

Regional Municipality of York

Appendix 4B

Sensitivity Analysis

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Project #

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Overview

In August 2009, a series of model runs were undertaken for 2031 to test the impact of specific changes to the preferred road network (Alternative 8) considering overall network performance and corridor specific congestion levels based on screenline analyses and detailed network assignments focusing on 2031. Additionally, the earlier land use forecasts were revised to include the updated assumptions by York region and the City of Brampton. This sensitivity analysis carried the project forward in a series of steps from “Alt #8D” to “Alt #8Gv2” (which considered updated land use and network assumptions). Tables 1 – 3 and Figures 1 – 4 summarize the Sensitivity Analysis results and show the estimated impacts of reducing capacity on either Major Mackenzie Drive or Rutherford Road in 2031.

Discussion of Findings/Conclusions

Pine Valley Drive (Originally proposed for widening to 4 lanes between Rutherford Road and Teston Road).

The analysis of Alternative 8G version 2, with and without the widening of Pine Valley Drive between Rutherford Road and Teston Road to four lanes (two lanes per direction), showed minimal benefits. This conclusion was confirmed by reviewing more detailed assignments focusing on the Pine Valley Corridor (see Figure 5 and Figure 6). The forecasts from the original base (scenario 3512) shown in Figure 5 for Pine Valley Drive as a 4 lane road (2/2) demonstrate that the over-capacity problems would be limited to the area north of Major Mackenzie Drive and are associated with specific residential developments in the corridor. The forecasts from scenario 3523 where Pine Valley is operating as a two lane facility (1/1) show the same over-capacity issues north of Major Mackenzie Drive, with both Major Mackenzie Drive and Rutherford Road operating at acceptable levels of service. Therefore, Scenario 3523 became the new base for the analysis of possible reductions in lane capacity on Major Mackenzie Dr. and Rutherford Rd.

Major Mackenzie Dr. and Rutherford Rd.

Additional analyses were undertaken varying Major Mackenzie Dr from 6 lanes (3/3) to 4 lanes (2/2) as well as Rutherford Road from 6 lanes (3/3) to 4 lanes (2/2). Figures 6 – 9 illustrate the resulting volume to capacity ratios achieved for each scenario; all of which have Pine Valley Drive as a two lane facility (1/1) and Major Mackenzie Drive and Rutherford Road are both assumed to be 6 lane facilities (3/3).

Figure 10 – 12 highlight how the auto volumes would differ if Major Mackenzie Drive and/or Rutherford Road were to operate as four lane facilities (2/2).

The conclusions for this analysis indicated that by 2031 it will be necessary to have both Major Mackenzie and Rutherford Road operating as 6 lanes facilities between Highway 50 and Weston Road in Western Vaughan. Note that even with the recommended roadway improvements, the overall arterial road levels of service in Western Vaughan can be expected to decline compared to existing roadway levels of service (illustrated in Figure 13).

Subsequent to the analyses discussed above, further network modifications have been made to the preferred alternative (8Gv2) in the Western Vaughan area to reflect more recent study findings for the Highway 427 corridor and the City of Brampton. These include realigning the Highway 427/Major Mackenzie Dr. interchange and Huntington Rd, and updating the Peel Region road network to reflect the Region of Peel's current road network assumptions. These subsequent modifications would not be expected to change the findings or conclusions of the sensitivity analyses discussed in this appendix.

Table 1 – Origin/Destination Trips Summary for Alternatives 8G and 8Gv2

Model Travel Demand (AM Peak Period)	Orig Trips									Dest Trips								
	2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)			2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)		
	West Vaughan	Vaughan	Entire York Region	West Vaughan	Vaughan	Entire York Region	West Vaughan	Vaughan	Entire York Region	West Vaughan	Vaughan	Entire York Region	West Vaughan	Vaughan	Entire York Region	West Vaughan	Vaughan	Entire York Region
Auto Driver Trips	44,770	144,590	469,660	48,010	140,250	471,110	48,510	140,710	470,790	57,350	160,980	478,340	58,460	161,140	482,600	61,760	158,420	476,070
Auto Passenger Trips	7,800	26,260	86,190	9,430	28,490	99,210	9,450	28,510	99,090	10,450	27,150	86,720	11,410	29,330	98,470	11,840	29,050	97,810
Transit Trips	7,450	33,510	98,210	7,980	33,320	101,350	7,880	33,340	103,550	5,970	18,090	52,870	6,240	18,840	55,740	6,580	18,820	58,260
Total Trips	60,020	204,350	654,060	65,420	202,070	671,670	65,850	202,560	673,430	73,770	206,230	617,920	76,120	209,310	636,800	80,180	206,290	632,140
Transit Mode Share	12.4%	16.4%	15.0%	12.2%	16.5%	15.1%	12.0%	16.5%	15.4%	8.1%	8.8%	8.6%	8.2%	9.0%	8.8%	8.2%	9.1%	9.2%
	Intra-Regional Trips									Intra-Regional Trips								
Model Travel Demand (AM Peak Period)	2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)			2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)		
	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region
Auto Driver Trips	10,840	68,410	310,220	11,800	66,040	311,350	12,370	65,390	308,700	10,840	68,410	310,220	11,800	66,040	311,350	12,370	65,390	308,700
Auto Passenger Trips	3,300	14,780	65,090	4,270	16,640	76,660	4,330	16,560	76,390	3,300	14,780	65,090	4,270	16,640	76,660	4,330	16,560	76,390
Transit Trips	1,040	6,460	31,290	1,260	7,000	33,880	1,290	6,990	35,440	1,040	6,460	31,290	1,260	7,000	33,880	1,290	6,990	35,440
Total Trips	15,180	89,640	406,590	17,330	89,670	421,890	17,990	88,950	420,530	15,180	89,640	406,590	17,330	89,670	421,890	17,990	88,950	420,530
Transit Mode Share	6.9%	7.2%	7.7%	7.3%	7.8%	8.0%	7.2%	7.9%	8.4%	6.9%	7.2%	7.7%	7.3%	7.8%	8.0%	7.2%	7.9%	8.4%
	Intra-Regional Trips (% of Total Orig Trips)									Intra-Regional Trips (% of Total Dest Trips)								
Model Travel Demand (AM Peak Period)	2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)			2031 (Alt #8D)			2031 (Alt #8G)			2031 (Alt #8Gv2)		
	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region	Intra-West Vaughan	Intra-Vaughan	Intra-York Region
Auto Driver Trips	24%	47%	66%	25%	47%	66%	25%	46%	66%	19%	42%	65%	20%	41%	65%	20%	41%	65%
Auto Passenger Trips	42%	56%	76%	45%	58%	77%	46%	58%	77%	32%	54%	75%	37%	57%	78%	37%	57%	78%
Transit Trips	14%	19%	32%	16%	21%	33%	16%	21%	34%	17%	36%	59%	20%	37%	61%	20%	37%	61%
Total Trips	25%	44%	62%	26%	44%	63%	27%	44%	62%	21%	43%	66%	23%	43%	66%	22%	43%	67%

Table 2 – 2031 - Screenline Summary – 2031

UMA ScIn	Scn	Dir	Location	OLD #8G				#8G_v2 + PV 1/1				#8G_v2 MM 2/2 + PV 1/1				#8G_v2 Ruth 2/2 + PV 1/1				#8G_v2 MM&Ruth 2/2 + PV 1/1			
				HCI 2031 (Alt #8G w/ TDM & TSM) - Sc3512				HCI 2031 (Alt #8G_v2 w/ TDM & TSM) - Sc3523 (PV1/1)				HCI 2031 (Alt #8G_v2 w/ TDM & TSM) - Sc3520 (MM 2/2, PV1/1)				HCI 2031 (Alt #8G_v2 w/ TDM & TSM) - Sc3521 (Ruth 2/2, PV1/1)				HCI 2031 (Alt #8G_v2 w/ TDM & TSM) - Sc3522 (MM&Ruth 2/2, PV1/1)			
				Pk Hr Total Veh	Pk Hr Transit Pass	Pk Hr Transit Share	V/C Ratio	Pk Hr Total Veh	Pk Hr Transit Pass	Pk Hr Transit Share	V/C Ratio	Pk Hr Total Veh	Pk Hr Transit Pass	Pk Hr Transit Share	V/C Ratio	Pk Hr Total Veh	Pk Hr Transit Pass	Pk Hr Transit Share	V/C Ratio	Pk Hr Total Veh	Pk Hr Transit Pass	Pk Hr Transit Share	V/C Ratio
AA	1	N	N of Teston Rd	6,800	290	4%	0.40	5,910	210	3%	0.35	5,970	210	3%	0.35	5,980	210	3%	0.35	5,990	210	3%	0.35
AA	1	S	N of Teston Rd	15,190	1,150	6%	0.95	15,290	1,160	6%	0.96	15,180	1,160	7%	0.95	15,350	1,150	6%	0.96	15,270	1,160	6%	0.96
BB	2	N	N of Rutherford Rd	11,680	570	4%	0.40	10,740	530	4%	0.38	10,690	530	4%	0.38	10,780	530	4%	0.38	10,710	530	4%	0.38
BB	2	S	N of Rutherford Rd	26,700	2,900	9%	0.92	26,770	2,960	9%	0.95	26,750	2,960	9%	0.95	27,230	2,910	9%	0.97	27,100	2,920	9%	0.96
CC	3	N	S of Langstaff Rd	15,250	910	5%	0.52	15,140	920	5%	0.51	15,200	920	5%	0.51	15,240	920	5%	0.52	15,300	920	5%	0.52
CC	3	S	S of Langstaff Rd	31,420	3,110	8%	0.95	31,660	3,150	8%	0.95	31,670	3,150	8%	0.95	31,790	3,110	8%	0.96	31,730	3,120	8%	0.95
DD	4	N	N of Steeles Ave W	18,110	1,480	7%	0.51	19,000	1,540	7%	0.54	19,090	1,540	7%	0.54	19,100	1,540	7%	0.54	19,110	1,540	7%	0.54
DD	4	S	N of Steeles Ave W	31,970	3,320	9%	0.91	31,630	3,250	9%	0.90	31,710	3,260	9%	0.90	31,710	3,210	8%	0.90	31,740	3,220	8%	0.90
WW	5	E	E of Hwy 50	24,540	2,120	7%	1.15	23,820	2,180	8%	1.11	23,620	2,180	8%	1.10	23,820	2,180	8%	1.11	23,830	2,180	8%	1.11
WW	5	W	E of Hwy 50	11,400	980	7%	0.53	12,580	1,020	7%	0.59	12,360	1,020	7%	0.58	12,530	1,020	7%	0.59	12,370	1,020	7%	0.58
XX	6	E	E of Hwy 27	18,480	2,220	10%	0.92	17,680	2,160	10%	0.88	17,440	2,150	10%	0.89	17,530	2,150	10%	0.91	17,290	2,160	10%	0.92
XX	6	W	E of Hwy 27	16,890	1,380	7%	0.84	18,140	1,600	7%	0.90	17,930	1,610	8%	0.92	17,930	1,600	8%	0.93	17,620	1,600	8%	0.94
YY	7	E	E of Pine Valley Dr	20,250	3,390	13%	0.96	19,640	3,280	13%	0.93	19,380	3,280	13%	0.95	19,440	3,270	13%	0.96	19,150	3,280	13%	0.97
YY	7	W	E of Pine Valley Dr	15,880	1,640	9%	0.75	16,960	1,800	9%	0.81	16,820	1,810	9%	0.82	16,720	1,810	9%	0.83	16,510	1,810	9%	0.84
ZZ	8	E	E of Hwy 400	24,440	4,130	13%	1.03	23,910	4,080	13%	1.01	23,850	4,080	13%	1.01	23,950	4,080	13%	1.01	23,850	4,090	13%	1.01
ZZ	8	W	E of Hwy 400	20,060	2,690	11%	0.85	20,680	2,800	11%	0.87	20,680	2,810	11%	0.87	20,620	2,810	11%	0.87	20,500	2,810	11%	0.87
	9	S	N of King-Vaughan Rd	12,810	550	4%	0.96	12,620	580	4%	0.95	12,530	580	4%	0.94	12,670	570	4%	0.95	12,550	580	4%	0.94
	9	N	N of King-Vaughan Rd	2,800	10	0%	0.21	2,820	10	0%	0.21	2,820	10	0%	0.21	2,850	10	0%	0.21	2,840	10	0%	0.21
	13	E	E of Kipling	15,080	2,440	13%	1.09	14,470	2,330	13%	1.05	14,480	2,330	13%	1.05	14,570	2,330	13%	1.06	14,610	2,330	13%	1.06
	13	W	E of Kipling	11,740	950	7%	0.85	12,890	1,120	7%	0.93	12,980	1,120	7%	0.94	13,050	1,120	7%	0.95	13,100	1,120	7%	0.95

Assume auto occupancy is 1.10 approximately
 Assume Transit Peak Hour Factor is 0.60 approximately

UMA ScIn	Scn	Dir	Location	vs 2031 Alt #8G (Old)				vs 2031 Alt #8G2 (PV1/1)				vs 2031 Alt #8G (Old)				vs 2031 Alt #8G (Old)							
				Tot Veh	Trn Pass	Trn %	V/C	Tot Veh	Trn Pass	Trn %	V/C	Tot Veh	Trn Pass	Trn %	V/C	Tot Veh	Trn Pass	Trn %	V/C				
AA	1	N	N of Teston Rd	-13%	-27%	-1%	-0.05	1%	0%	0%	0.00	1%	1%	0%	0.00	1%	0%	0%	0.00	1%	0%	0%	0.00
AA	1	S	N of Teston Rd	1%	1%	0%	0.01	-1%	0%	0%	-0.01	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00
BB	2	N	N of Rutherford Rd	-8%	-7%	0%	-0.02	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00
BB	2	S	N of Rutherford Rd	0%	2%	0%	0.03	0%	0%	0%	0.00	2%	-2%	0%	0.02	1%	-1%	0%	0.01	1%	-1%	0%	0.01
CC	3	N	S of Langstaff Rd	-1%	1%	0%	0.00	0%	0%	0%	0.00	1%	0%	0%	0.00	1%	1%	0%	0.00	1%	1%	0%	0.01
CC	3	S	S of Langstaff Rd	1%	1%	0%	0.01	0%	0%	0%	0.00	0%	-1%	0%	0.00	0%	-1%	0%	0.00	0%	-1%	0%	0.00
DD	4	N	N of Steeles Ave W	5%	4%	0%	0.03	0%	0%	0%	0.00	1%	0%	0%	0.00	1%	1%	0%	0.00	1%	1%	0%	0.00
DD	4	S	N of Steeles Ave W	-1%	-2%	0%	-0.01	0%	0%	0%	0.00	0%	-1%	0%	0.00	0%	-1%	0%	0.00	0%	-1%	0%	0.00
WW	5	E	E of Hwy 50	-3%	3%	0%	-0.03	-1%	0%	0%	-0.01	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00
WW	5	W	E of Hwy 50	10%	4%	0%	0.06	-2%	0%	0%	-0.01	0%	0%	0%	0.00	-2%	0%	0%	0.00	-2%	0%	0%	-0.01
XX	6	E	E of Hwy 27	-4%	-3%	0%	-0.04	-1%	0%	0%	0.01	-1%	0%	0%	0.03	-2%	0%	0%	0.03	-2%	0%	0%	0.04
XX	6	W	E of Hwy 27	7%	16%	0%	0.06	-1%	0%	0%	0.01	-1%	0%	0%	0.03	-3%	0%	0%	0.03	-3%	0%	0%	0.04
YY	7	E	E of Pine Valley Dr	-3%	-3%	0%	-0.03	-1%	0%	0%	0.01	-1%	0%	0%	0.03	-2%	0%	0%	0.03	-2%	0%	0%	0.04
YY	7	W	E of Pine Valley Dr	7%	10%	0%	0.05	-1%	0%	0%	0.01	-1%	0%	0%	0.02	-3%	0%	0%	0.02	-3%	0%	0%	0.03
ZZ	8	E	E of Hwy 400	-2%	-1%	0%	-0.02	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00	0%	0%	0%	0.00
ZZ	8	W	E of Hwy 400	3%	4%	0%	0.03	0%	0%	0%	0.00	0%	0%	0%	0.00	-1%	0%	0%	0.00	-1%	0%	0%	-0.01
	9	S	N of King-Vaughan Rd	-1%	5%	0%	-0.01	-1%	0%	0%	-0.01	0%	-1%	0%	0.00	-1%	0%	0%	0.00	-1%	0%	0%	-0.01
	9	N	N of King-Vaughan Rd	1%	-8%	0%	0.00	0%	0%	0%	0.00	1%	0%	0%	0.00	1%	0%	0%	0.00	1%	0%	0%	0.00
	13	E	E of Kipling	-4%	-4%	0%	-0.04	0%	0%	0%	0.00	1%	0%	0%	0.01	1%	0%	0%	0.01	1%	0%	0%	0.01
	13	W	E of Kipling	10%	18%	0%	0.08	1%	0%	0%	0.01	1%	0%	0%	0.01	2%	0%	0%	0.01	2%	0%	0%	0.02

Table 3 – 2031 - V/C Ratios and Average Speeds for arterial roads within study area with Reduced Capacity on Major Mackenzie and Rutherford

Arterial Roads	Dir	Final Opt #8Gv2				Final Opt #8Gv2 (MM 2/2)				Final Opt #8Gv2 (Ruth 2/2)				Final Opt #8Gv2 (MMRuth 2/2)			
		2031 Alt #8Gv2				2031 Alt #8Gv2				2031 Alt #8Gv2				2031 Alt #8Gv2			
		v/c > 1.0 (%)	v/c > 0.9 (%)	v/c > 0.8 (%)	Avg Speed (kph)	v/c > 1.0 (%)	v/c > 0.9 (%)	v/c > 0.8 (%)	Avg Speed (kph)	v/c > 1.0 (%)	v/c > 0.9 (%)	v/c > 0.8 (%)	Avg Speed (kph)	v/c > 1.0 (%)	v/c > 0.9 (%)	v/c > 0.8 (%)	Avg Speed (kph)
Hwy 50	N-S	25%	43%	88%	50	25%	43%	88%	50	25%	43%	95%	49	25%	43%	95%	50
Huntington Rd	N-S	0%	0%	0%	55	0%	0%	0%	55	0%	0%	0%	54	0%	0%	0%	56
Hwy 27	N-S	53%	84%	99%	46	53%	84%	99%	45	53%	84%	99%	45	41%	84%	99%	46
Islington Ave	N-S	12%	24%	37%	43	12%	24%	37%	43	24%	24%	49%	43	24%	24%	49%	42
Pine Valley Dr	N-S	16%	16%	25%	42	16%	16%	25%	42	16%	16%	25%	42	16%	16%	25%	43
Weston Rd	N-S	41%	47%	74%	45	39%	47%	74%	44	39%	56%	74%	44	41%	56%	74%	45
Teston Rd	E-W	37%	40%	72%	40	37%	40%	68%	39	37%	40%	72%	39	37%	40%	75%	39
Major Mac Dr	E-W	22%	28%	62%	46	26%	58%	66%	44	22%	58%	66%	45	34%	62%	66%	41
Rutherford Rd	E-W	14%	36%	48%	45	14%	36%	63%	44	21%	63%	72%	41	21%	63%	63%	41
Langstaff Rd	E-W	0%	37%	44%	45	8%	37%	44%	44	8%	37%	44%	44	17%	37%	44%	44
Hwy 7	E-W	18%	20%	50%	48	18%	20%	50%	49	18%	20%	50%	48	18%	20%	50%	48
Steeles Ave	E-W	7%	13%	43%	47	7%	10%	43%	47	7%	13%	43%	47	7%	16%	43%	47
Total:		22%	33%	55%	46	22%	36%	57%	45	24%	39%	60%	45	25%	40%	59%	45

v/c > 0.9	33%
0.8 < v/c <= 0.9	22%
v/c <= 0.8	45%

v/c > 0.9	36%
0.8 < v/c <= 0.9	21%
v/c <= 0.8	43%

v/c > 0.9	39%
0.8 < v/c <= 0.9	20%
v/c <= 0.8	40%

v/c > 0.9	40%
0.8 < v/c <= 0.9	19%
v/c <= 0.8	41%

Figure 1 – 2031 Road Conditions – New Base Case (Alternative 8Gv2 with Pine Valley 1/1)

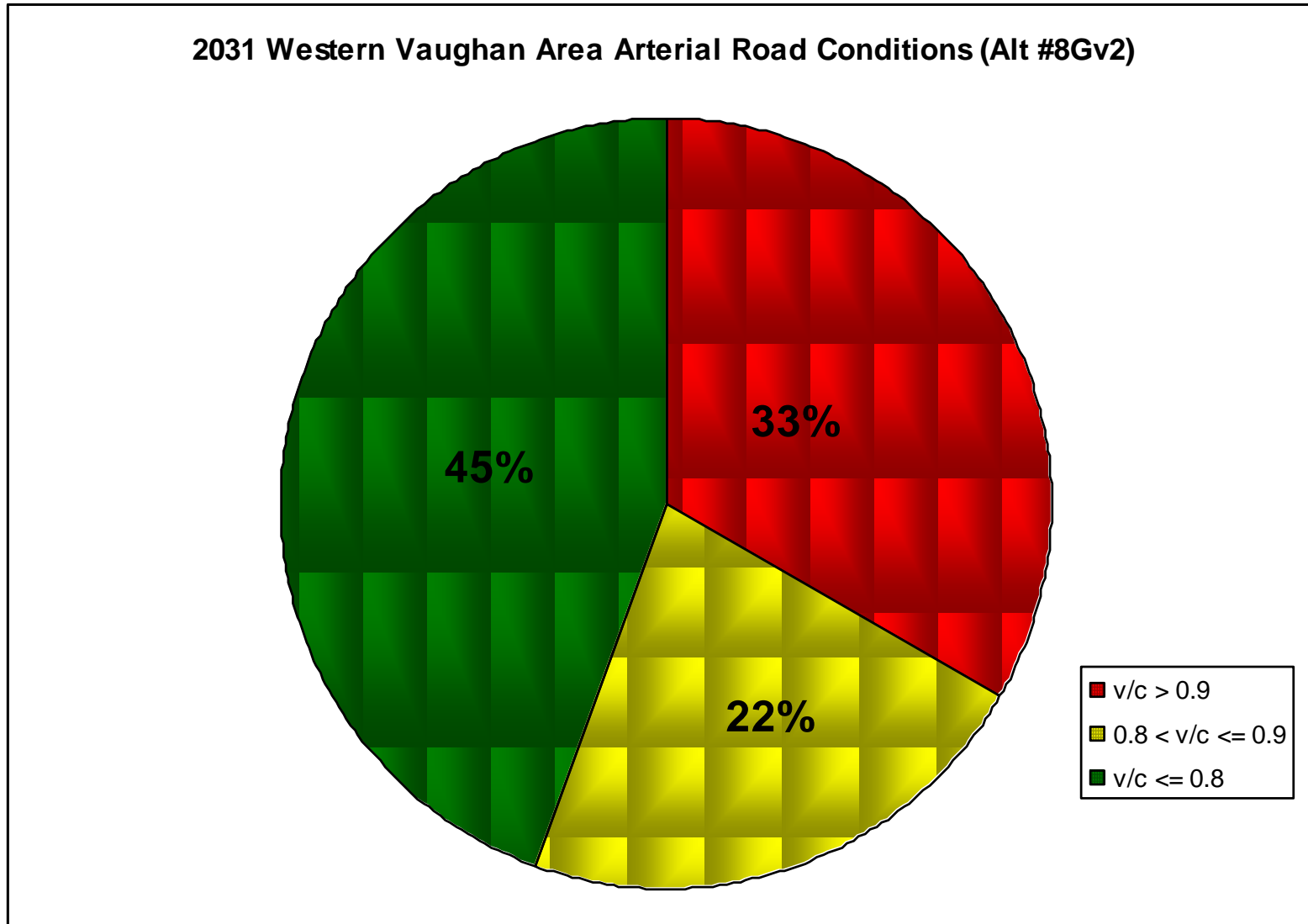


Figure 2 – 2031 Road Conditions – New Base Case with Reduced Capacity on Major Mackenzie Drive

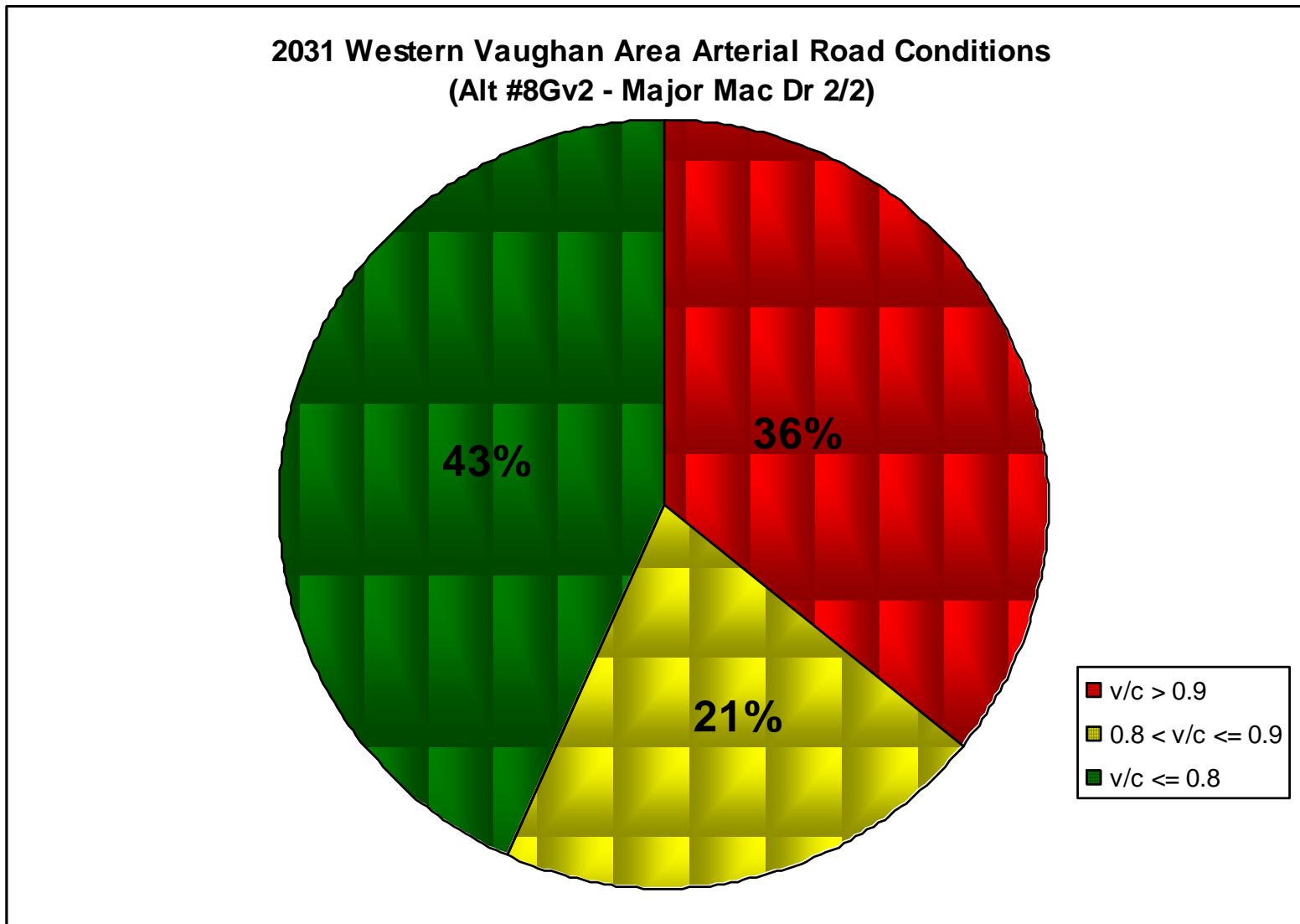


Figure 3 – 2031 Road Conditions – New Base Case with Reduced Capacity on Rutherford Road

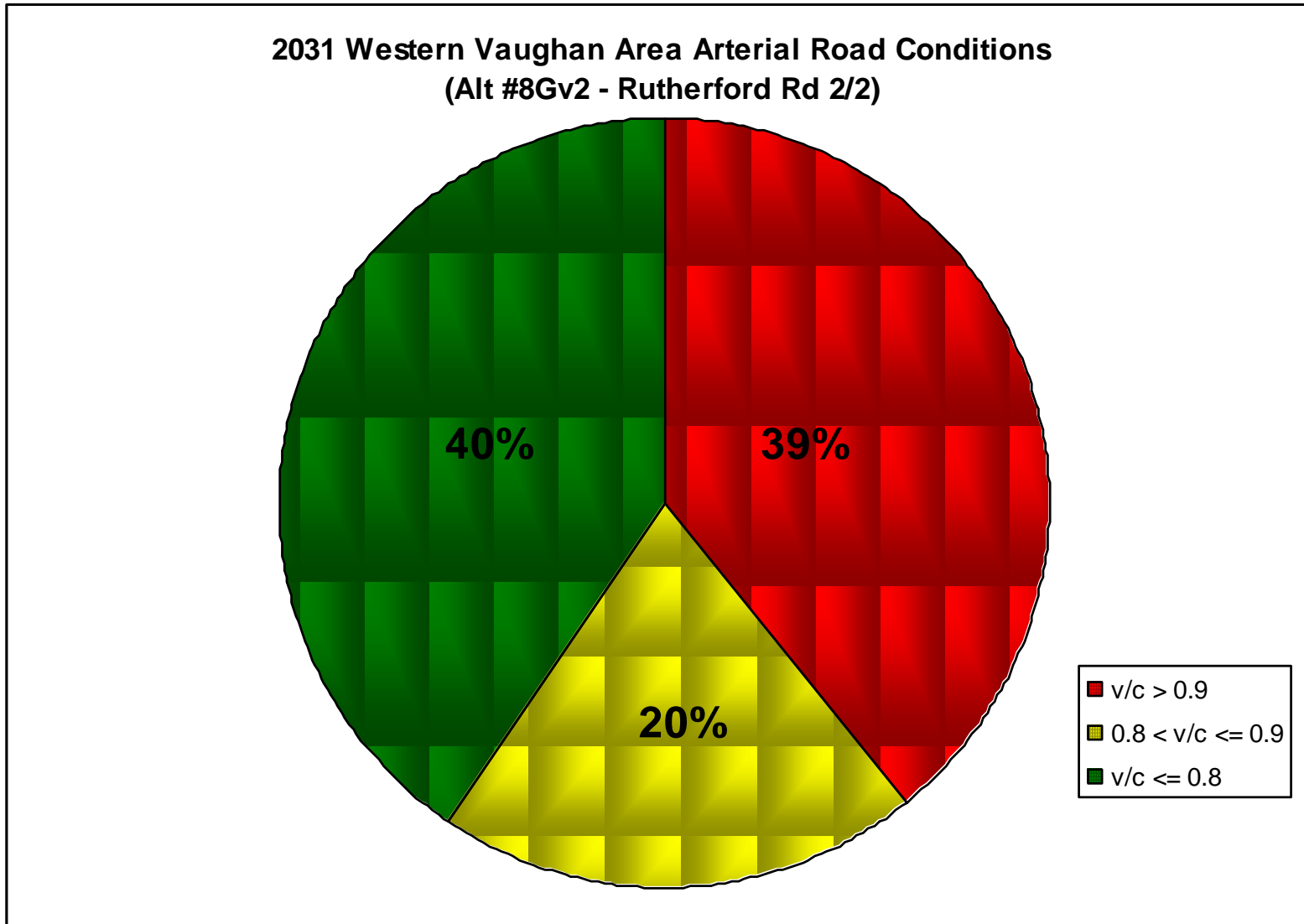


Figure 4 – 2031 Road Conditions – New Base Case with Reduced Capacity on Major Mac and Rutherford Road

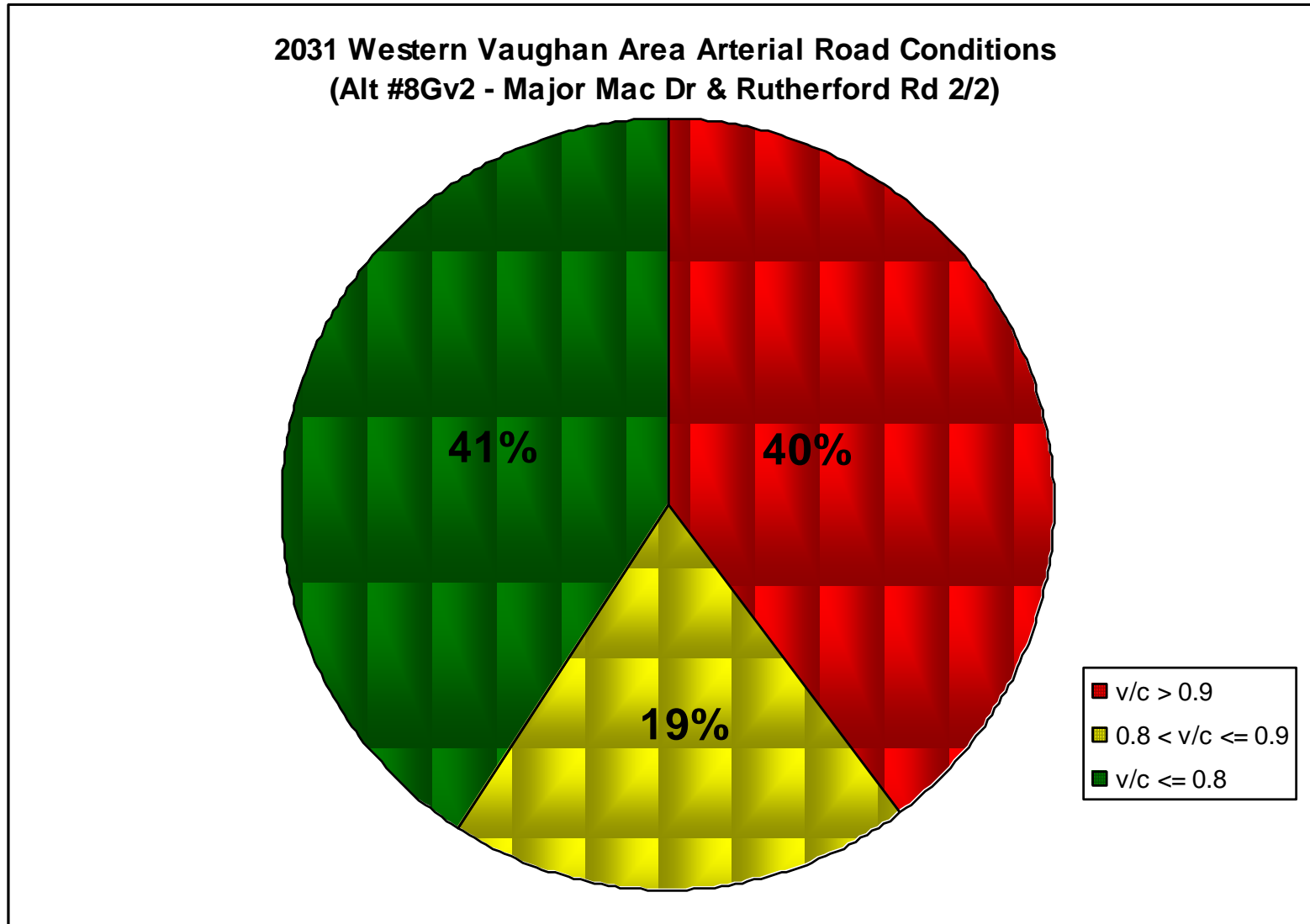


Figure 5 – 2031 Alt #8G (Original Base with Pine Valley at 2/2 north of Rutherford to Teston) - Auto Volume and V/C ratio (With Volume Scale) (Sc3512)

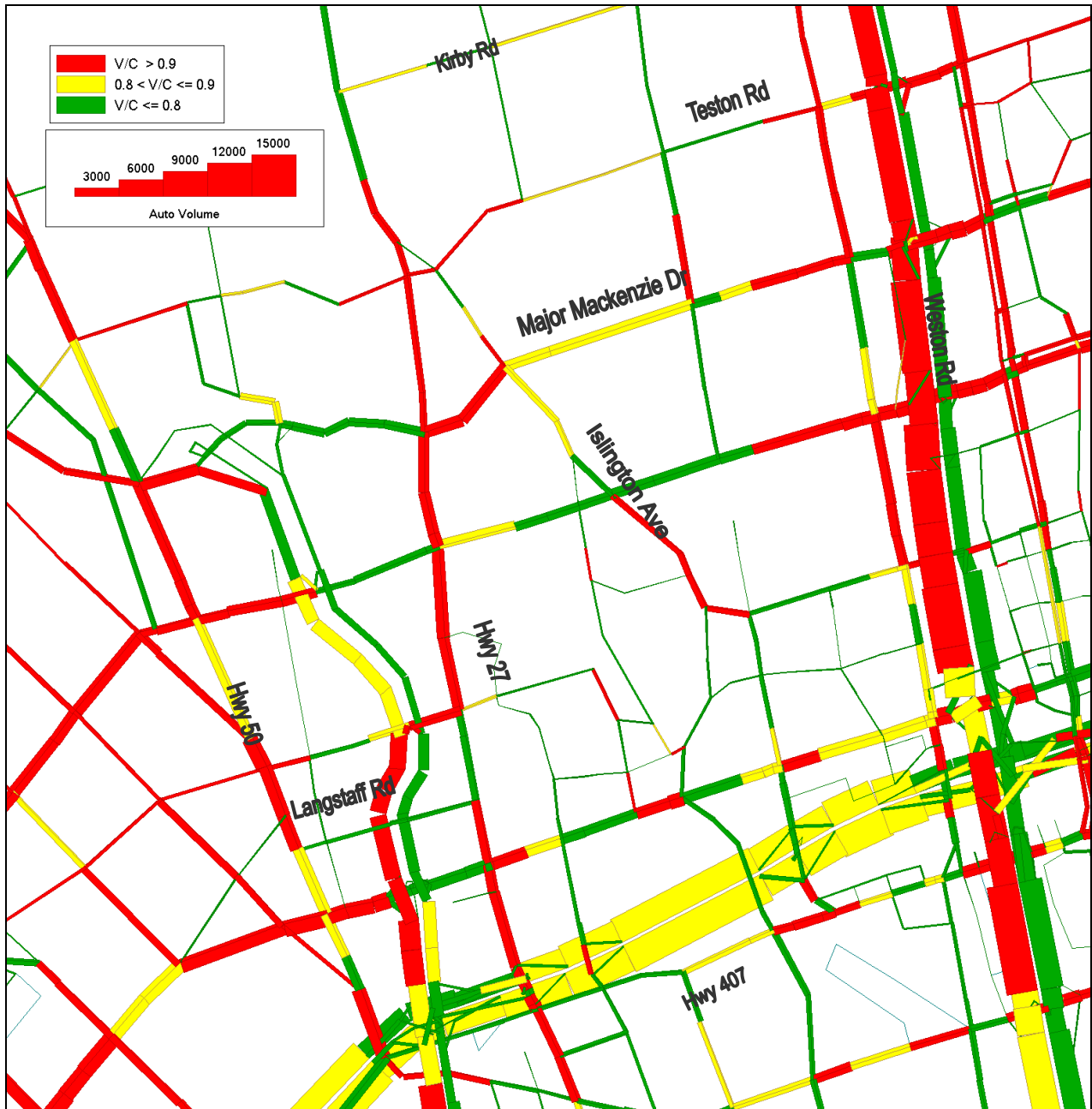


Figure 6 - 2031 Alt #8Gv2 (New Base) Auto Volume and V/C ratio (With Volume Scale) (Sc3523 Revised Population/ Employment; Pine Valley 1/1 between Major Mac Dr & Rutherford Rd)

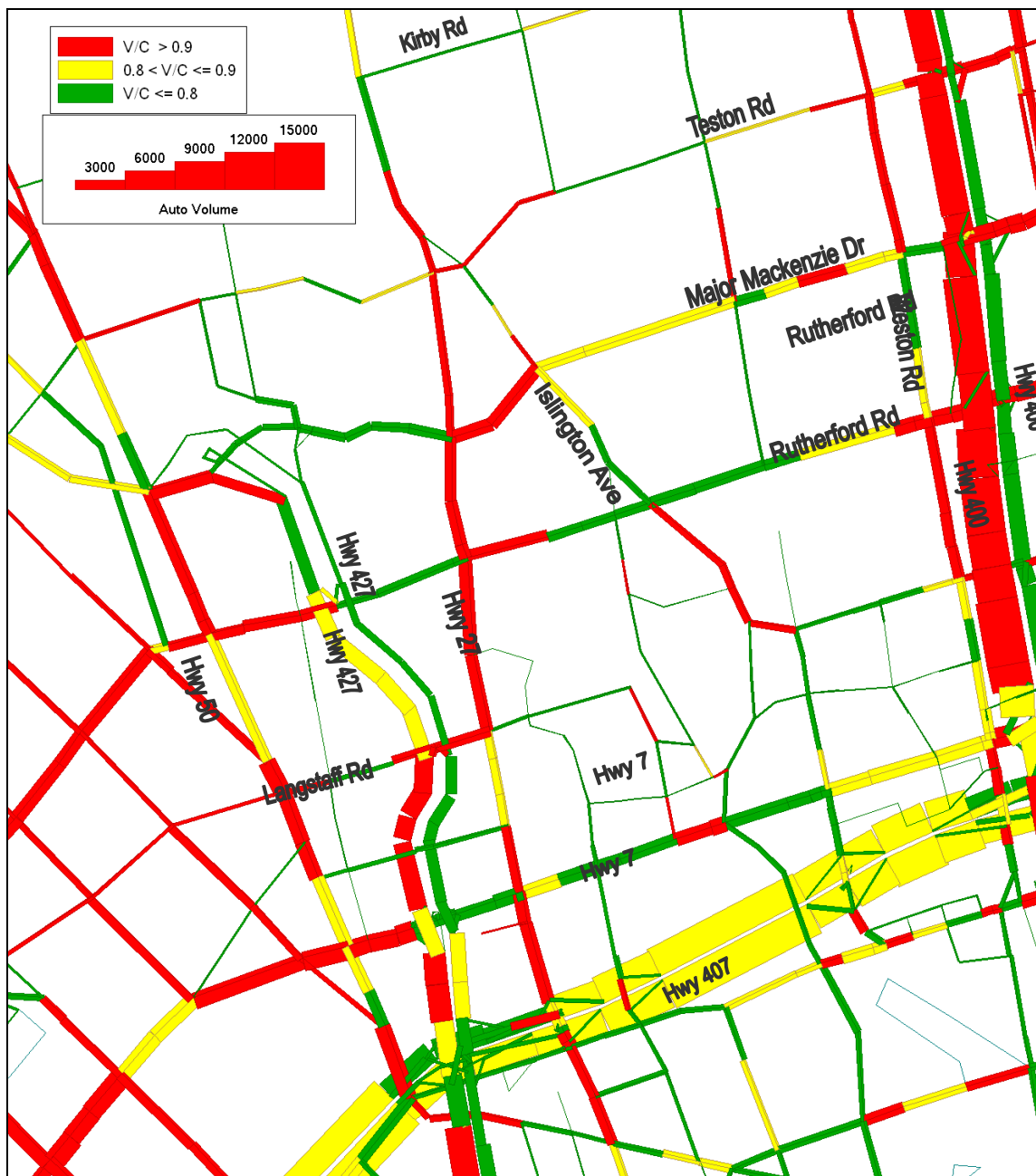


Figure 7 - 2031 Alt #8Gv2 Auto Volume and V/C ratio (With Volume Scale) (Sc3524 Revised Employment; Pine Valley 1/1 between Major Mac Dr & Rutherford Rd; Major Mac Dr 2/2)

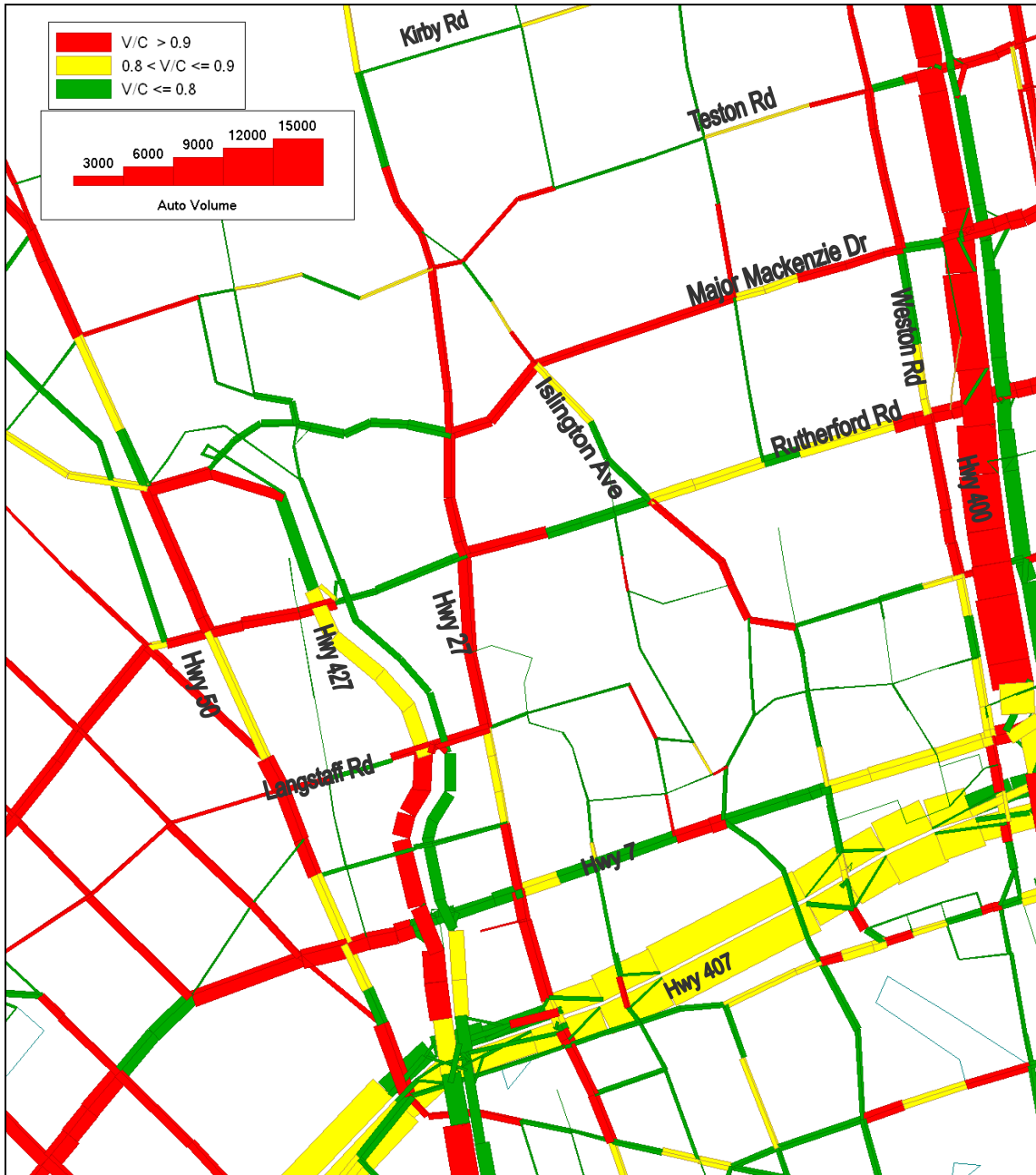


Figure 8 - 2031 Alt #8Gv2 Auto Volume and V/C ratio (With Volume Scale) (Sc3525 Revised Employment; Pine Valley 1/1 between Major Mac Dr & Rutherford Rd; Rutherford Rd 2/2)

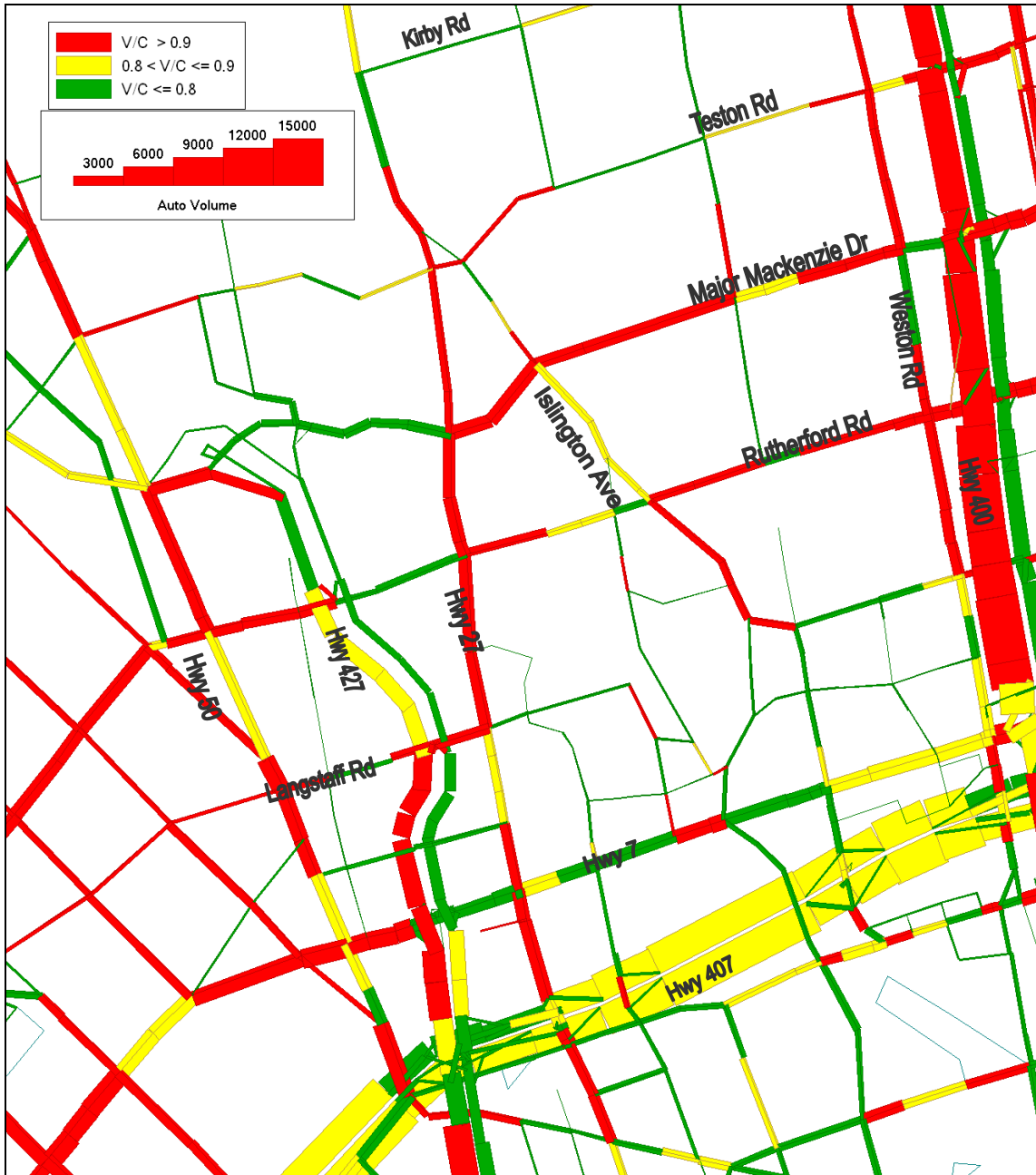


Figure 9 - 2031 Alt #8Gv2 Auto Volume and V/C ratio (With Volume Scale) (Sc3526 Revised Employment; Pine Valley 1/1 between Major Mac Dr & Rutherford Rd; Major Mac Dr & Rutherford Rd 2/2)

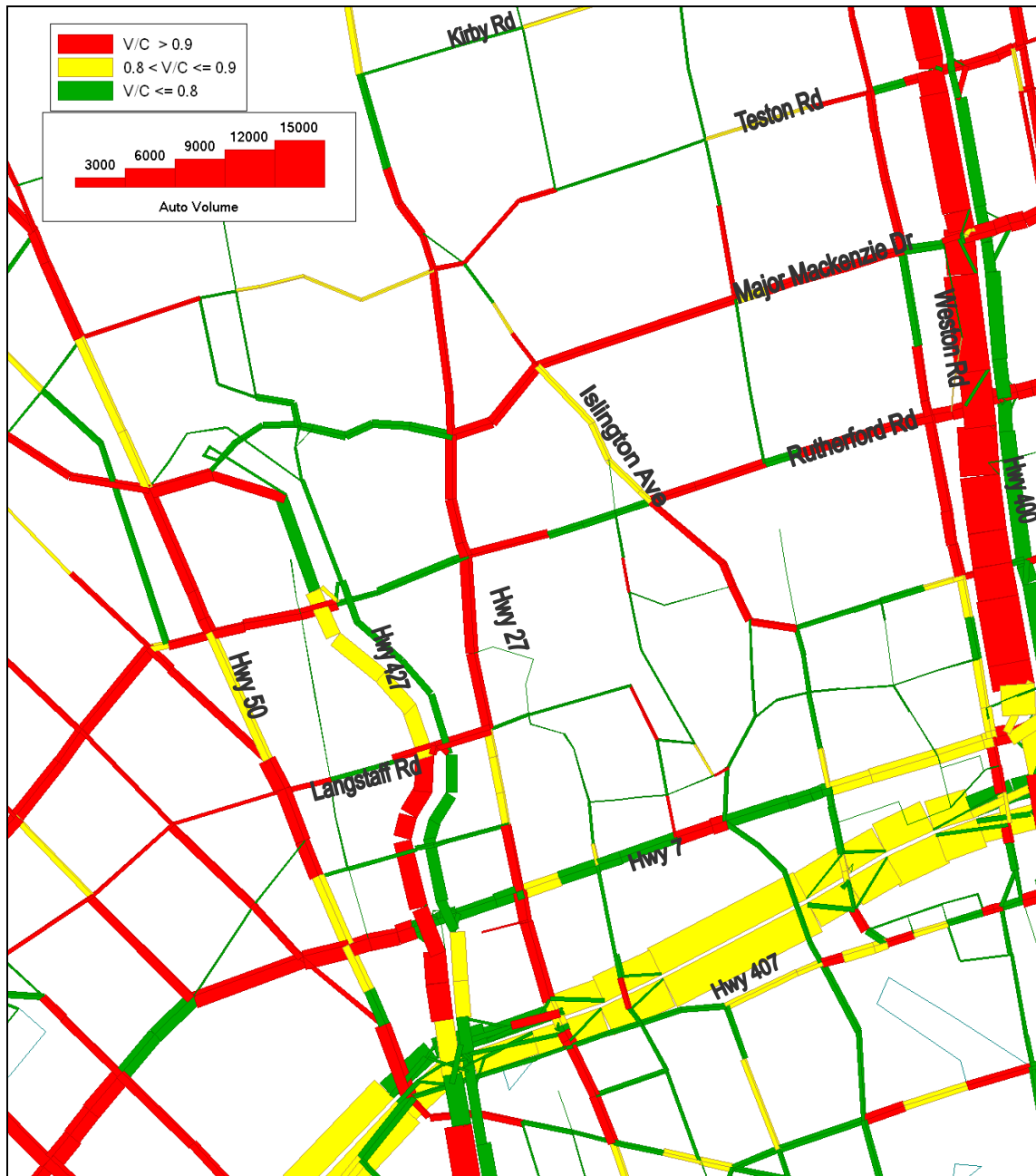


Figure 10 - Auto Volume Difference – Major Mac Dr 2/2

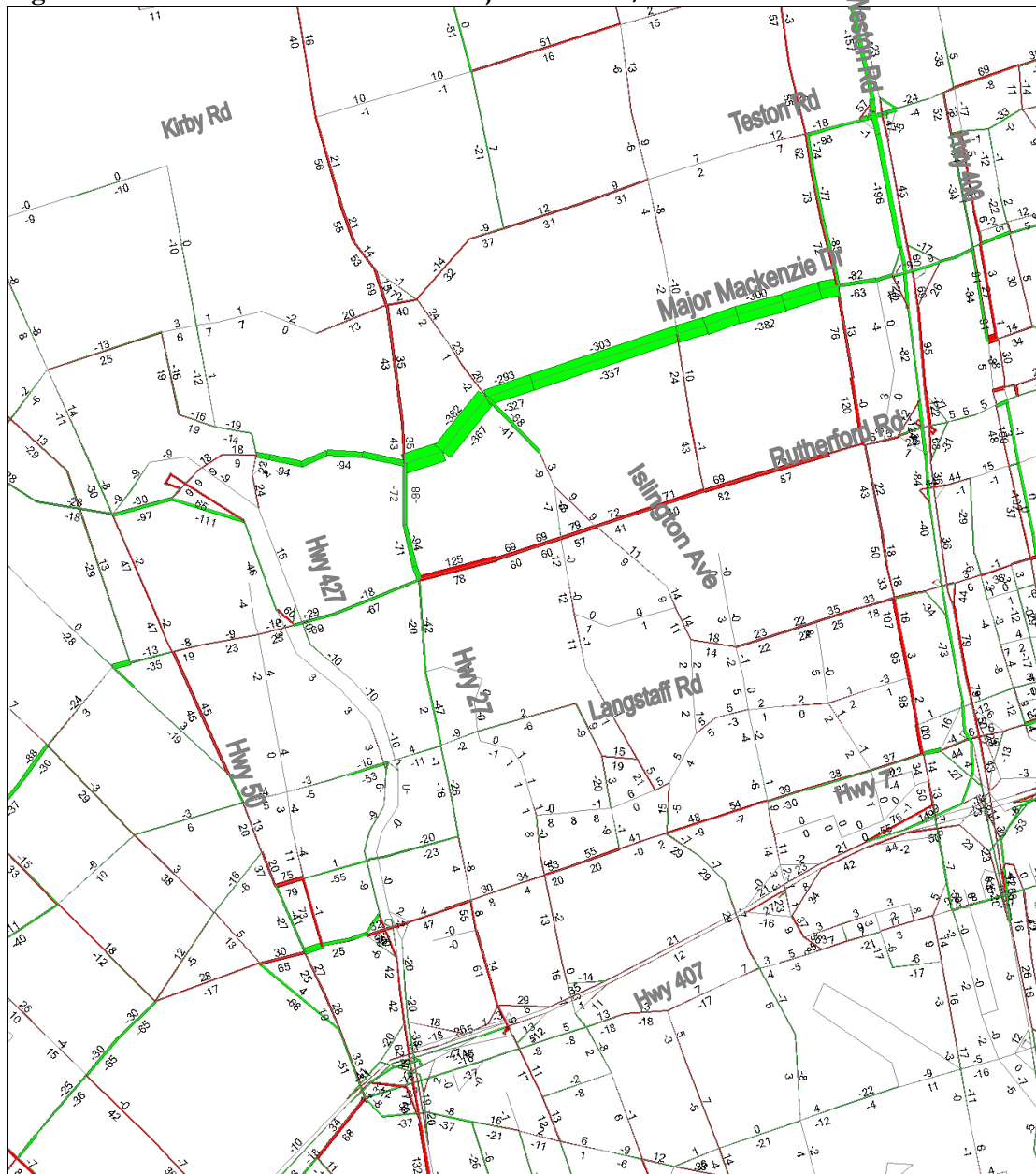


Figure 11 - Auto Volume Difference – Rutherford Rd 2/2

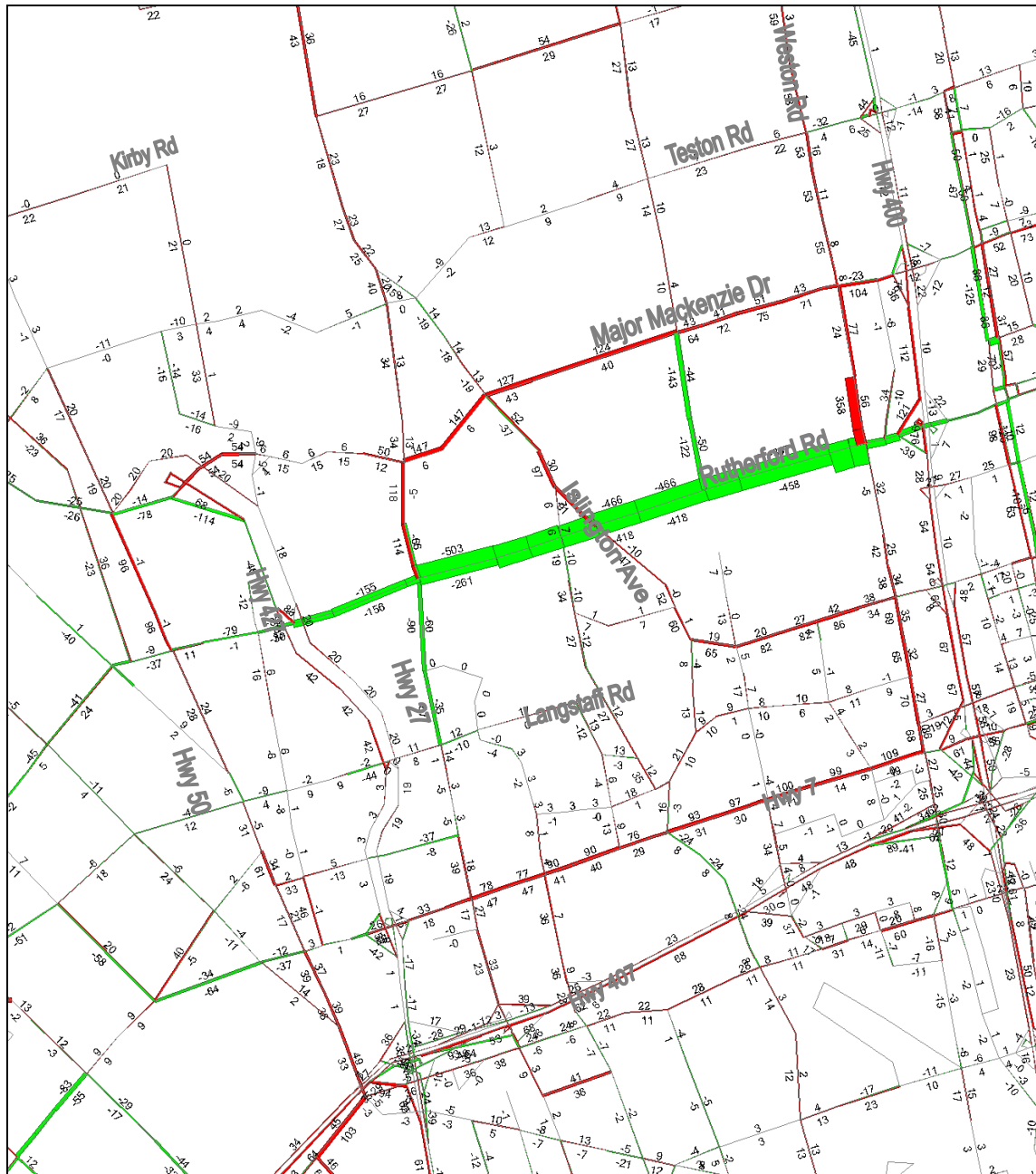


Figure 12 - Auto Volume Difference – Major Mac Dr & Rutherford Rd 2/2

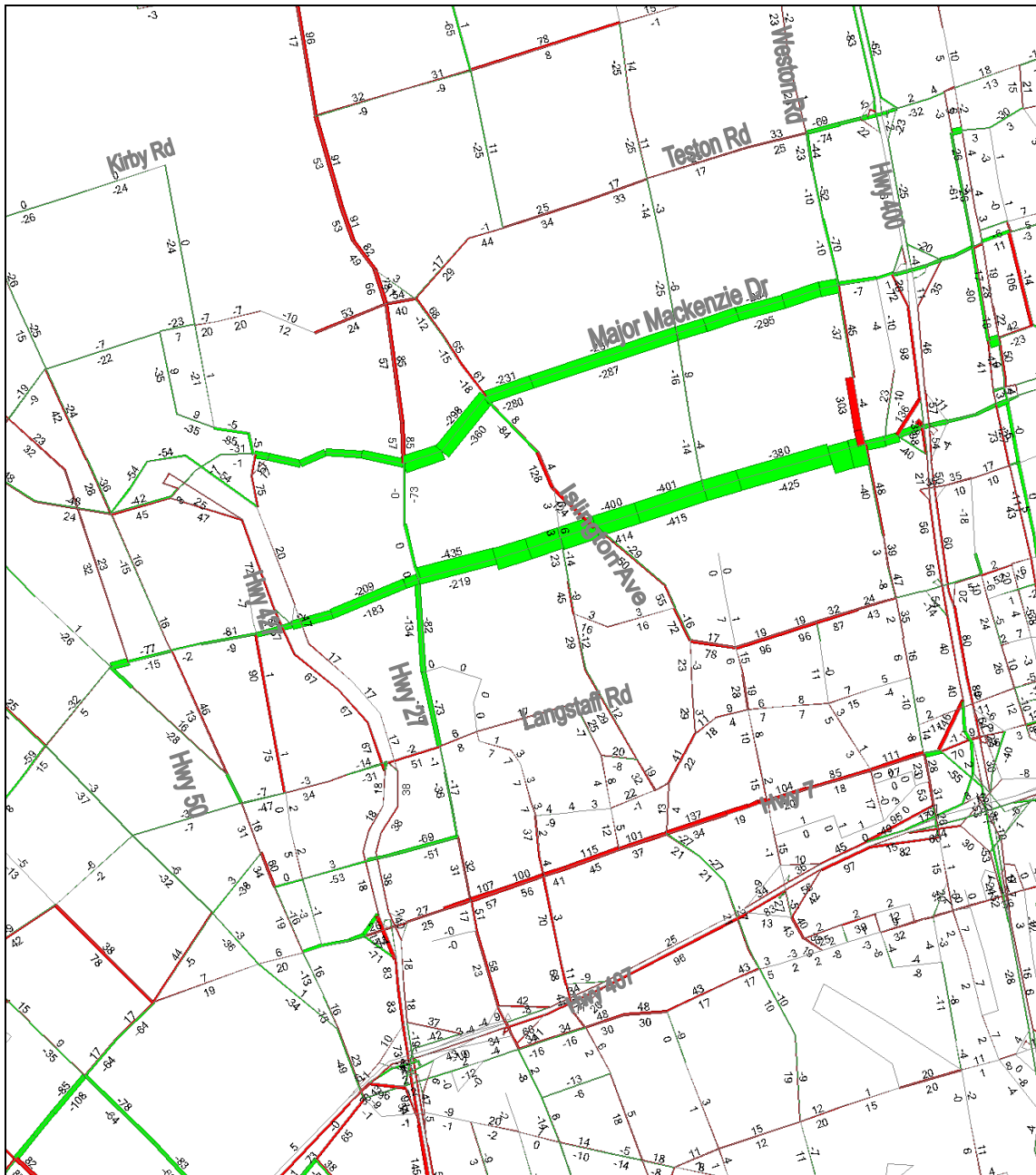


Figure 13 – 2006 Road Conditions

