Appendix G: EMME Model Context and Scenario Results

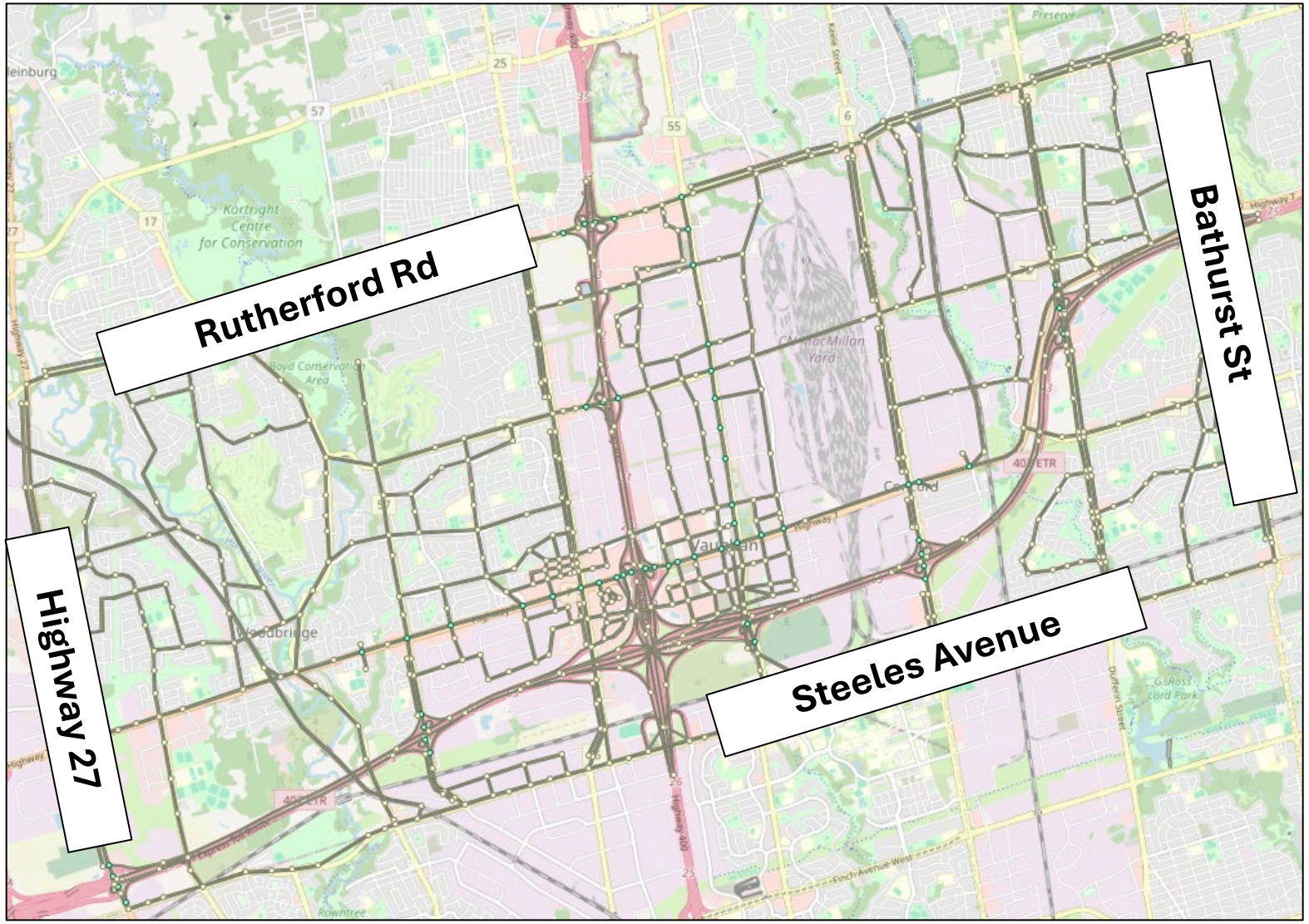
Outline

1. Model Context for VMC
2. W7 vs VMC Modeling Outputs
3. VMC Modeled Scenarios and Results Summaries
4. VMC Detailed Model Results
5. VMC Results in Context
6. Conclusions

Model Context

- The base model used for this study is the York Region Travel Demand Forecasting (YRTDF) model that was recalibrated in 2014.
- Model represents AM Peak Hour
- Model changes include *(Note: methodology assumed after discussion with the City and Region)*:
  - Updated population in the study area
  - Updated employment totals and employment distribution in the study area.
  - % 0 car households were updated within our study area to reflect the proposed residential parking supply. 60% 0-car households is assumed for VMC.
  - Parking cost was assumed to be $30/day.
  - Updated Trip Generation rates for HBW and HBS trips within our area. The updates were based on proxy sites from the 2016 TTS.

Model Sub-Area (for statistics summary)



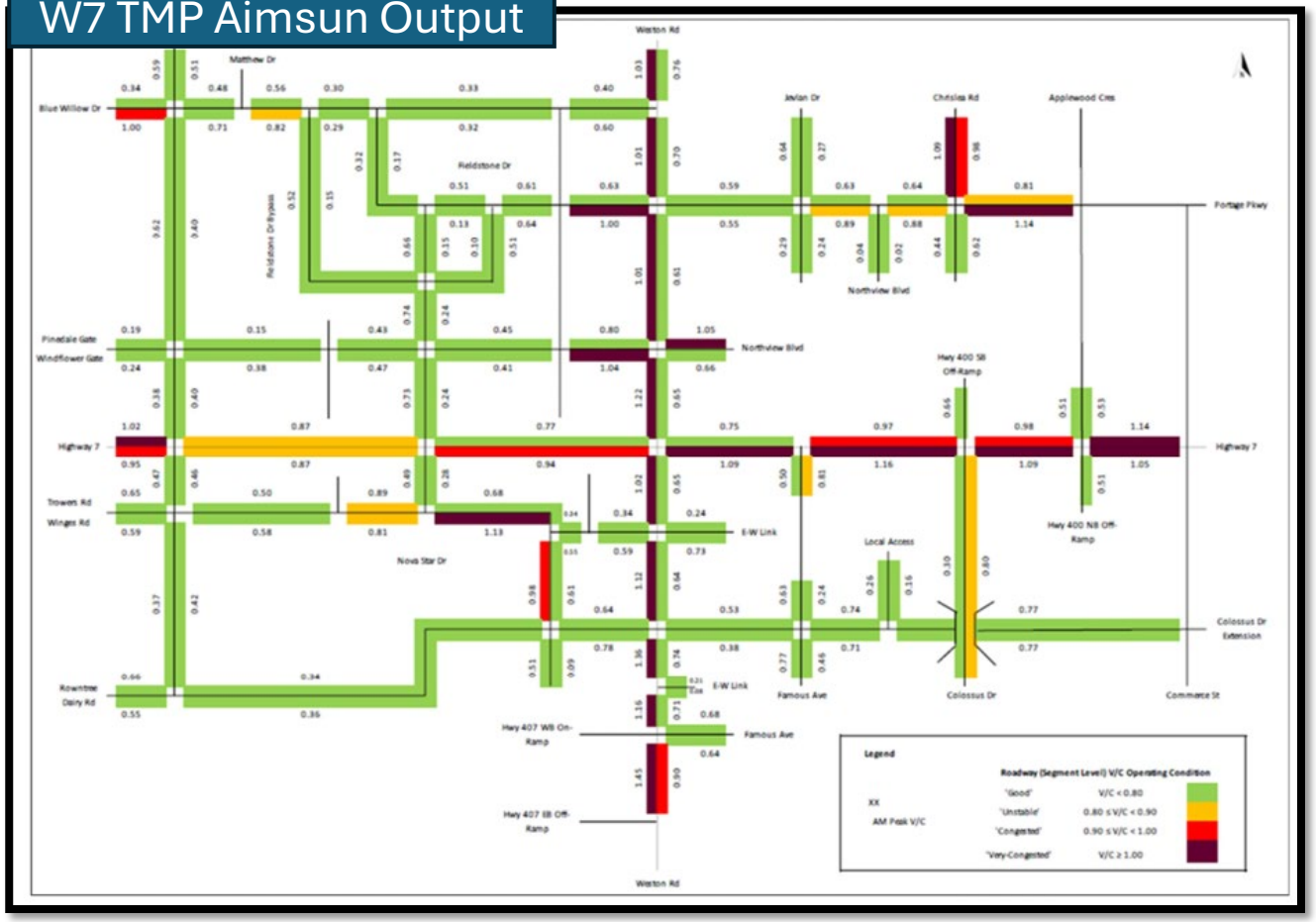
W7 vs VMC Modeling Outputs

- Although different scenarios are tested for the VMC modelling, care was taken to ensure that the previously provided W7 results are similar to the VMC results.

W7 vs VMC Modeling Outputs

W7 65k / VMC 105k pop+jobs

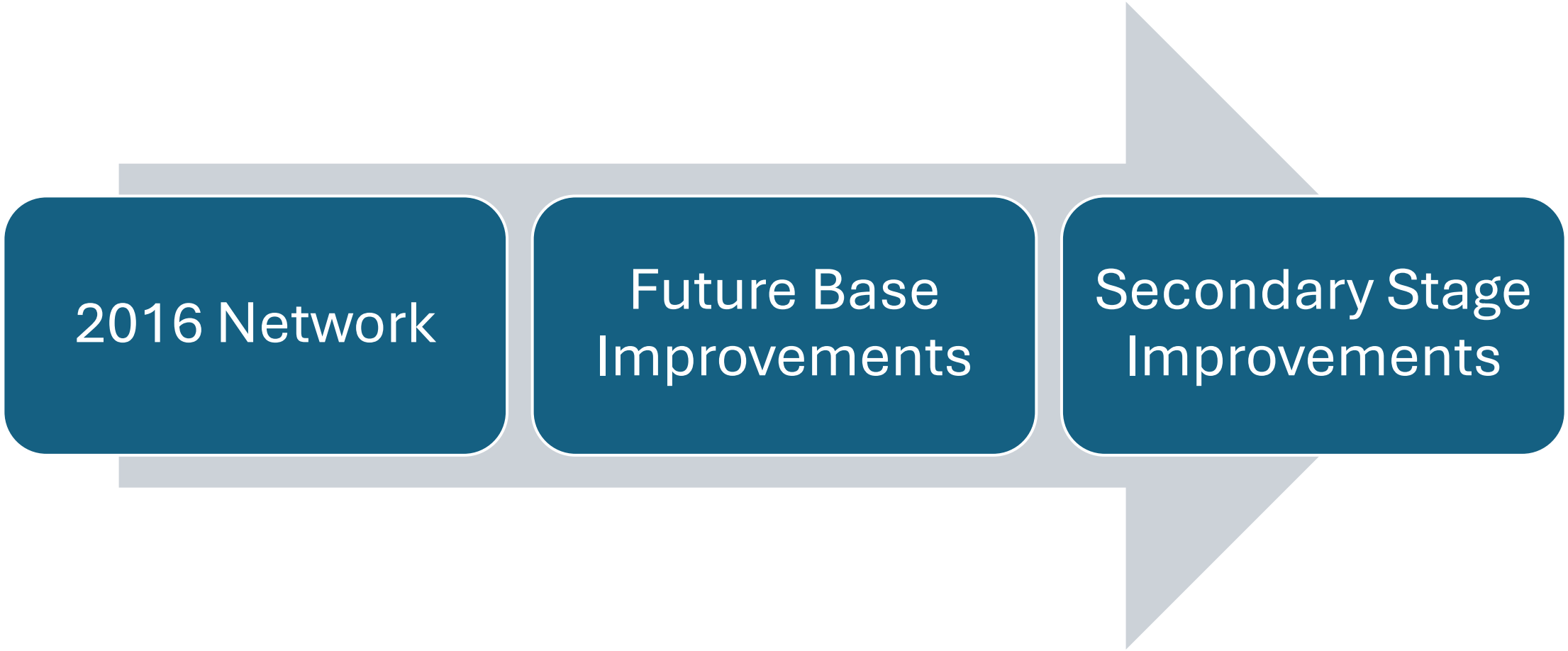
W7 TMP Aimsun Output



W7 TMP concluded that the above network was non-functional and that the W7 SPA could not support a combined 65k pop+jobs

VMC TMP Emme Output (Alt 8) – *used for calibration*

Networks Examined



Future Base Network Improvements

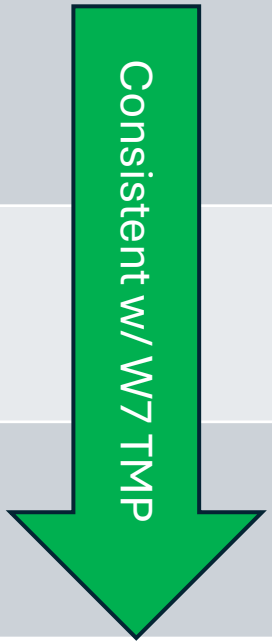
- Colossus Drive extension over Highway 400 (4 lane roadway)
- Bass Pro Mills extension from Highway 400 to Weston Road
- Langstaff Road widening between Weston Road and Creditstone Road (4 to 6 lanes)
- Langstaff Road connection over CN Yard
- Langstaff Road full interchange at Highway 400
- Steeles Avenue widening west of Jane Street (4 to 6 lanes)
- Pine Valley Drive widening between Highway 7 and Steeles Avenue (4 to 6 lanes)
- Weston Road widening north of Steeles Avenue (4 to 6 lanes)
- Keele Street widening north of Steeles Avenue (4 to 6 lanes)
- Highway 7 rapid transit corridor (Viva headway 10 minutes)
- Steeles Avenue Transit Corridor (4 GP lanes + transitway east of Jane Street)
- Jane Street Transit Corridor (4 GP lanes + transitway between Highway 7 and Major Mackenzie Drive, 10 minute headways)
- Transit circulator connecting Weston 7 and VMC Secondary Plan areas, operating in GP lanes

Second Stage Network Improvements (Beyond Future Base)

- Extension of Colossus Drive-Rowntree Dairy Road to Pine Valley Drive
- Removal of Jane BRT and replace with subway extension to Major Mackenzie with stations at Langstaff, Vaughan Mills-Rutherford, and Major Mackenzie-Wonderland-Cortellucci Hospital
- Extension of Interchange Way to Keele Street over CN Rail yard
- Additional east-west flyover of Highway 400 connecting Chancellor Dr-Carlauren Rd to Pennsylvania Ave
- Conversion of Highway 7 BRT to LRT
- Examination of free access to Highway 407 for all users between Highway 427 and Highway 404

Development Horizons Examined

Background Pop + Emp	W7 SPA Pop+Emp	VMC Pop+Emp
2041 Horizon	25 k	42 k (Baseline Growth from Model)
2041 Horizon	25 k	105 k (Prior Secondary Plan)
2041 Horizon	25 k	156 k (Mid-Range Growth, Secondary Plan Update)



Modeled Scenarios (AM Peak)

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	Modeling Status
-1	2041 Horizon	2041 Horizon (42 k)	25 k	Existing	Complete
0	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Existing	Complete
1	2041 Horizon	2041 Horizon (42 k)	25 k	Future Base	Complete
3	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Future Base	Complete
4	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Second Stage Network (Free Hwy 407)	Complete
5	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Second Stage Network (Tolled Hwy 407)	Complete
6	2041 Horizon	Mid-Range Growth (156 k)	25 k	Future Base	Complete
7	2041 Horizon	Mid-Range Growth (156 k)	25 k	Second Stage Network (Free Hwy 407)	Complete
9	2041 Horizon	Mid-Range Growth (156 k)	25 k	Second Stage Network (Tolled Hwy 407)	Complete

Scenario Summaries
Impact of Population / Emp Growth at VMC

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	VKT	VHT	Avg Speed (km/h)
1	2041 Horizon	**2041 Horizon (42 k)**	25 k	Future Base	903,400	27,500	32.9
3	2041 Horizon	**Prior Secondary Plan (105 k)**	25 k	Future Base	920,800	28,600	32.1
Difference (Scn 1 & Scn 3)					**+17,400 (+1.9%)**	**+1,100 (+4.0%)**	**-0.8**
3	2041 Horizon	**Prior Secondary Plan (105 k)**	25 k	Future Base	920,800	28,600	32.1
6	2041 Horizon	**Ad'l Growth (156 k)**	25 k	Future Base	938,200	29,900	31.3
Difference (Scn 3 & Scn 6)					**+17,400 (+1.9%)**	**+1,300 (+4.5%)**	**-0.8**

- Increasing pop/emp at VMC to 105k from 42k adds 17,400 VKT and 1,100 VHT to the network aggregately, resulting in an average speed decrease of -0.8 km/h
- Further increases in pop/emp at VMC from 105k to 156k adds a further 17,400 VKT and 1,300 VHT to the network, resulting in an average speed decrease of a further -0.8 km/h

Scenario Summaries
Impact of Future Base Improvements (42k and 105 k Pop / Emp)

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	VKT	VHT	Avg Speed (km/h)
-1	2041 Horizon	2041 Horizon (42 k)	25 k	**Existing**	909,200	32,400	28.1
1	2041 Horizon	2041 Horizon (42 k)	25 k	**Future Base**	903,400	27,500	32.9
Difference (Scn -1 & Scn 1)					**-5,800 (-0.6%)**	**-4,900 (-15.1%)**	**+4.8**
0	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Existing**	931,800	34,100	27.3
3	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Future Base**	920,800	28,600	32.1
Difference (Scn 0 & Scn 3)					**-11,000 (-1.2%)**	**-5,500 (-16.1%)**	**+4.8**

- Future base improvements remove 5,800 VKT and 4,900 VHT from the network, resulting in an average speed increase of 4.8 km/h at the 42k VMC development horizon
- Future base improvements remove 11,000 VKT and 5,500 VHT from the network, resulting in an average speed increase of 4.8 km/h at the 105k VMC development horizon
- **More VKT are added due to development than are removed due to Future Base improvements though aggregate VHT from additional development to the 105k horizon are more than offset by Future Base network improvements**

Scenario Summaries
Impact of Secondary Stage Improvements (105 k Pop / Emp)

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	VKT	VHT	Avg Speed (km/h)
3	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Future Base**	920,800	28,600	32.1
4	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Second Stage (Free Highway 407)**	1,005,200	32,600	30.8
Difference (Scn 3 & Scn 4)					**+84,400 (+9.2%)**	**+4,000 (+14.0%)**	**-1.3**
3	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Future Base**	920,800	28,600	32.1
5	2041 Horizon	Prior Secondary Plan (105 k)	25 k	**Second Stage (Tolled Highway 407)**	981,800	30,800	31.9
Difference (Scn 3 & Scn 5)					**+61,000 (+6.6%)**	**+2,200 (+7.7%)**	**-0.2**

- Second stage improvements (including free Highway 407 travel) paradoxically **increase** both VKT and VHT at the 105k horizon by 84,400 and 4,000, respectively, in contrast to the future base network, resulting in an average speed reduction of 1.3 km/h
- If tolls are maintained on Highway 407, overall increases in VKT and VHT are lessened
- **Secondary Stage improvements degrade network capacity through the sub-area overall at the 105k horizon as compared to the future base network**

Scenario Summaries
Impact of Secondary Stage Improvements (156 k Pop / Emp)

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	VKT	VHT	Avg Speed (km/h)
6	2041 Horizon	Ad'l Growth (156 k)	25 k	**Future Base**	938,200	29,900	31.3
7	2041 Horizon	Ad'l Growth (156 k)	25 k	**Second Stage (Free Highway 407)**	1,015,000	33,300	30.5
Difference (Scn 6 & Scn 7)					**+76,800 (+8.1%)**	**+3,400 (+11.4%)**	**-0.8**
6	2041 Horizon	Ad'l Growth (156 k)	25 k	**Future Base**	938,200	29,900	31.3
9	2041 Horizon	Ad'l Growth (156 k)	25 k	**Second Stage (Tolled Highway 407)**	944,300	30,300	31.2
Difference (Scn 6 & Scn 9)					**+6,100 (+0.1%)**	**+400 (+1.3%)**	**-0.1**

- Second stage improvements (including free Highway 407 travel) similarly **increase** both VKT and VHT at the 156k horizon by 76,400 and 3,400, respectively, in contrast to the future base network, resulting in an average speed reduction of 1.3 km/h
- If tolls are maintained on Highway 407, overall increases in VKT and VHT are significantly lessened
- **Similar to the 105k horizon, Secondary Stage improvements degrade network capacity through the sub-area overall at the 156k horizon as compared to the future base network**

VMC Detailed Model Results

Scenario -1: VMC 42k, W7 25k, Existing Network

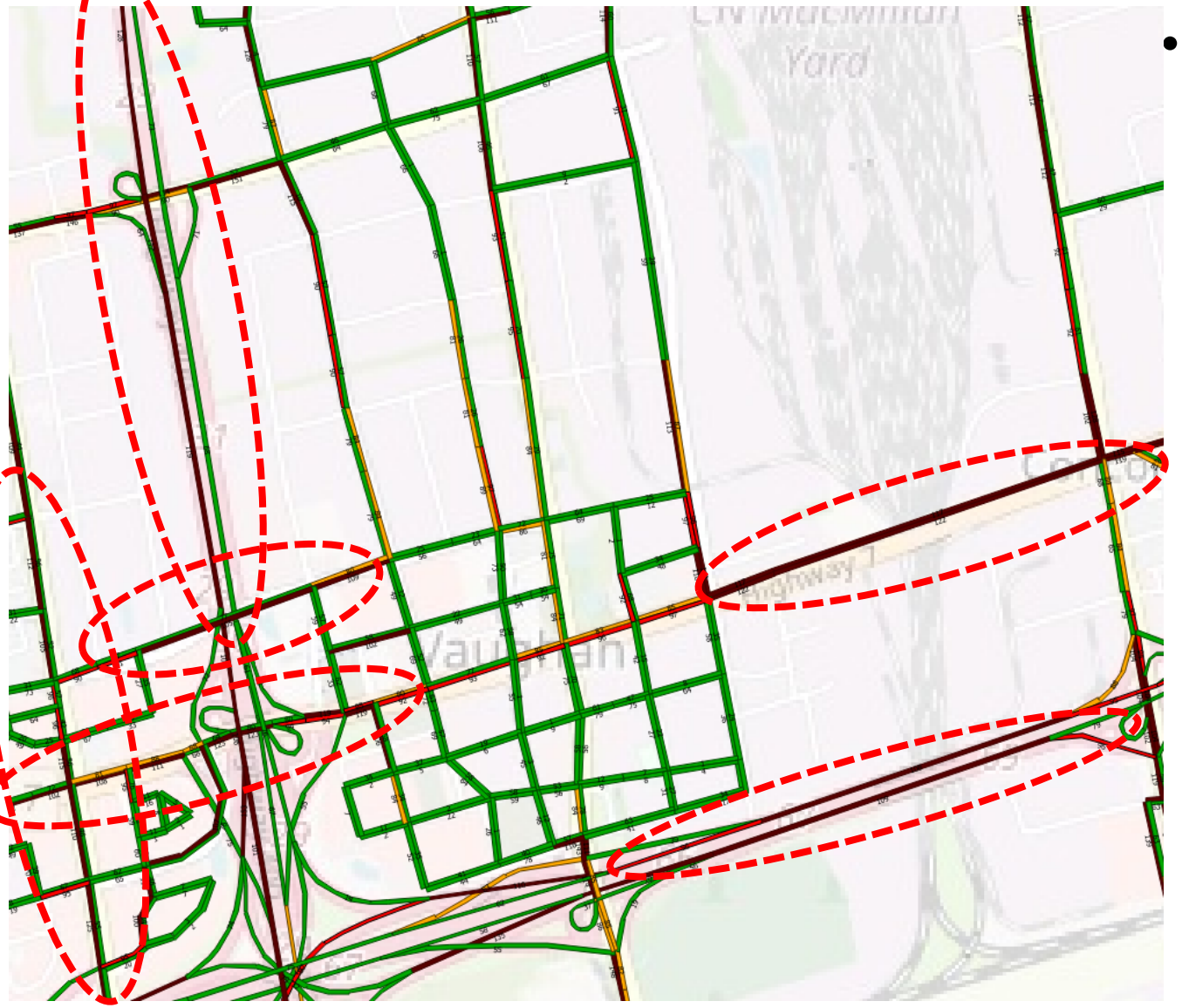
TRAFFIC VOLUMES

TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	9,800	46%	6,800	54%
Car-Passenger Trips	1,600	8%	1,100	9%
Transit-Passenger Trips	9,500	46%	4,700	37%
TOTAL	**20,900**	**100%**	**12,600**	**100%**

Scenario -1: VMC 42k, W7 25k, Existing Network

PERFORMANCE



- Network **is nearing or over-capacity** in many areas, particularly near:
  - EB/WB Hwy 7 (Centre Street – Creditstone)
  - Keele Street between Highway 407 and Steeles Avenue
  - SB Jane Street between VMC and Steeles Avenue
  - Hwy 7 between Weston Road and NB Highway 400 ramps
  - SB Highway 400
  - SB Weston Road between Major Mackenzie and Steeles Avenue
  - EB Portage Parkway overpass
  - EB/WB Highway 407

NETWORK IMPROVEMENTS ARE NECESSARY IN A BASELINE SCENARIO TO ADDRESS EXISTING AND ANTICIPATD BACKGROUND CAPACITY CONSTRAINTS IN THE NETWORK

Scenario 0: VMC 105k, W7 25k, Existing Network

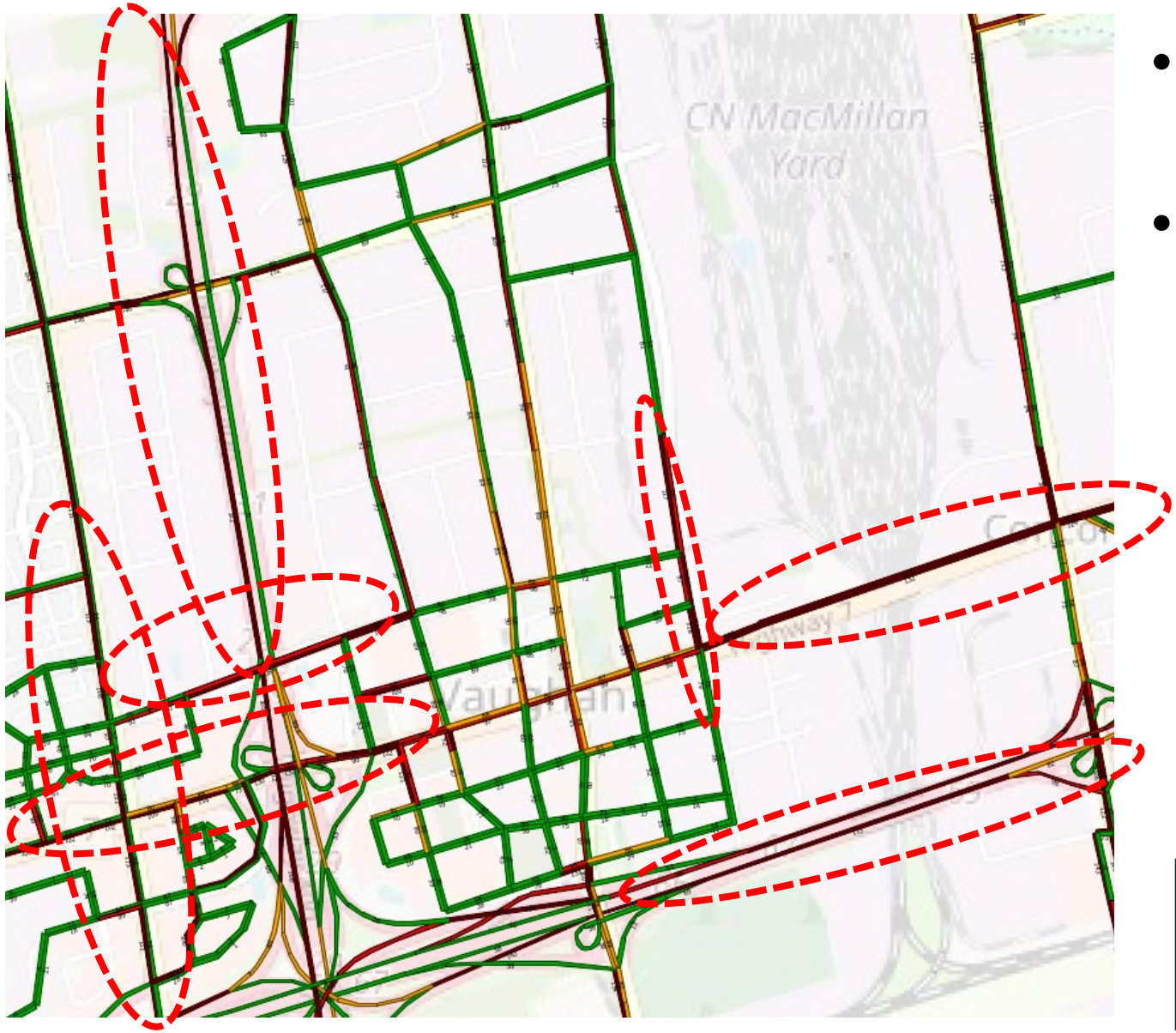
TRAFFIC VOLUMES

TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	23,900	47%	6,600	52%
Car-Passenger Trips	4,700	9%	1,100	9%
Transit-Passenger Trips	22,800	44%	4,900	39%
TOTAL	**51,400**	**100%**	**12,600**	**100%**

Scenario 0: VMC 105k, W7 25k, Existing Network

PERFORMANCE

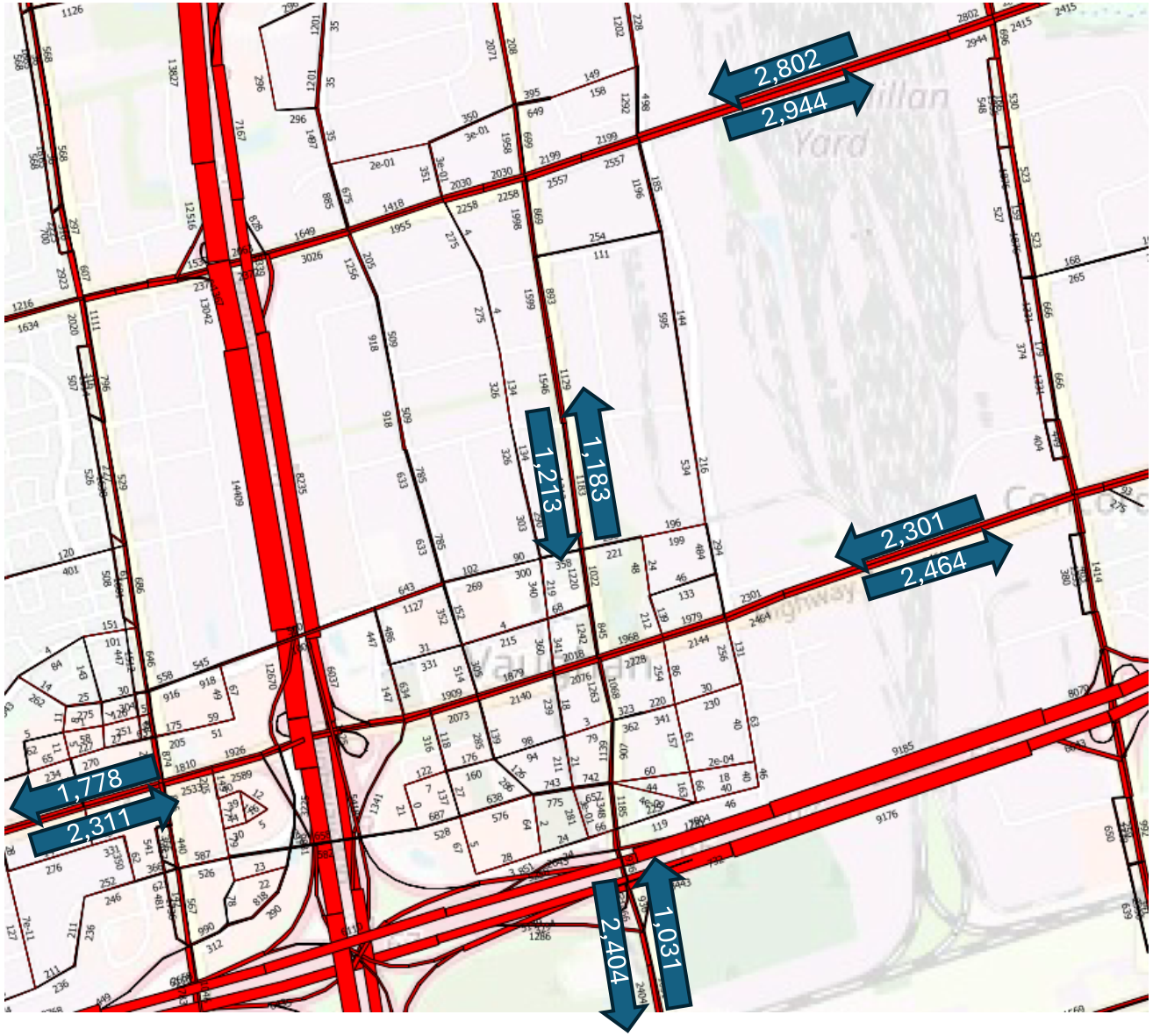


- Network is **significantly over-capacity.**
- Magnification of issues exhibited at the 42k development horizon plus:
  - Emerging breakdown of Highway 7 between Highway 400 and Creditstone Road
  - SB Creditstone Road to Highway 7 signal

ADDITIONAL POPULATION AT VMC FURTHER UNDERSCORES THE NEED FOR ADDITIONAL CAPACITY IN AN UNDERSUPPLIED NETWORK

Scenario 1: VMC 42k, W7 25k, Future Base Network

TRAFFIC VOLUMES

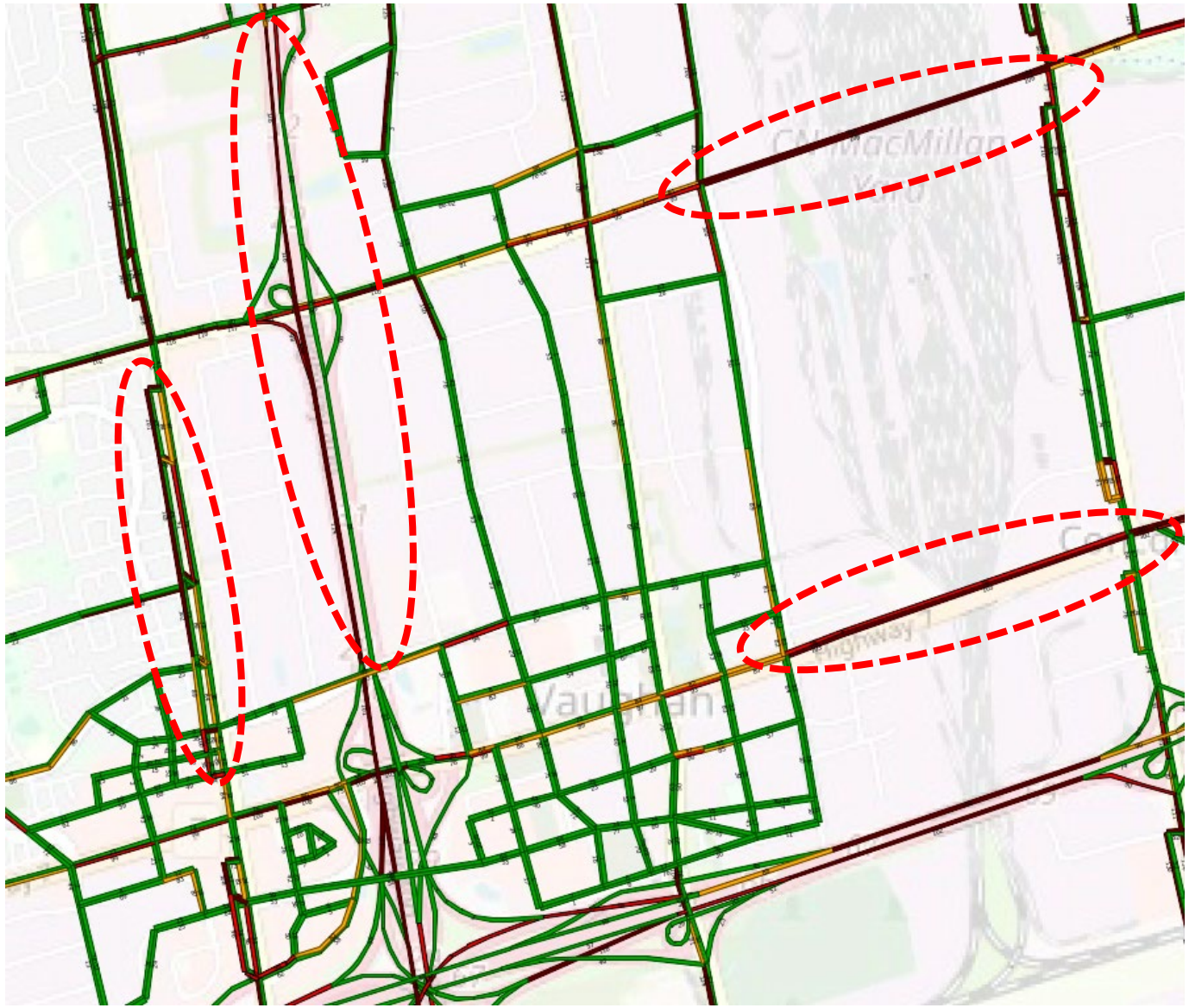


TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	9,700	46%	6,200	49%
Car-Passenger Trips	1,600	7%	1,000	9%
Transit-Passenger Trips	10,000	47%	5,400	42%
TOTAL	**21,300**	**100%**	**12,600**	**100%**

Scenario 1: VMC 42k, W7 25k, Future Base Network

PERFORMANCE

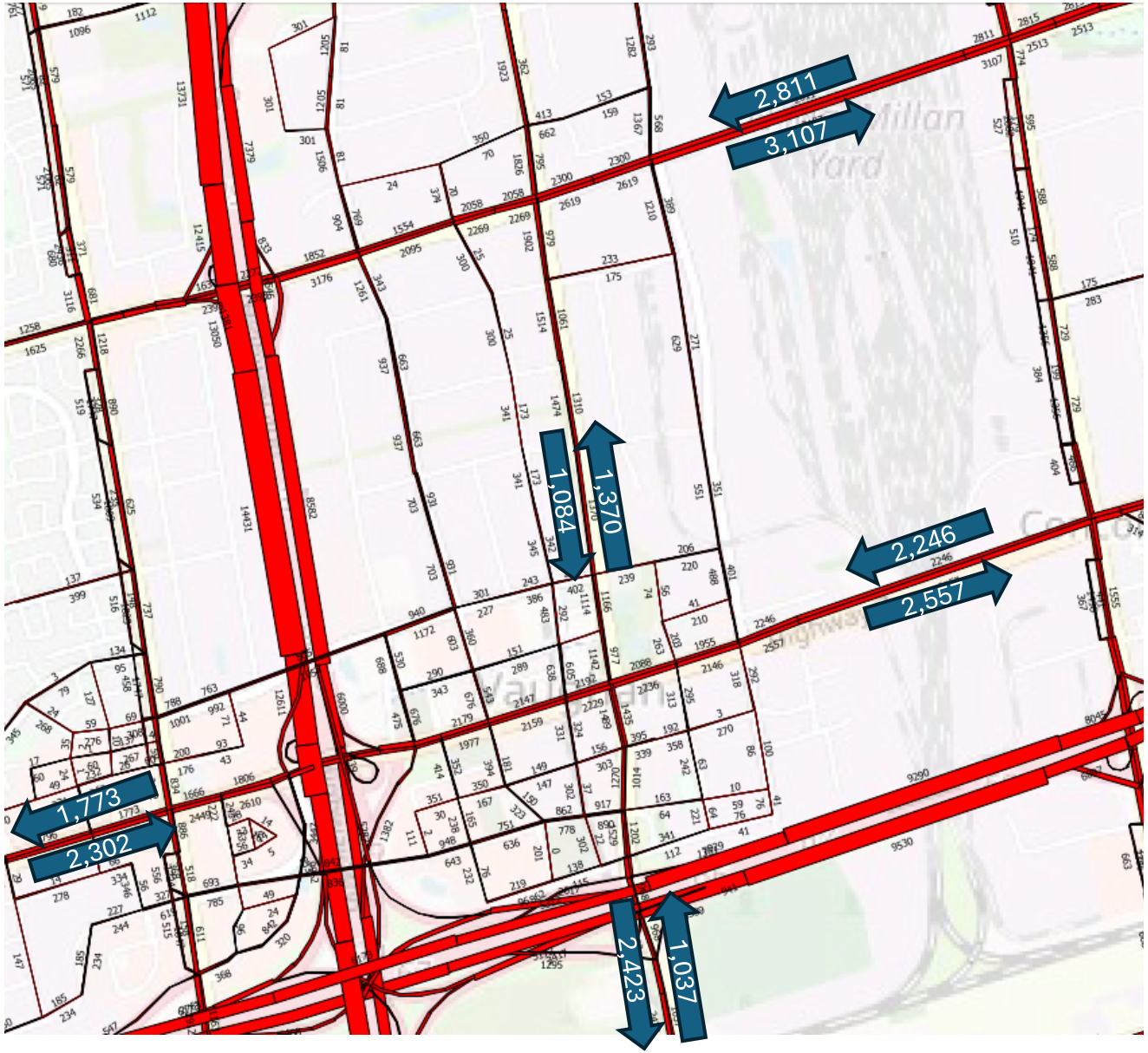


- Regional network **exhibits improvement,** including along Highway 7 through VMC but capacity issues still remain along many key segments
- Significant traffic diversion to Langstaff
- The following capacity constraints identified in the base network are largely resolved:
  - Modest relief of EB/WB Highway 407 (Jane St to Bathurst St)
- The following issues remain outstanding:
  - SB Weston Road between Major Mackenzie and Steeles Avenue
  - EB/WB Hwy 7 (E of Keele – Creditstone)
  - Keele Street between Highway 407 and Steeles Avenue
  - Hwy 7 between Weston Road and Edgeley Blvd (beyond Highway 400 ramps)
  - SB Jane Street between VMC and Steeles Avenue
  - SB Highway 400
- New issues introduced:
  - Capacity constraints identified along Langstaff (Highway 400 to Dufferin Street) as traffic diverts along new Langstaff rail overhead

IMPROVEMENTS LESSEN CAPACITY CONSTRAINTS BUT DO NOT RESOLVE BACKGROUND ISSUES ON MAJOR REGIONAL CORRIDORS

Scenario 3: VMC 105k, W7 25k, Future Base Network

TRAFFIC VOLUMES



TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	23,700	46%	6,000	47%
Car-Passenger Trips	4,700	9%	1,000	8%
Transit-Passenger Trips	23,100	45%	5,700	45%
TOTAL	**51,500**	**100%**	**12,700**	**100%**

Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE

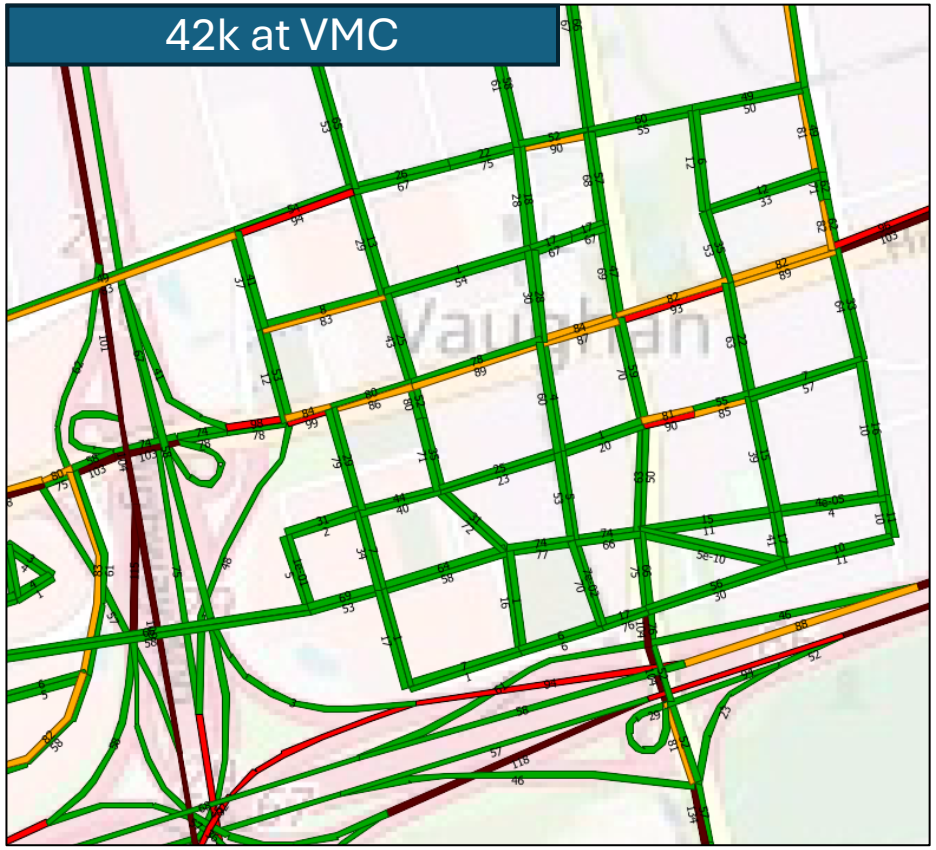
- Regional network **exhibits improvement** compared to the 2016 network, including along Highway 7 through VMC but capacity issues still remain along many key segments
- Significant traffic diversion to Langstaff
- Network performs similar to 42k VMC scenario with intensifications of issues already present in the base condition

BACKGROUND TRAFFIC CONDITIONS ARE PRIMARILY RESPONSIBLE FOR THE PERSISTENT AND SIGNIFICANT CONSTRAINTS PROJECTED

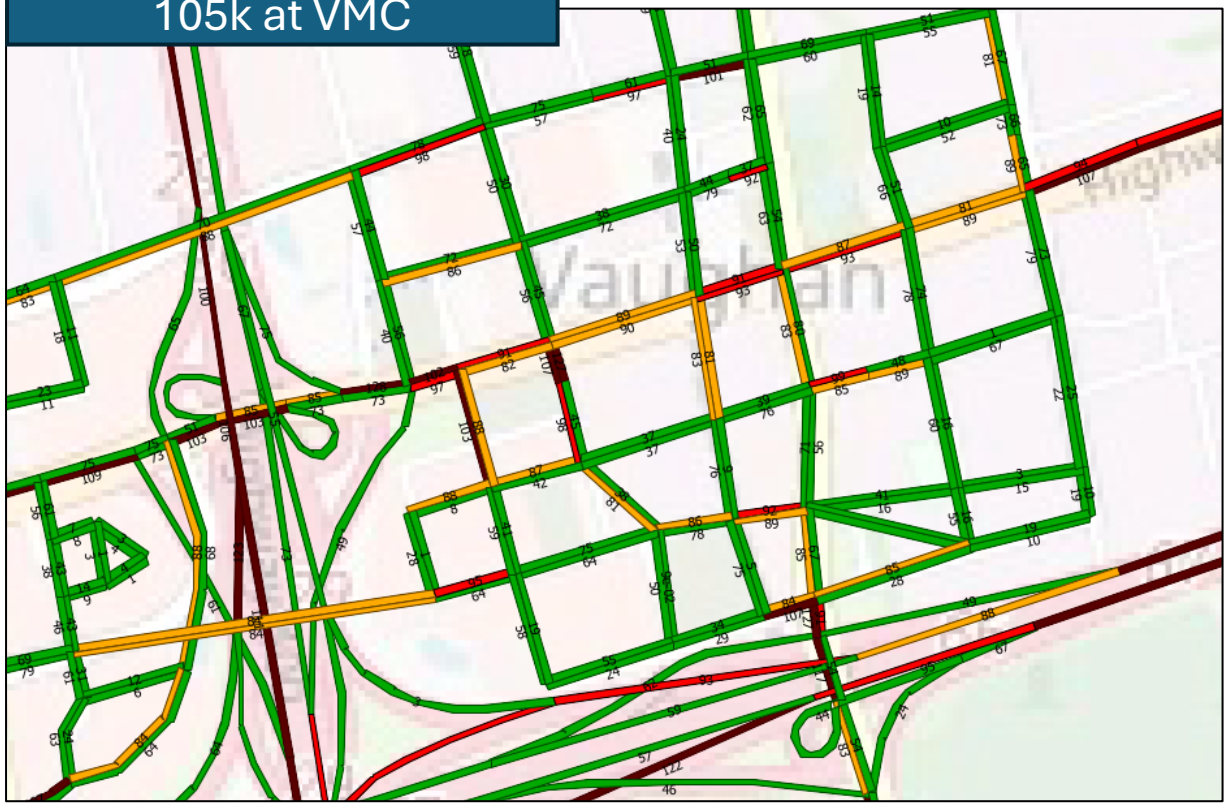
Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE – ZOOMED IN

42k at VMC



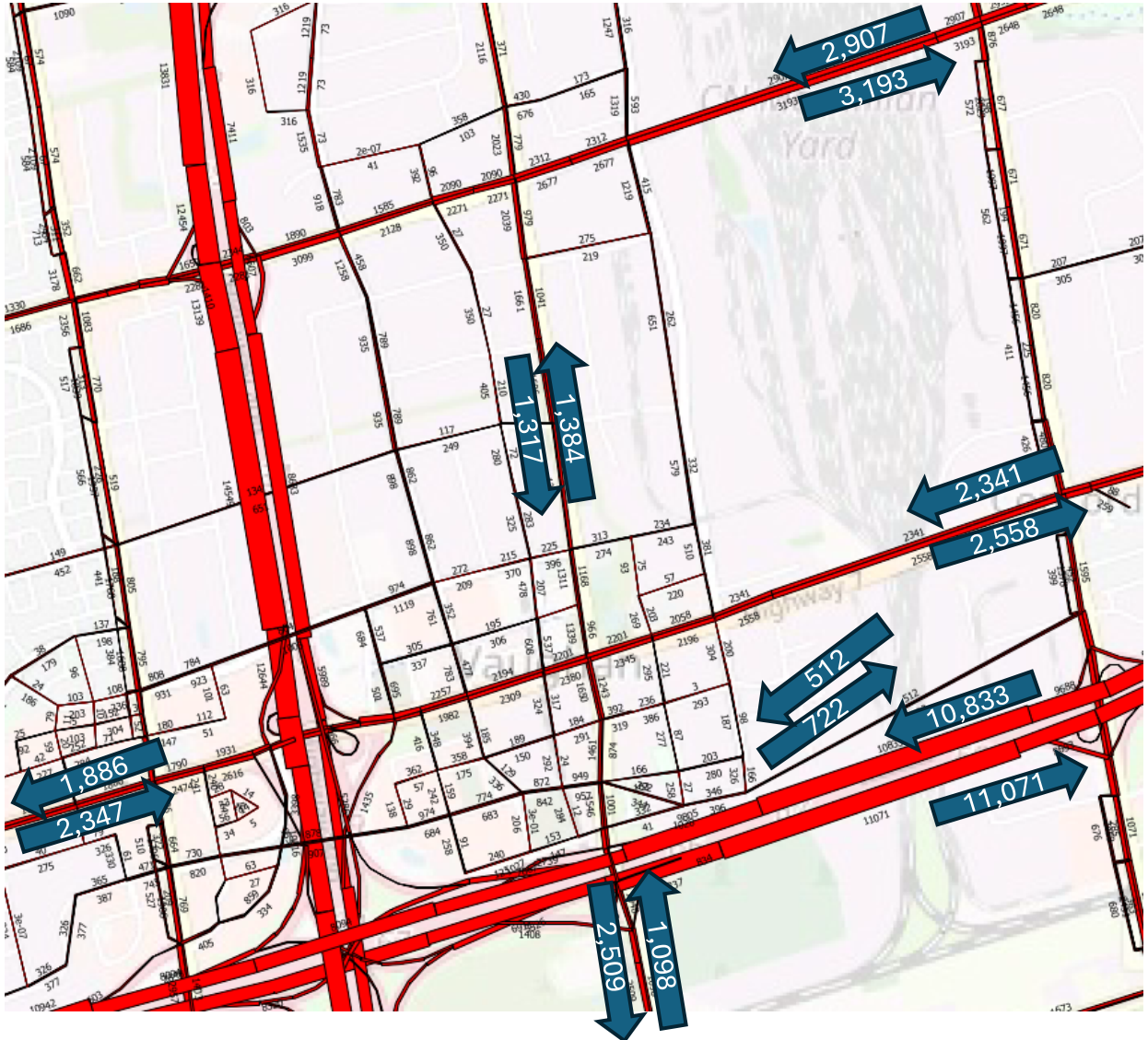
105k at VMC



- Background traffic conditions are primarily responsible for the persistent and significant constraints projected
- Incremental impact of development to 105k is modest in comparison

Scenario 4: VMC 105k, W7 25k, Second Stage Network (w/ free Hwy 407)

TRAFFIC VOLUMES

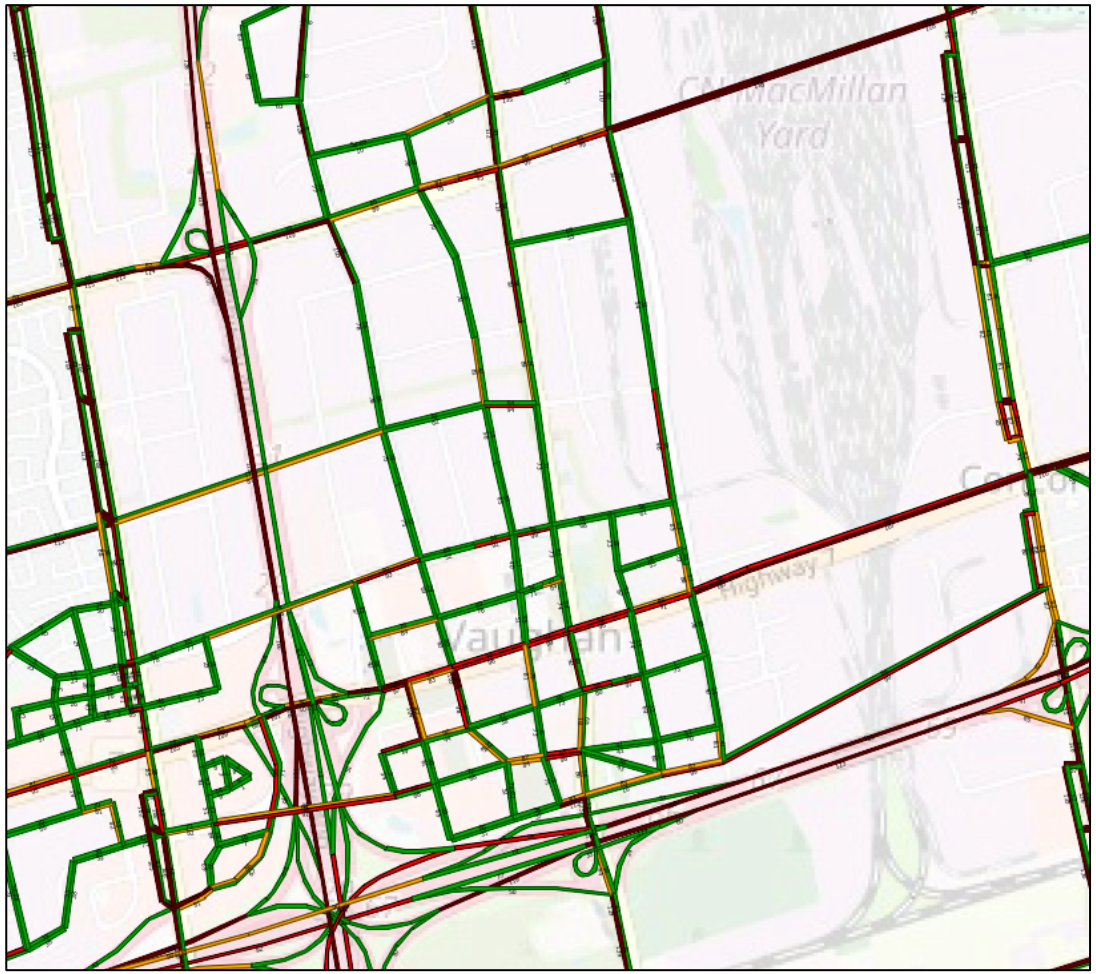


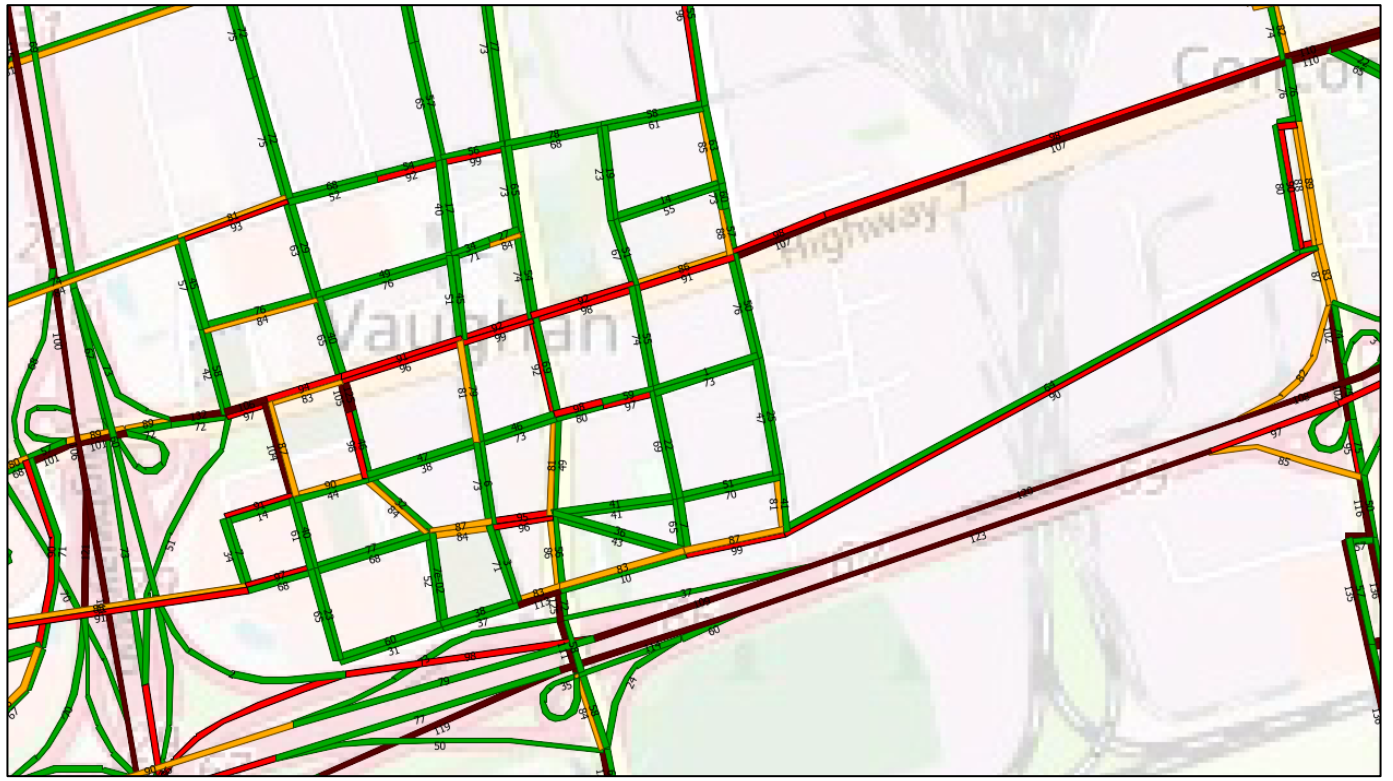
TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	23,800	46%	6,000	48%
Car-Passenger Trips	4,700	9%	1,000	8%
Transit-Passenger Trips	22,900	45%	5,600	44%
TOTAL	**51,400**	**100%**	**12,600**	**100%**

Scenario 4: VMC 105k, W7 25k, Second Stage Network (w/ free Hwy 407)

PERFORMANCE

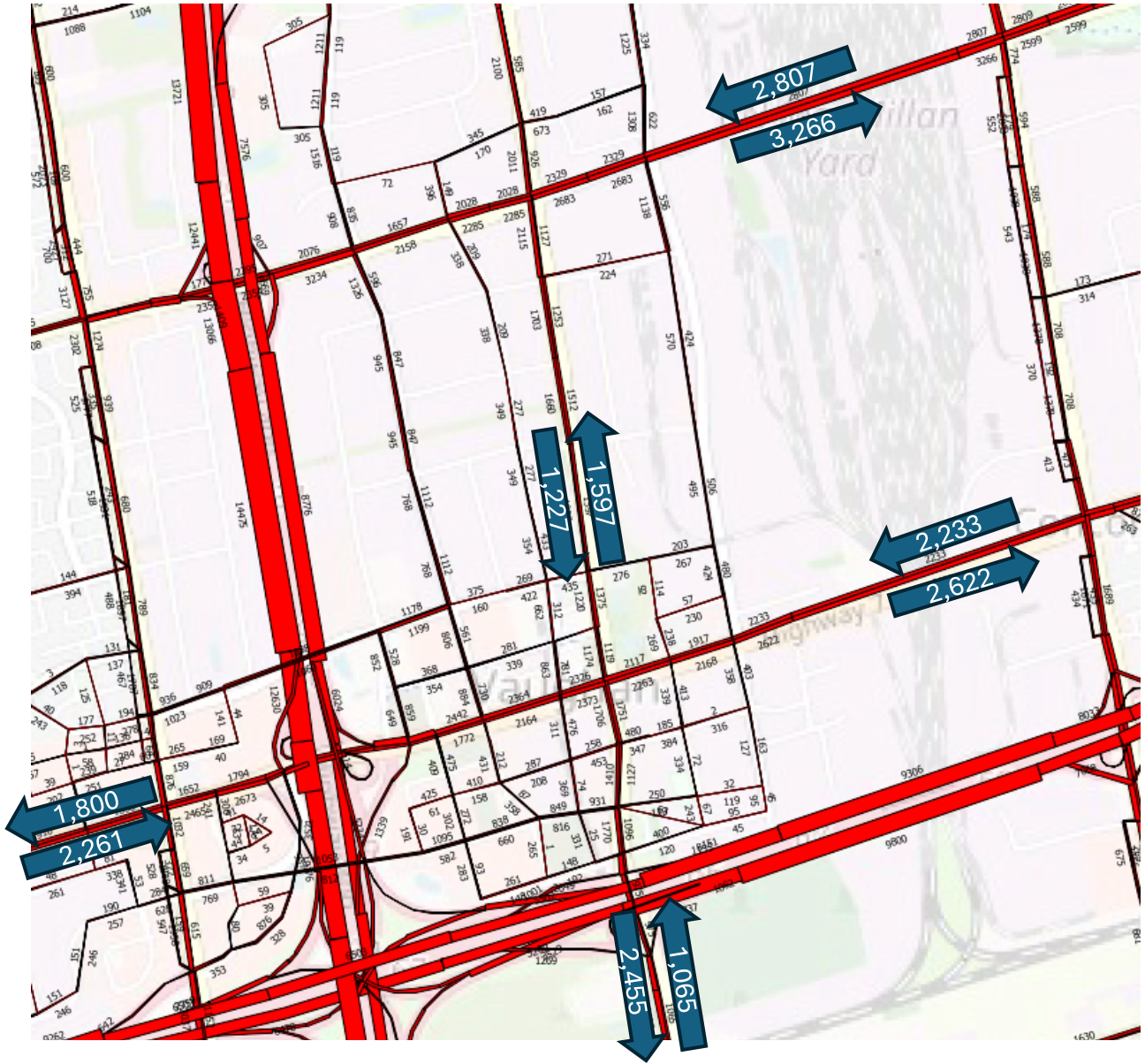




- No notable performance improvements noted
- Additional traffic diverting through area as a result of new rail overhead

Scenario 6: VMC 156k, W7 25k, Future Base Network

TRAFFIC VOLUMES



TRIP SUMMARY:

	VMC		Weston 7	
	#	%	#	%
Drive Trips	33,900	47%	5,900	47%
Car-Passenger Trips	7,300	10%	1,000	8%
Transit-Passenger Trips	30,700	43%	5,800	45%
TOTAL	**71,900**	**100%**	**12,700**	**100%**

Scenario 6: VMC 156k, W7 25k, Future Base Network

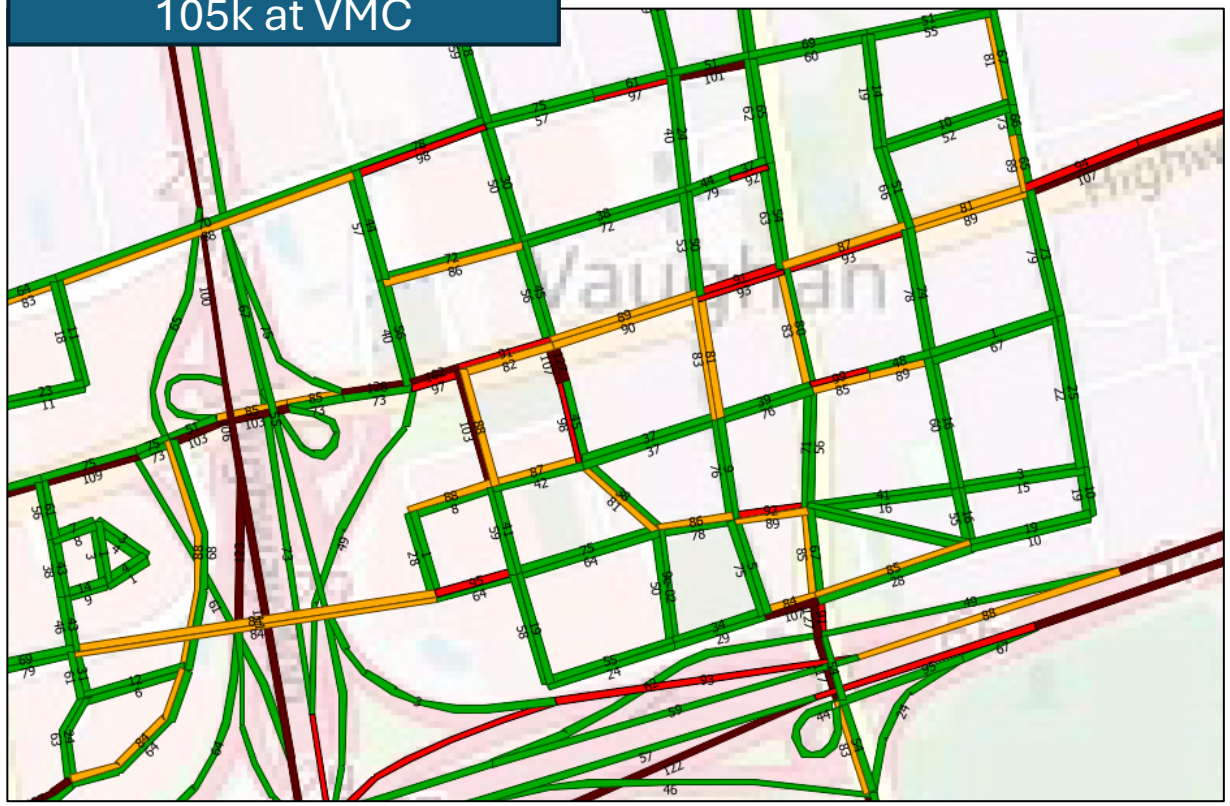
PERFORMANCE

- Same persistent issues in the regional network as at the 105k scenario plus emerging local network issues

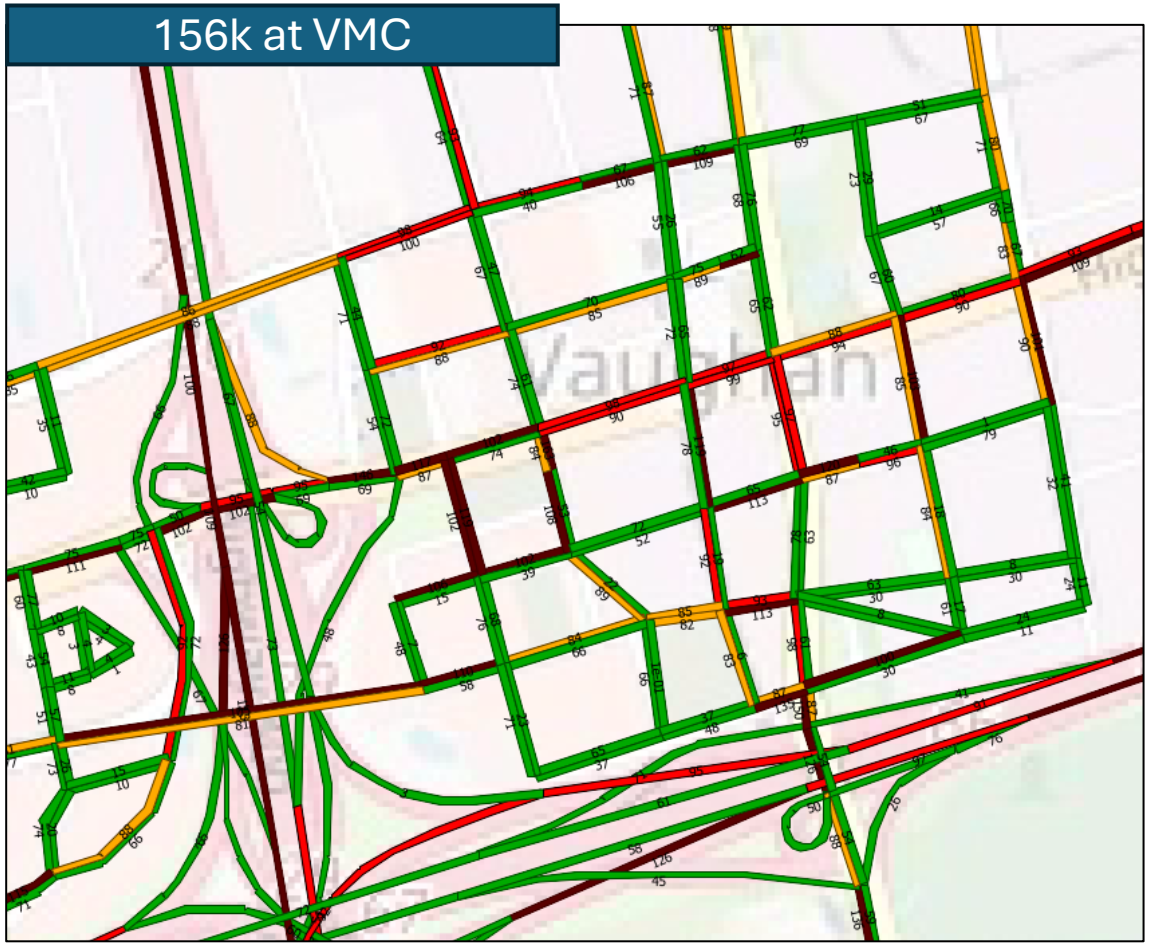
Scenario 6: VMC 156k, W7 25k, Future Base Network

PERFORMANCE – ZOOMED IN

105k at VMC



156k at VMC

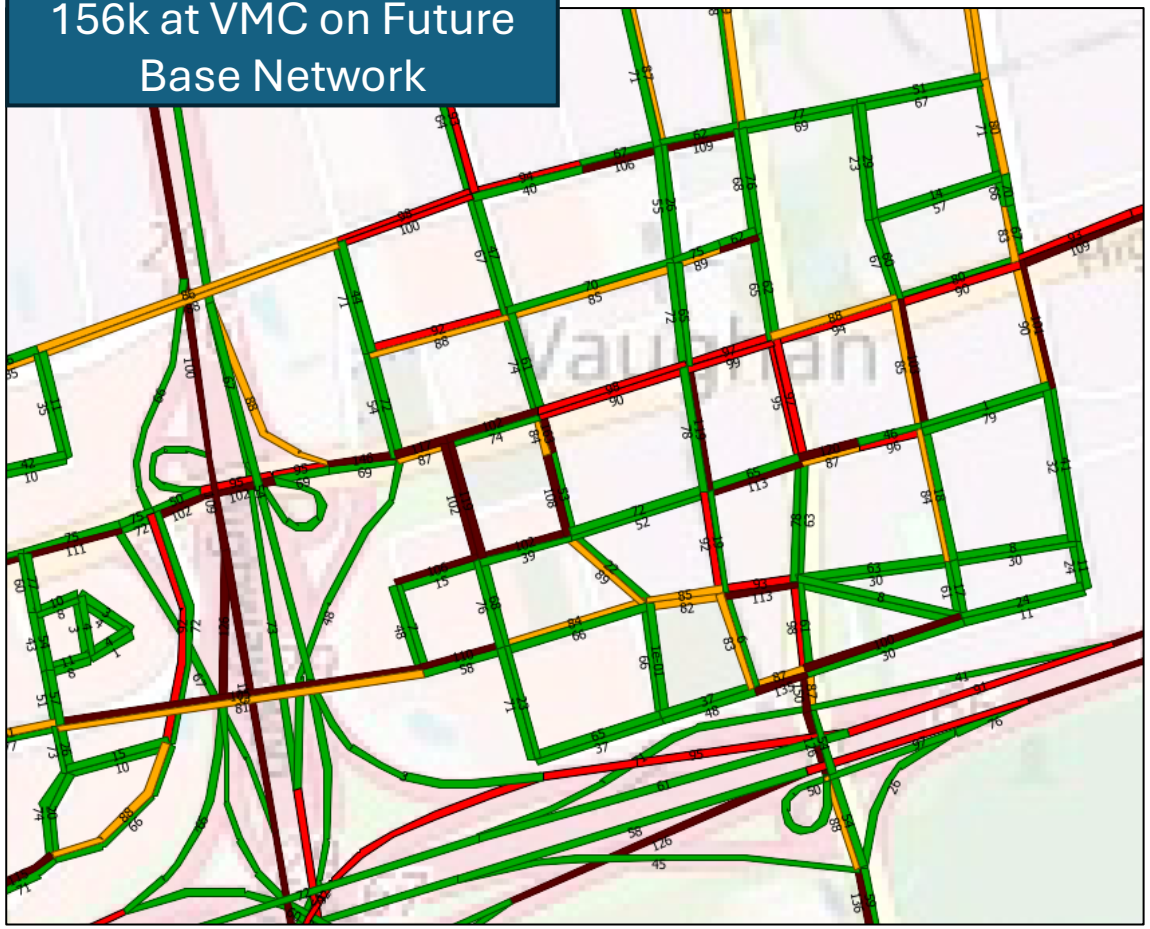


- Emergence of significant local capacity issues along Colossus Drive, Peelar Rd, Doughton Rd, and approaches to Highway 7
- 156 k pop+emp cannot be supported along the proposed network

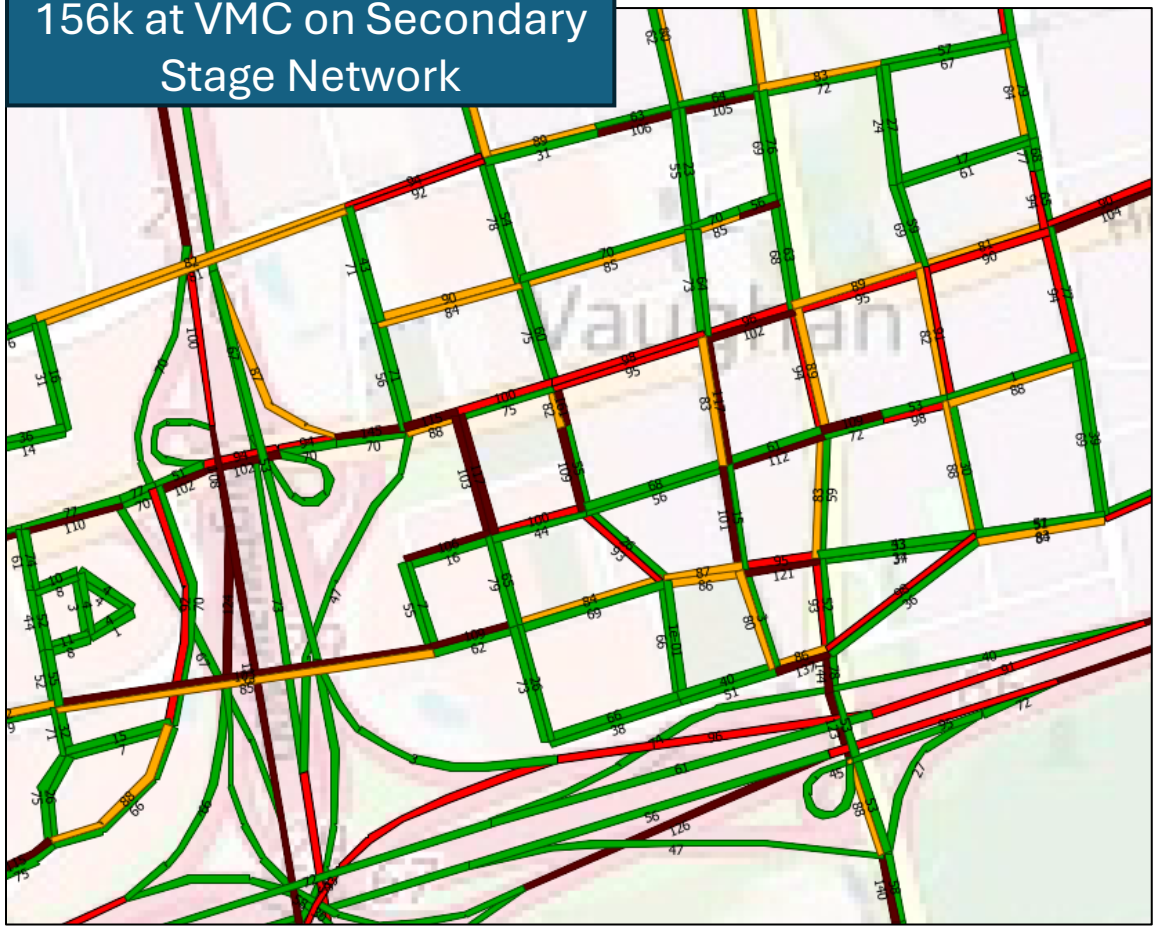
Scenario 9: VMC 156k, W7 25k, Second Stage Network (Tolled Hwy 407)

PERFORMANCE – ZOOMED IN

156k at VMC on Future Base Network



156k at VMC on Secondary Stage Network

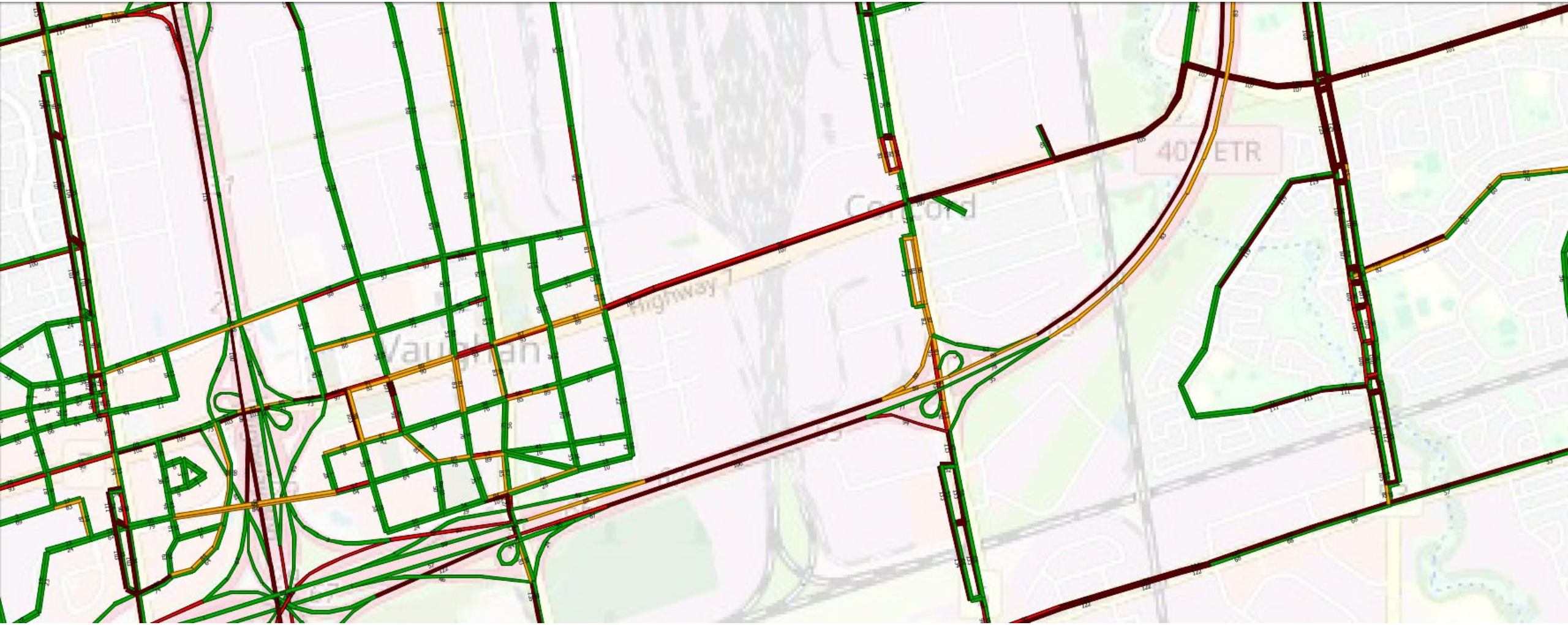


- The Secondary Stage Network does not resolve prior local network issues at the 156 k horizon and introduces additional traffic along Interchange Way as a result of the extension to Keele Street
- 156 k pop+emp cannot be supported along the Second Stage network

VMC Results in Context

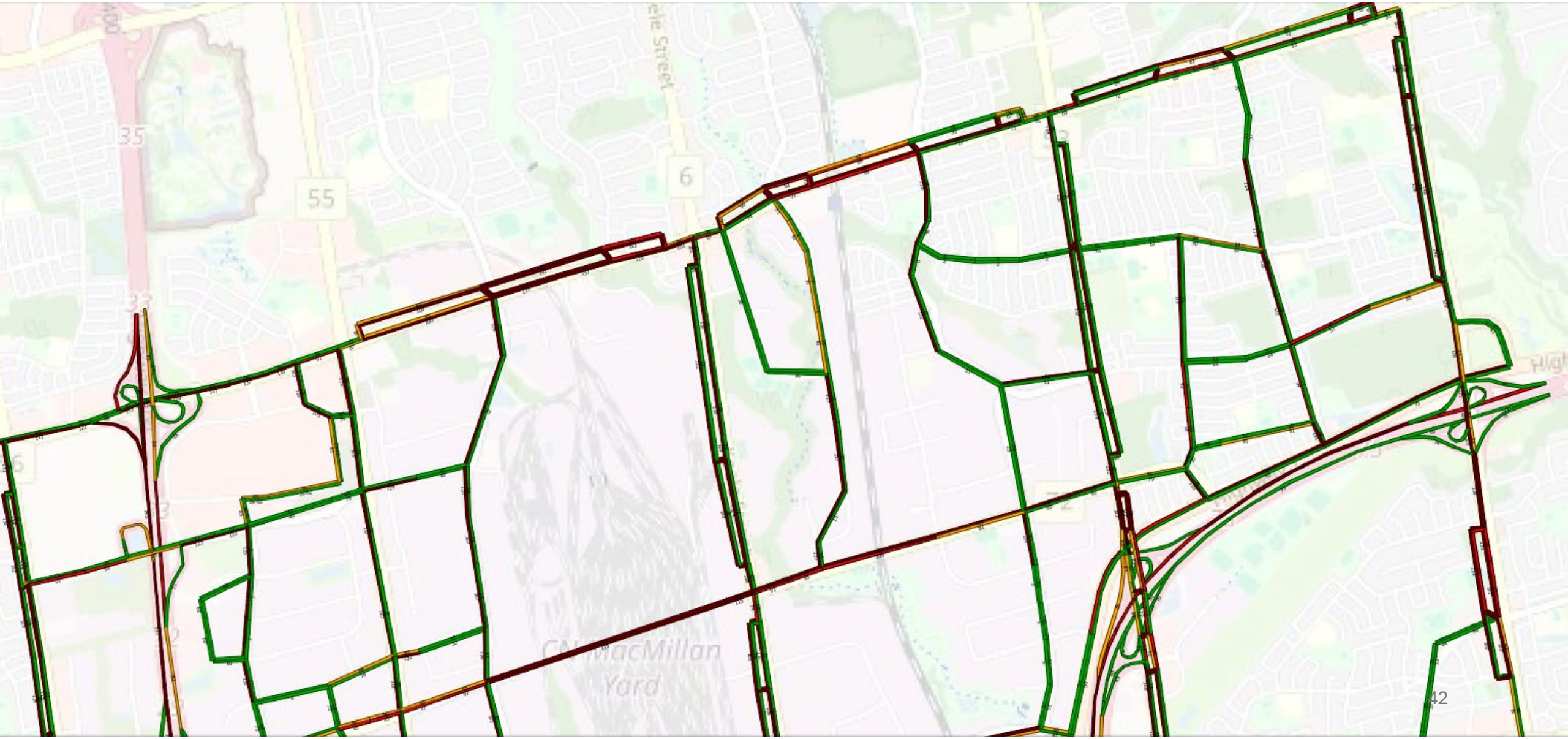
Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE – SE SUB-AREA



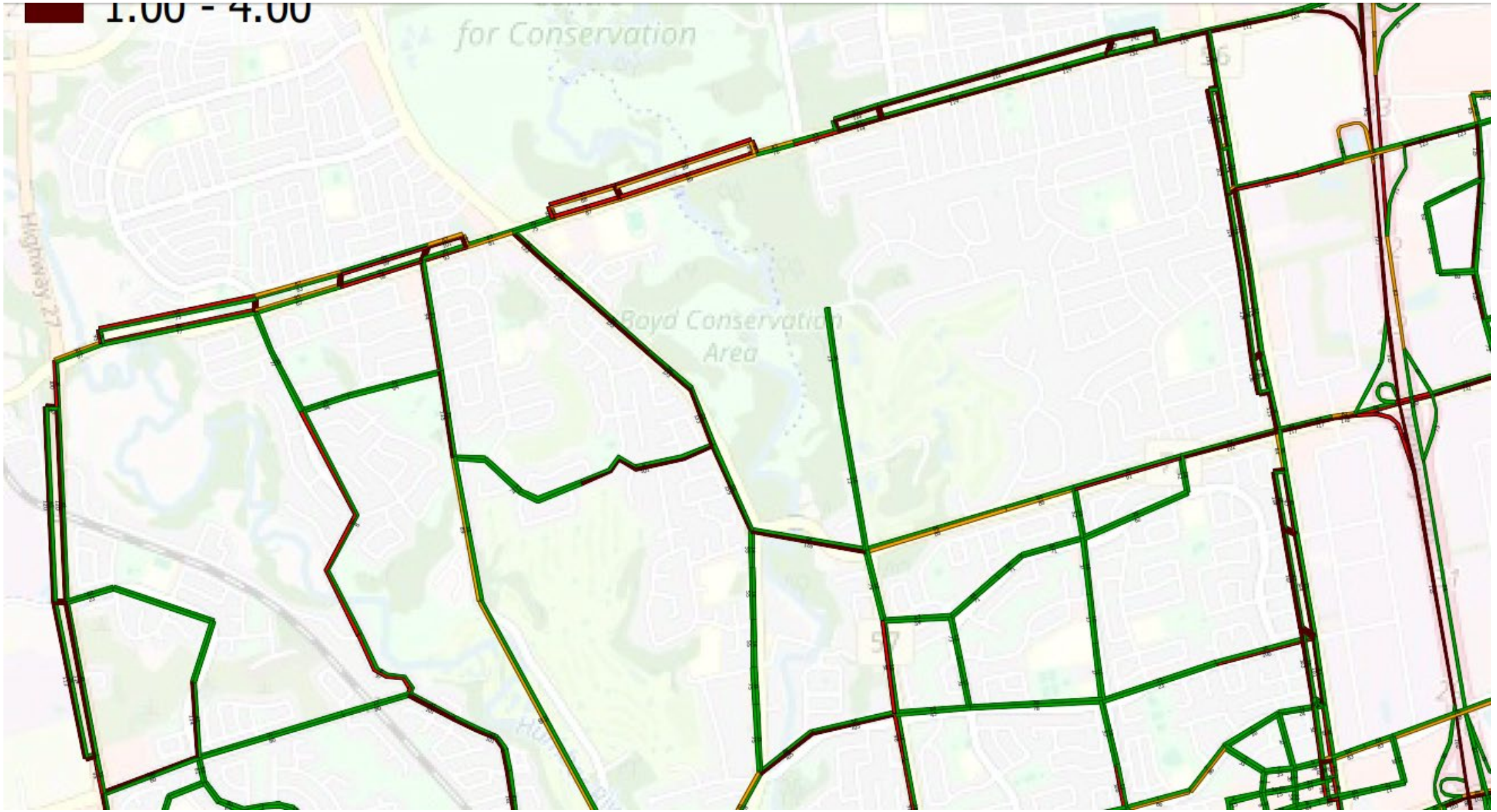
Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE – NE SUB-AREA



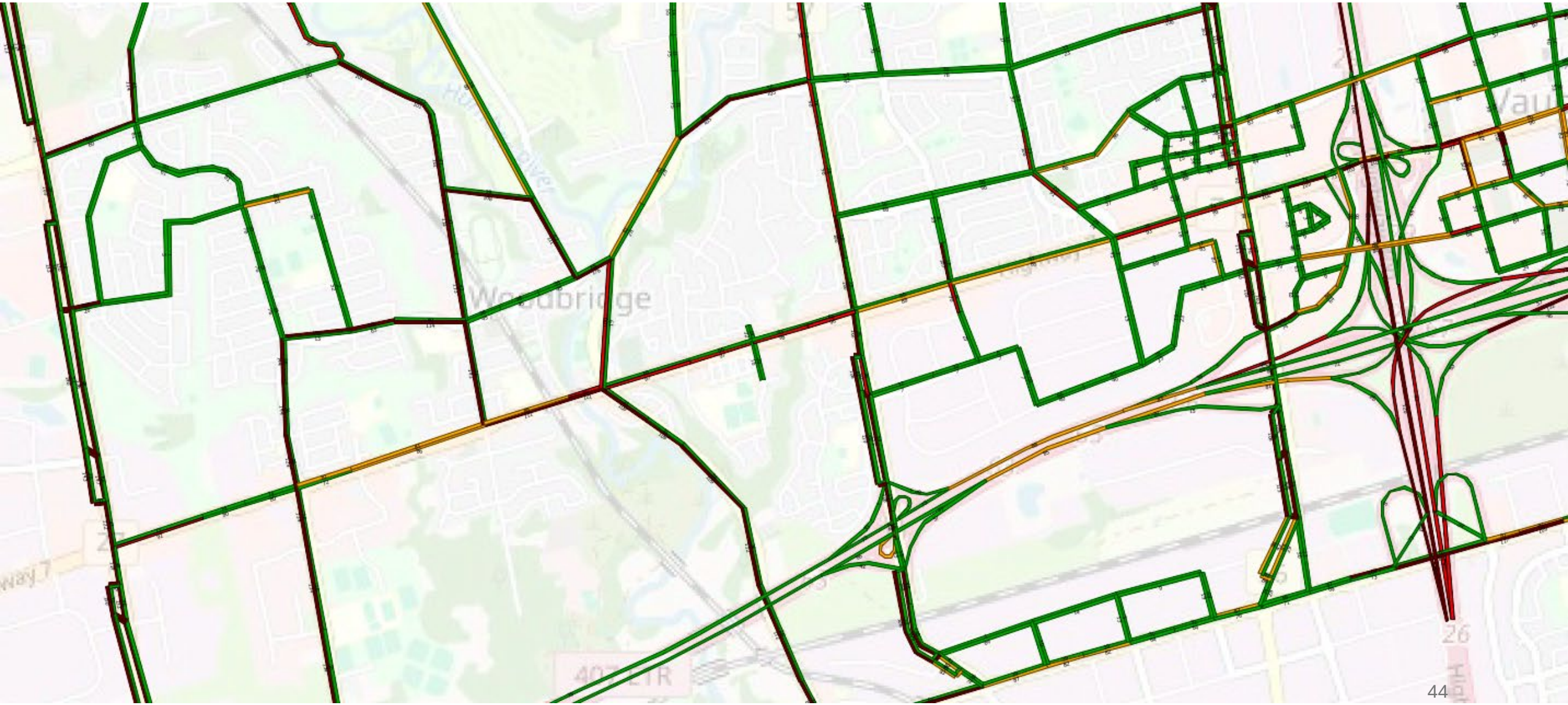
Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE – NW SUB-AREA



Scenario 3: VMC 105k, W7 25k, Future Base Network

PERFORMANCE – SW SUB-AREA



Conclusions

Scenario	Background Pop+Emp	VMC Pop+Emp	W7 Pop+Emp	Network	AM Peak Network Functionality through VMC and W7 SPAs (Recommended improvements, if applicable)
-1	2041 Horizon	2041 Horizon (42 k)	25 k	Existing	X
0	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Existing	X
1	2041 Horizon	2041 Horizon (42 k)	25 k	Future Base	●
3	2041 Horizon	Prior Secondary Plan (105 k)	25 k	Future Base	●
6	2041 Horizon	Ad'l Growth (156 k)	25 k	Future Base	X
7	2041 Horizon	Ad'l Growth (156 k)	25 k	Second Stage (Free Highway 407)	X
9	2041 Horizon	Ad'l Growth (156 k)	25 k	Second Stage (Tolled Highway 407)	X

X	Projected volumes are nearing, at, or exceed capacity on most key links; network is non-functioning
●	Projected volumes are nearing, at, or exceed capacity on many key links; network approaching dysfunction
●	Projected volumes are nearing capacity on several key links; localized breakdown may occur
●	Projected volumes are considerably lower than capacity on most key links