pinebrook Blvd.	TWSC	>1.50	>150.0	F	Signal	0.53	10.4	B	Signal	0.66	12.4	B
SE 3rd Street at Murphy Rd.	Signal	0.70	27.4	C	Signal	0.67	28.7	C	Signal	0.70	27.8	C
Murphy Road at Parrell Rd.	TWSC	0.52	37.6	E	Signal	0.59	10.0	B	Signal	0.73	16.8	B
Murphy Road at Country Club Rd.	TWSC	0.42	22.1	C	Signal	0.68	11.8	B	Signal	0.74	13.9	B
Murphy Road at Brosterhous Rd.	TWSC	0.98	77.0	F	Signal	0.79	16.3	B	Signal	0.81	15.8	B
Murphy Road at 15 th St.	Does Not Exist in No Build Scenario				TWSC	0.88	44.6	E	TWSC	1.09	>100	F
Ferguson Road at 27 th St.	TWSC	0.64	43.6	E	TWSC	>1.50	>150.0	F	TWSC	>1.50	>100	F

Notes:

1 – The maximum individual lane group volume-to-capacity ratio (v/c ratio) from the intersection analysis.

2 – For TWSC or AWSC intersections, reported delay is for the highest minor street lane group delay.

* Information reported in **bold** font indicates higher than acceptable levels of congestion.

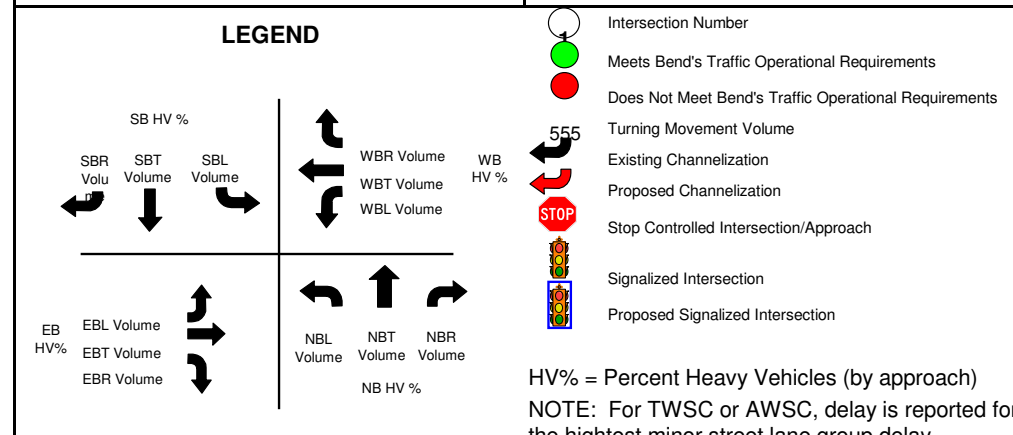
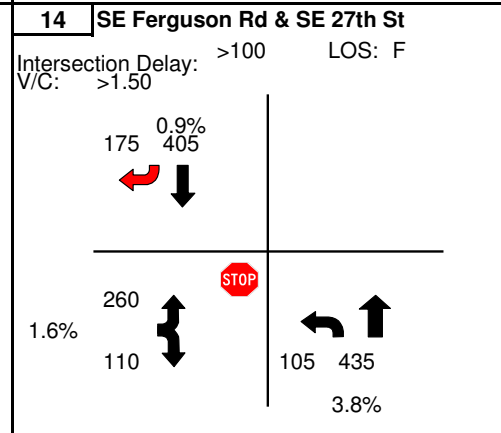
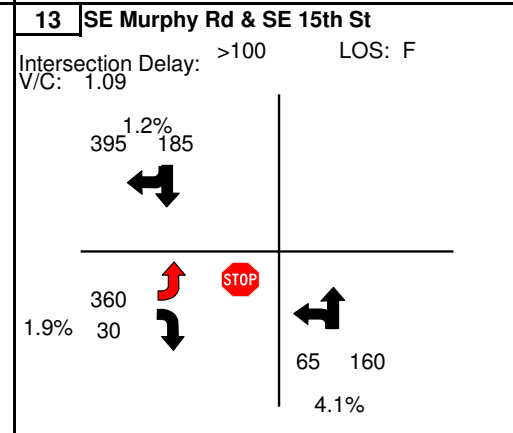
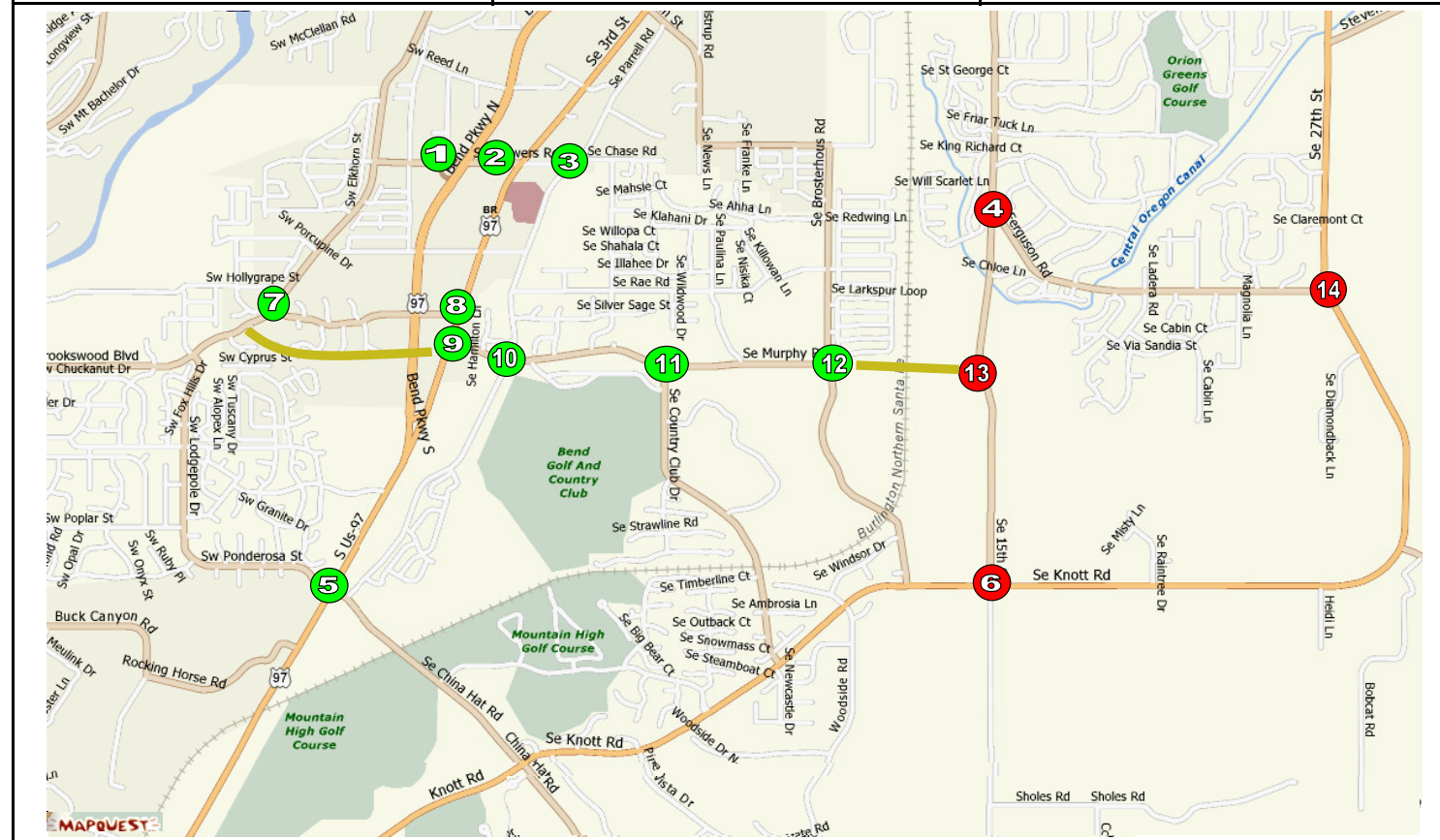
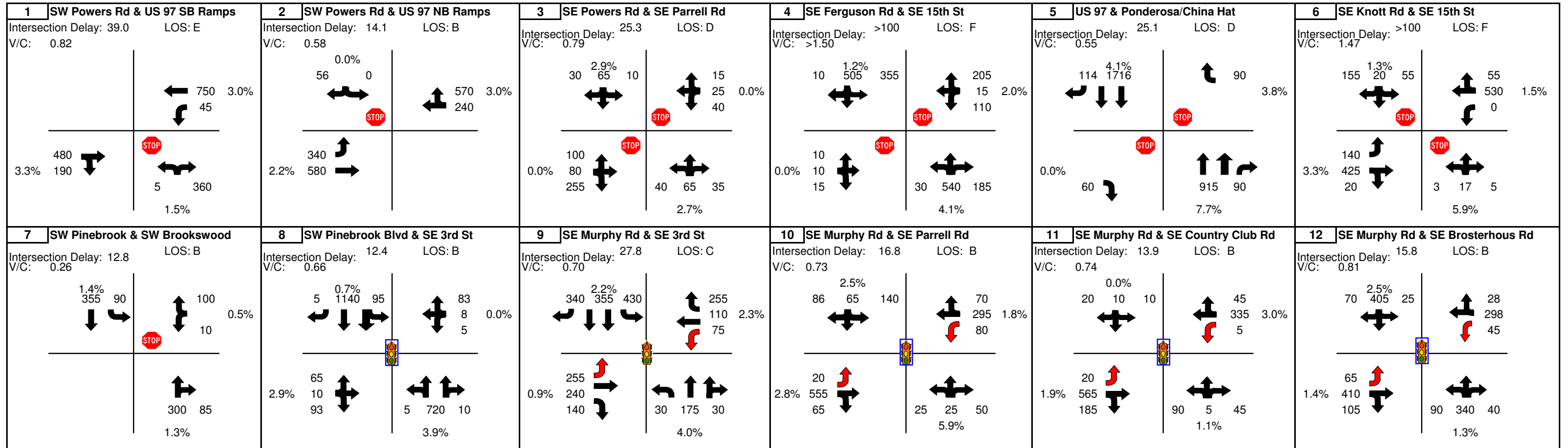
[^] Control Definitions: TWSC = Two Way Stop Controlled, AWSC = All Way Stop Controlled

As shown in Table 2, the two intersections shown as not meeting relevant City of Bend mobility standards in the future Murphy Crossing scenario are shown as deficient in the high growth land use scenario as well. These are the 15th and Ferguson and the 27th and Ferguson intersections. The first, the 15th and Ferguson intersection, worsens from a 0.30 v/c to a >1.5 v/c. The second, 27th and Ferguson, was shown to be >1.5 v/c in the base case =Murphy Crossing land use scenario as well.

Two area intersections that operated at an acceptable level in the base case = Murphy Crossing land use scenario were identified as deficient under the high growth land use scenario. These included the 15th Street and Knott Road intersection and the 15th Street and Murphy Road intersection. Both intersections were shown as a two-way stop control.

Next Steps

The Murphy Road Corridor Study TAC will consider the deficiencies identified by the sensitivity test above, to determine whether adjustments to the preferred alternative are warranted to ensure the Murphy Road corridor operates at an acceptable level of mobility in the future. Potential adjustments could include additional traffic controls or improvements, monitoring, or potential land use controls. The modified preferred alternative will be presented to the public and described in the Murphy Road Refinement Plan.



*****FIGURE 4*****

**Murphy Road Corridor
Bend, Oregon**

Study Area Intersection
LOS, Volumes, Channelization
2030 Build Conditions and Deficiencies
High Growth Scenario