Hatch Mott MacDonald

Paradise Traffic Improvement Plan
Final Report
Paradise, NL

May 2014

Town of Paradise

Hatch Mott MacDonald

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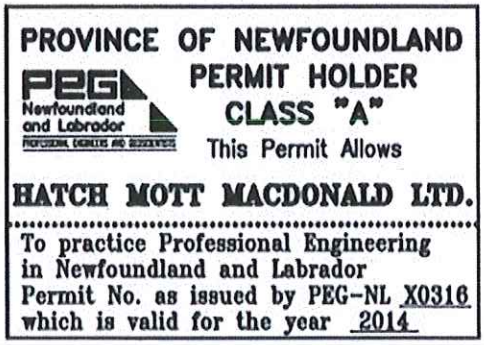

May-12-14	Final Report	C. McCarthy R. King	M. MacDonald	R. King
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Executive Summary

The Paradise Transportation Study completed by Hatch Mott MacDonald in early 2011 provided a picture of current and future traffic operations throughout the Town of Paradise. The study provided recommendations and a series of roadway improvements that would be required in the short term (0-5 years), medium term (5-10 years) and over the long term (greater than 10 years) time frames.

This study, the Paradise Transportation Improvement Plan, is an extension of the previous work providing more detail and a much greater level of operational type analysis. The goal of this study to provide the Town of Paradise with:

- A preferred road network configuration in the study area.
- A prioritized list of short, medium and long term capital improvements, complete with cost estimates, that will be required to accommodate the existing and projected growth in the Town to the year 2025.

To complete this work, HMM gained permission from the City of St. John's to use the regional VISUM transportation planning model that they have developed and use on a regular basis to assess future traffic conditions for many of the larger projects they have under consideration. This macroscopic planning model was then calibrated for this project and used to forecast traffic conditions throughout the Town's road network under several regional road network access configurations. Traffic volumes derived from these VISUM models were then used to develop VISSIM models of the study area. VISSIM is a microscopic traffic simulation software package developed by PTV America, which does a superior job in simulating roundabouts and roundabouts in conjunction with other closely spaced traffic control devices.

In total HMM developed 20 different VISSIM models of the study area based on 2 analysis periods, 4 traffic volume subsets, and 7 different network intersection configurations. The analysis was basic on the following:

- The analysis periods included the AM and PM peak traffic periods.
- The volume scenarios included:
    a. S0 - Existing conditions 2013 volumes
    b. S1 - 2025 traffic volumes with no access improvements
    c. S3 - 2025 traffic volumes with the access improvements in place to the network via a new Route 2 interchange and connections to both Topsail Road and Kenmount Road
    d. S5 - 2025 traffic volumes with the access improvements in place to the network via a new Route 2 interchange and connections to both Topsail Road and Kenmount Road, and via a new Route 1 interchange and connections in place to both Trails End Drive and Paradise Road.
- The road network configurations included, traffic signal timing and phasing optimizations, auxiliary right and left turn lane additions, signalization of intersections, the installation of roundabouts at key intersections and ramp terminals, and the widening of key roads within the study area road network.

The results of the existing conditions modelling indicates that the existing road network, with some minor modifications, has the ability to accommodate the volumes currently present on the road network with acceptable Levels of Service (LOS). These network improvements include:

- The installation of a Northbound auxiliary right turning lane at Karwood Drive intersection with Topsail Road,
- Dual left turning lanes at both the Northbound and Southbound ramp terminals of the Outer Ring Road and Topsail Road,
- The completion of the planned roundabout at Karwood Drive and Kenmount Road,
- The installation of a traffic signal at the Southbound Outer Ring Road ramp terminal with Kenmount Road, and
- The installation of a NB auxiliary right turning lane at the Bruce Street intersection with Kenmount Road.

Looking forward over the next 12 years, traffic volumes are expected to increase substantially on the Town's road network. In fact, looking at the results of the S1 – 2025 scenarios it is fairly clear that the Town's road network along Topsail Road and Kenmount Road is simply over capacity. Improvements to the road network are required that provide some relief/reductions in the volumes travelling on the roadways within the study area.

The S3 volume scenario introduced new access onto the regional road network with a new interchange proposed on Route 2. While this interchange reduced the traffic volumes on Kenmount Road, its effect in terms of providing the same relief on Topsail Road is limited.

The S5 volume scenario, which included new access connections to both Route 2 and to Route 1, provide the required reduction in traffic volumes on both Kenmount Road and along Topsail Road that allow for a network configuration that provides reasonable levels of service at most intersections within the study area.

The Route 2 interchange and connections to both Kenmount Road and to Topsail Road provide benefits mainly to the Kenmount corridor. This interchange is estimated to cost $10.1 million dollars. The connection roads to Topsail Road and to Kenmount Road are estimated to cost $9,800,000. There may be opportunities for the Town to participate in a cost sharing arrangement with Oceanex Inc., the City of St. John's, and the Provincial Government to build this interchange. Oceanex Inc., is interested in developing a tract of land it owns on the Southside of Route 2 in the same area but it too needs the interchange access to proceed.

The configuration proposed for the interchange on Route 1 is very similar to that proposed for Route 2. The cost is estimated at $10.1 million dollars. The roadway connections to Trails End Drive and Paradise Road are estimated to be $11,500,000. Again there may be opportunities for the Town of Paradise to explore cost sharing arrangements with the City of St. John's and the Provincial Government to build this interchange. The City of St. John's will need access on their side of the interchange to properly service development they are looking at on the lands that are above the 190 meter contour.

Conceptual designs for both interchanges are contained in Appendix E.

The recommended road network configuration that will be required to effectively handle the 2025 traffic volumes in both the AM and PM peak traffic periods with both the Route 2 and Route 1 interchanges in place is the S5-N6 scenario. This scenario includes the following network improvements:

1. Optimized Traffic signal timings at all signalized intersections,
2. Auxiliary right turn lanes at all approaches to the Karwood Drive / Topsail Road intersection,
3. Roundabouts at the ORR ramp terminals with Topsail Road,
4. Roundabout at Karwood Drive and Kenmount Road (Underway),
5. Roundabout at ORR SB ramp terminal with Kenmount Road,
6. Roundabout at Kenmount Road and Bruce Street, and
7. Traffic Signals at the Kenmount Road ramp terminals with Topsail Road.

The recommended road network is shown in Figure 1 below.

Figure 1: 2025 Recommended Road Network (S5-N6)

The estimated cost of implementing this road network is $54,370,600 which includes the full costs of both required interchanges. If cost sharing agreements are reached the projected cost would be $40,870,600.

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1.0 Introduction

1.1 Background

In 2011, Hatch Mott MacDonald (HMM) completed a town-wide transportation study for the Town of Paradise. From the study, came a series of recommendations for short-term, medium-term, and long-term improvements. The recommendations were reviewed from a traffic operations standpoint. Many of the short-term recommendations have been implemented or completed to detailed design. However, the medium-term and long-term improvements were developed in only a conceptual way at the completion of the transportation study. The Town of Paradise Engineering Department required a more detailed plan for road network improvements in order to develop a sufficient capital works plan that would address the traffic demands anticipated within the Town.

The Town retained HMM to provide a traffic improvement plan to address these needs.

1.2 Project Objectives

The objectives of the plan are to develop detailed concept plans, cost estimates, and prioritization for the following medium-term and long-term improvements. Specifically, plans will be developed for:

- Kenmount Road from Karwood Drive to Bruce Street
- Prioritization of Medium-term Improvements including:
  - Topsail Road / St. Thomas' Line Traffic Signals
  - New Road from McNamara Drive to Kenmount Road
  - Lane widening on Kenmount Road
  - Improvements to Kenmount Road/Bruce Street intersection
- TransCanada Highway/Outer Ring Road Interchange
- Conception Bay Bypass Interchange

1.3 Methodology

Our methodology was based on the analysis of several different inputs that were used in order to develop functional plans for developing cost estimates. Figure 2 provides a conceptual summary of this approach.

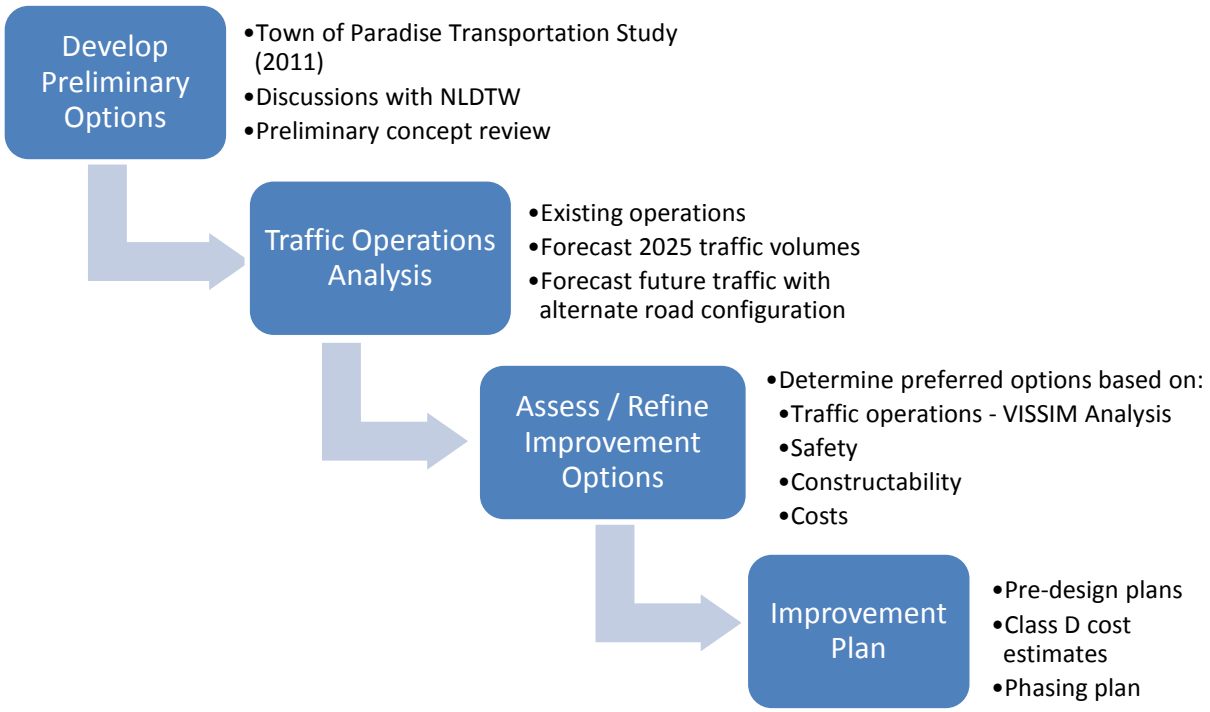


Figure 2: Study Approach

1.4 Study Area

The study area includes detailed analysis of three corridors that have major impacts to access to/from the entire Town as well as other roadways and intersections around Town that are shown in Figure 3.

The detailed traffic analysis included intersections under the jurisdiction of St. John's, Paradise, Mount Pearl, and the Newfoundland and Labrador Department of Transportation and Works (NLDTW). These key intersections are shown in Figure 4.

Intersections

1. Karwood Drive/Topsail Road
2. Outer Ring Road SB/Topsail Road
3. Outer Ring Road NB/Topsail Road
4. Carlisle Drive/Topsail Road
5. Kenmount Road SB/Topsail Road
6. Kenmount Road NB/Topsail Road
7. Kenmount Road/Bruce Street /Outer Ring Road NB
8. Kenmount Road/Outer Ring Road SB
9. Kenmount Road/Karwood Drive

Figure 3: Overall Study Area

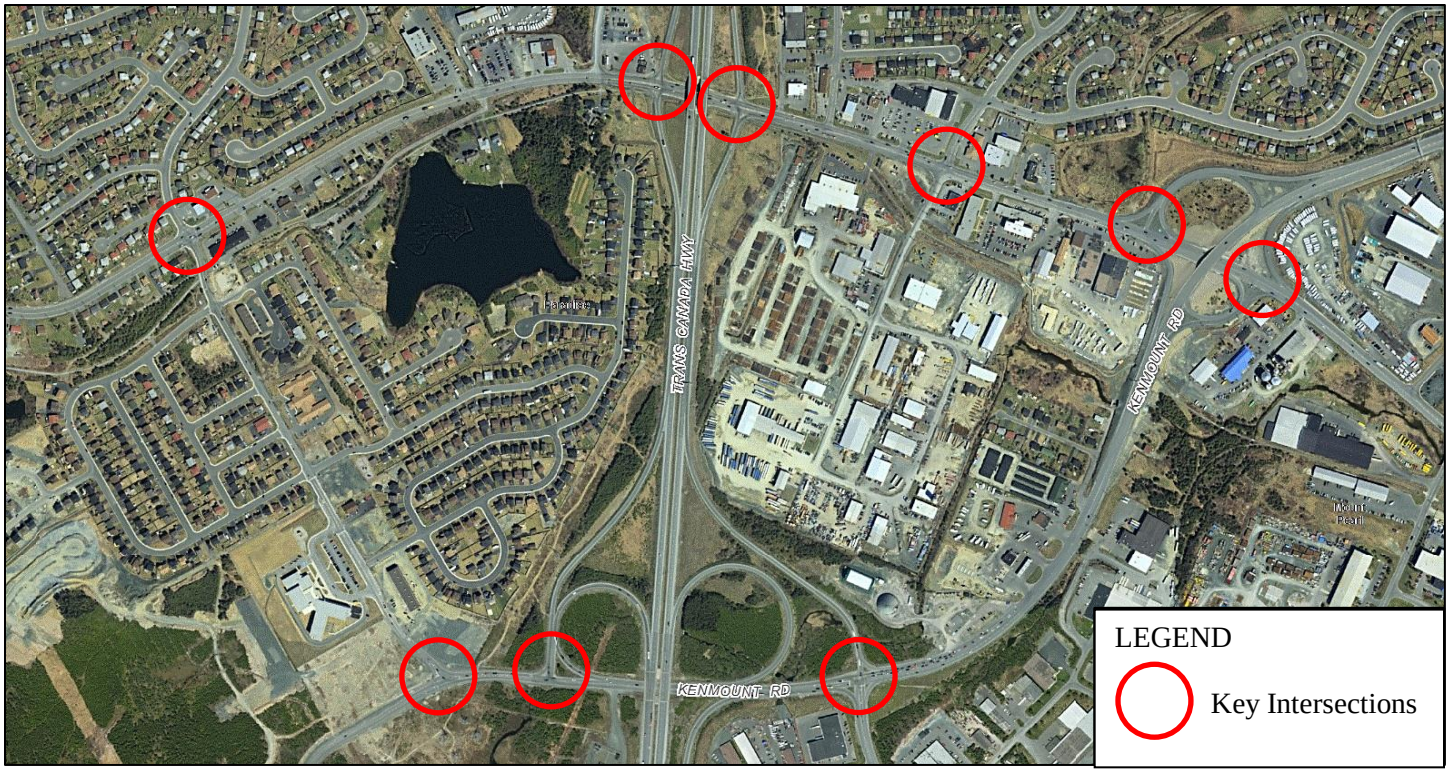


Figure 4: Key Intersections for Micro-simulation Analysis

1.5 Scenarios included within the VISSIM Analysis

As part of the analysis completed for the Paradise Traffic Improvement Plan, a total of 20 different VISSIM models were created to evaluate intersection performance under a variety of different network conditions. The scenarios were tested for both the AM and PM peak traffic periods. A description of each of the VISSIM models developed is noted below:

- **Scenario 0 – Network 1.** This VISSIM model used existing 2013 traffic volumes and the existing road network; traffic signal timings were optimized.
- **Scenario 0 – Network 2.** This VISSIM model used existing 2013 traffic volumes, traffic signal timings were optimized in the analysis and a number of different intersection improvements were made to the road network including:
  - NB auxiliary right turning lane added to Karwood Drive at Topsail Road
  - NB and SB dual left turning lanes added to the Outer Ring Road (ORR) ramp terminals with Topsail Road
  - Roundabout at Karwood Drive and Kenmount Road
  - Traffic Signals at the ORR SB off ramp terminal with Kenmount Road
  - NB auxiliary right turning lane added to Bruce Street / Kenmount Road intersection
- **Scenario 0 – Network 3.** This VISSIM model used existing 2013 traffic volumes, traffic signal timings were optimized in the analysis and a number of different intersection improvements were made to the road network including:
  - NB auxiliary right turning lane added to Karwood Drive at Topsail Road
  - NB and SB dual left turning lanes added to the Outer Ring Road (ORR) ramp terminals with Topsail Road
  - Roundabout at Karwood Drive and Kenmount Road
  - Traffic Signals at the ORR SB off ramp terminal with Kenmount Road

  - NB auxiliary right turning lane added to Bruce Street/Kenmount Road intersection
  - NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street traffic signal.
- **Scenario 1- Network 1.** This VISSIM model used the 2025 VISUM forecasted traffic volumes and the existing road network; traffic signal timings were optimized.
- **Scenario 1 – Network 4.** This VISSIM model used the 2025 VISUM forecasted traffic volumes, traffic signal timings were optimized, and a number of different intersection improvements were made to the road network including:
  - NB auxiliary right turning lane added to Karwood Drive at Topsail Road
  - NB and SB dual left turning lanes added to the Outer Ring Road (ORR) ramp terminals with Topsail Road
  - Roundabout at Karwood Drive and Kenmount Road
  - Traffic Signals at the ORR SB off ramp terminal with Kenmount Road
  - NB auxiliary right turning lane added to Bruce Street/Kenmount Road intersection
  - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road.
- **Scenario 1 – Network 5.** This VISSIM model used the 2025 VISUM forecasted traffic volumes, traffic signal timings were optimized, and a number of different intersection improvements were made to the road network including:
  - NB auxiliary right turning lane added to Karwood Drive at Topsail Road
  - NB and SB dual left turning lanes added to the Outer Ring Road (ORR) ramp terminals with Topsail Road
  - Roundabout at Karwood Drive and Kenmount Road
  - Traffic Signals at the ORR SB off ramp terminal with Kenmount Road
  - NB auxiliary right turning lane added to Bruce Street/Kenmount Road intersection
  - WB right thru lane added to Bruce Street /Kenmount Road Intersection
  - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road
  - NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street traffic signal.
- **Scenario 1 – Network 7.** This VISSIM model used the 2025 VISUM forecasted traffic volumes, traffic signal timings were optimized, and a number of different intersection improvements were made to the road network including:
  - An auxiliary right turn lane at all approaches to the Karwood Drive /Topsail Road intersection.
  - Roundabouts at the ORR ramp terminals with Topsail Road
  - Roundabout at Karwood Drive and Kenmount Road
  - Roundabout at ORR SB ramp terminal with Kenmount Road
  - Roundabout at Kenmount Road and Bruce Street
  - NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street roundabout.
  - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road

- **Scenario 3 – Network 7.** This VISSIM model used the 2025 VISUM forecasted traffic volumes that were generated with an interchange connection to Route2 from both Kenmount Road and from Topsail Road, traffic signal timings were optimized, and a number of different intersection improvements were made to the road network including:
    - An auxiliary right turn lane at all approaches to the Karwood Drive/Topsail Road intersection.
    - Roundabouts at the ORR ramp terminals with Topsail Road
    - Roundabout at Karwood Drive and Kenmount Road
    - Roundabout at ORR SB ramp terminal with Kenmount Road
    - Roundabout at Kenmount Road and Bruce Street
    - NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street roundabout.
    - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road
- **Scenario 5 - Network 6.** This VISSIM model used the 2025 VISUM forecasted traffic volumes that were generated reflecting an interchange connection to Topsail Road and Kenmount Road from Route 2 and an interchange connection from Route 1 to that connects to Trails End Drive and to Paradise Road. Traffic signal timings were optimized and a number of different intersection improvements were made to the road network including:
    - An auxiliary right turn lane at all approaches to the Karwood Drive / Topsail Road intersection.
    - Roundabouts at the ORR ramp terminals with Topsail Road
    - Roundabout at Karwood Drive and Kenmount Road
    - Roundabout at ORR SB ramp terminal with Kenmount Road
    - Roundabout at Kenmount Road and Bruce Street
    - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road
- **Scenario 5 - Network 7.** This VISSIM model used the 2025 VISUM forecasted traffic volumes that were generated reflecting an interchange connection to Topsail Road and Kenmount Road from Route 2 and an interchange connection from Route 1 to that connects to Trails End Drive and to Paradise Road. Traffic signal timings were optimized and a number of different intersection improvements were made to the road network including:
    - An auxiliary right turn lane at all approaches to the Karwood Drive / Topsail Road intersection.
    - Roundabouts at the ORR ramp terminals with Topsail Road
    - Roundabout at Karwood Drive and Kenmount Road
    - Roundabout at ORR SB ramp terminal with Kenmount Road
    - Roundabout at Kenmount Road and Bruce Street
    - NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street roundabout.
    - Traffic Signals at the Kenmount Road ramp terminals with Topsail Road

1.6 Traffic Operations Measures of Performance

For the purposes of conducting the analysis in this report, HMM used a number of industry standard software packages to calculate the measures of performance for the intersections included within the study area. The traffic analysis software used included:

- **VISSIM -** Micro-Simulation analysis software that creates a simulation of the road network and then measures key indicators such as delay, queues, and travel times along the corridors.
- **VISUM -** Transport Demand Forecasting software is used to forecast future traffic volumes. While the VISUM model can provide delay calculations, it was mainly used to determine the future traffic volumes, especially on proposed new links.
- **Synchro** - Traffic Signal Coordination Software which analyzes typical measures of performance based on the methodology of the Highway Capacity Manual (Transportation Research Board, 2000).
- **ARCADY**/Junction 8 was used to analyze roundabout options. ARCADY uses the TRL/Kimber empirical method to assess roundabouts.

The VISSIM micro-simulation software was specifically selected for this project to accurately represent the roundabouts included the various road network configurations considered and the interactions between them and any adjacent traffic signals. Synchro was used for optimizing traffic signal timings and progression settings; it is not an industry accepted tool for modelling roundabouts and was therefore not used for that purpose. The VISUM software was used with the existing regional transportation planning model to forecast traffic volumes to the year 2025 under various regional road network configurations. Arcady was used to assess the LOS and delay expected at roundabouts not included within the VISSIM model.

Three primary measures of performance are typically used to evaluate the performance of an intersection. These are outlined below:

Volume to Capacity Ratio (v/c) – Volume to capacity ratios relate the estimated traffic volumes (demand volume) to the theoretical maximum volume that could be accommodated (capacity volume / adjusted saturation flow rate). As the v/c ratio approaches 1.0, the movement has reduced ability to accommodate any additional volume of traffic. Generally, intersection control or road infrastructure movements can alleviate any reduced residual capacity

Level of Service (LOS) – LOS is a qualitative measure which describes operational conditions, expressed as a scale from ‘A’ to ‘F,’ where LOS A represents free flow conditions or very low delay, and LOS F represents delay times that are unacceptable to motorists using the facility. The signalized and unsignalized intersection analysis in this report use the average vehicle delay as the main criteria for LOS and the levels are qualified as below:

Level of Service Rating	Percentile Delay (seconds / vehicle)	
	Signalized Intersection	*Stop-controlled Intersection*
A	≤ 10.0	≤ 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	> 80.0	> 50.0

Queue Capacity – Queue capacity at intersections is critical to the performance of the network. As part of the analysis process, queue lengths were examined and recommendations were made to ensure that sufficient vehicle storage is available to maintain efficient traffic flow.

2.0 Existing Traffic Operations Analysis

Detailed existing traffic operations analysis was conducted using Synchro Traffic Signal Coordination Software and VISSIM Micro-Simulation software. The analysis was completed to assess the short-term and long-term improvements under consideration.

2.1 Existing Road Network Configuration

The current road network configuration was documented based on GIS information and aerial mapping provided by the City of St. John's, and through information obtained using the Street View features of Google Maps. Site conditions were verified, as necessary, through site visits. The existing lane configurations and intersection controls applied for the analysis are illustrated in Figure 5. The major roadways found in the study area are described below:

- **Trans-Canada Highway/ Outer Ring Road** are provincially controlled highway providing high speed linkages between the City of St. John's, The City of Mount Pearl, The Town of Paradise, and the Town of Conception Bay South and other communities and destinations to the west. In the greater St. John's area, the Outer Ring Road acts as a ring road commuter route. It has a four-lane divided cross section with a 100 km/hr posted speed limit. Grade-separated interchanges provide access to the Trans-Canada Highway at two locations in the vicinity of the project area; at Topsail Road and Kenmount Road.
- **Topsail Road** is a four lane undivided major arterial road, providing access to the City of Mount Pearl, and to the City of St. John's from the Town of Paradise and Conception Bay South. Topsail Road has many controlled access signalized intersections. It also has numerous uncontrolled access points, business and private access driveways.
- **Kenmount Road** is also a major arterial roadway that provides access to the City of Mount Pearl and to the City of St. John's. The cross section of Kenmount Road varies along its length from 2 lanes to 4 lanes; the posted speed limit is 50km/h.

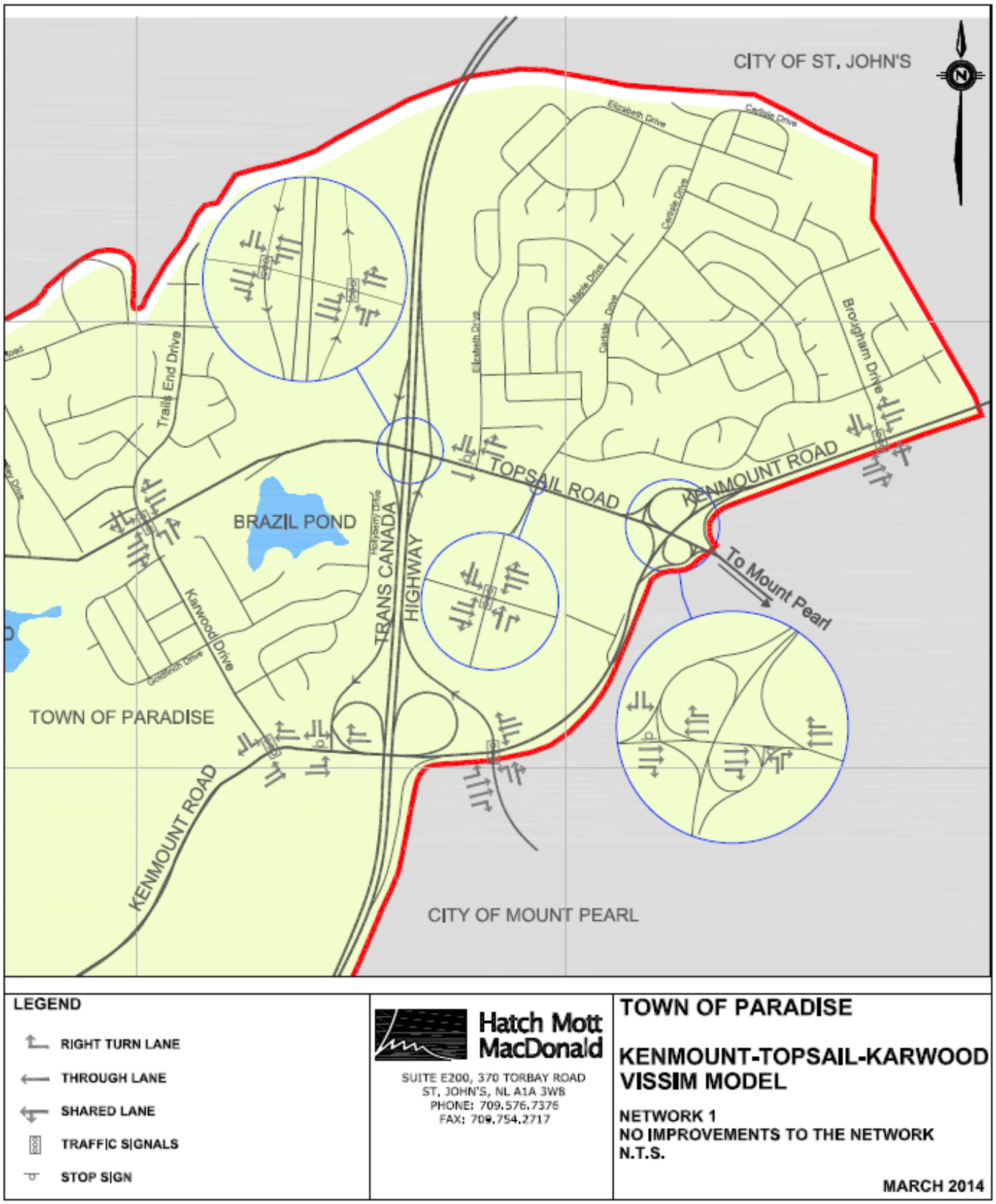


Figure 5: Existing Intersection Configurations

2.2 Existing Traffic Volumes (2013)

Existing traffic volumes for the 2013 base year were based on data by traffic counts conducted by HMM through local university students.

HMM conducted four-hour intersection counts (7:00 – 9:00 AM, 4:00 – 6:00 PM) at the following intersections:

- Topsail Road/Karwood Drive/ Trails End Drive – July 23, 2013
- Topsail Road/Carlisle Drive – July 25, 2013
- Topsail Road/Trans-Canada Highway W – July 24, 2013
- Topsail Road/Trans-Canada Highway E – August 6, 2013 (7-9) & July 24, 2013 (4-6)
- Topsail Road/Kenmount Road W – July 30, 2013
- Topsail Road/Kenmount Road E – August 13, 2013 (7-9) & July 30, 2013 (4-6)
- Kenmount Road/Trans-Canada Highway W – August 8, 2013
- Kenmount Road/Bruce Street – Trans-Canada Highway B – April 4, 2013
- Karwood Drive/Kenmount Road – April 10, 2013

The 2013 AM and PM peak hour traffic volumes used in the analysis are illustrated in figures in each of the individual scenarios.

2.3 Existing Traffic Operations (S0-N1)

The existing traffic operations were analyzed using the VISSIM software. For the signalized intersections, traffic signal timings were optimized using the Synchro software; the existing signal phasing plans were based on the information provided by the Town of Paradise's signal contractor (Traffic & Lighting Systems), and the Department of Transportation and Works of Newfoundland and Labrador (DTW). If available, peak hour factors and heavy vehicle percentages were based on existing count data. The results of the analysis for the existing conditions are noted in Figure 6 and Figure 7 and in Table 1.

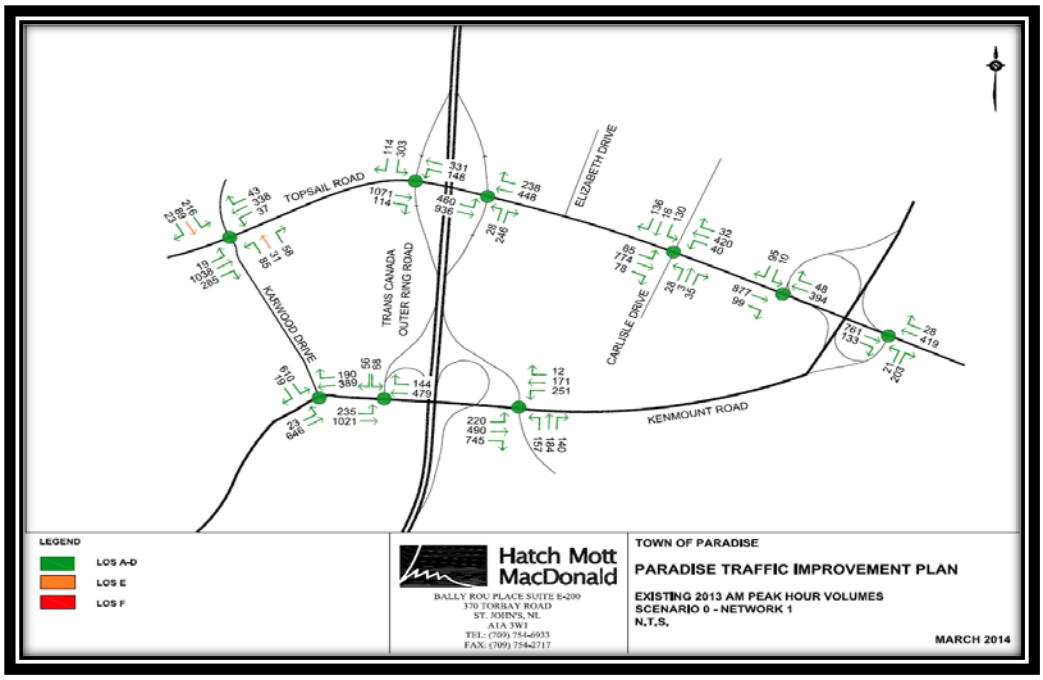


Figure 6: (S0-N1) 2013 AM Volumes Existing Network

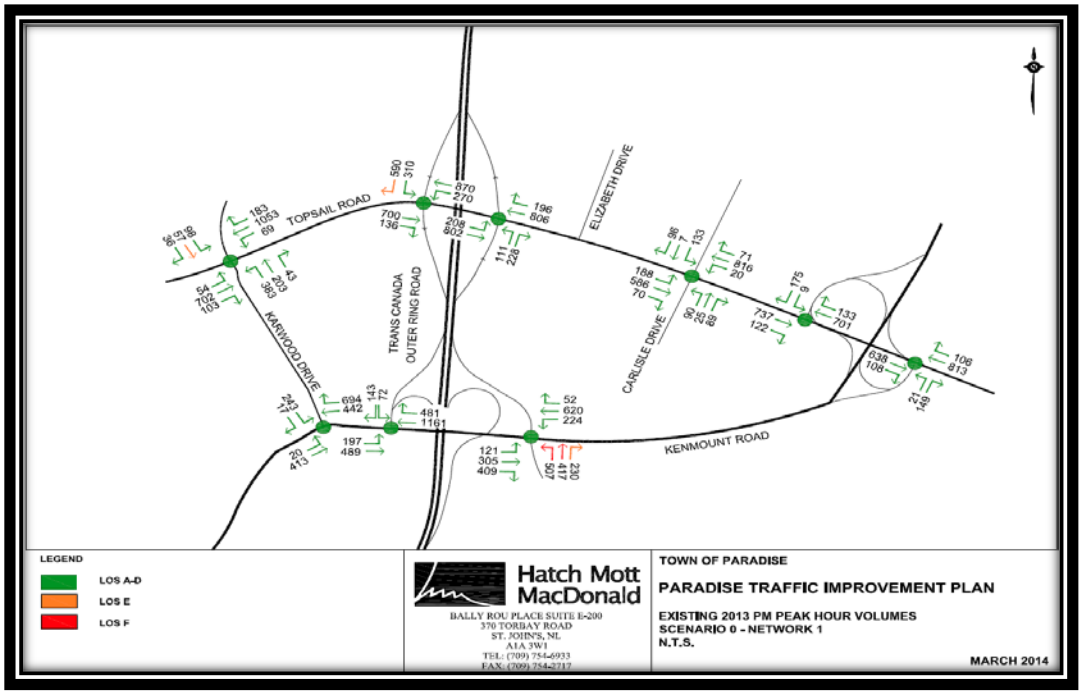


Figure 7: (S0-N1) 2013 PM Volumes Existing Network

The LOS for each movement as calculated by VISSIM are shown by colour. Level of service A-D is shown in green, E is shown in orange and F is shown in red. The analysis summaries and detailed results are included in Appendix A.

Table 1: S0-N1 Existing 2013 LOS Summary Analysis

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Intersection Delay (Secs)	Intersection Equivalent LOS		VISSIM Intersection Delay (Secs)	Intersection Equivalent LOS
Topsail Road/ Karwood Drive	26	C		27.7	C
TCH SB/ Topsail Road	19.4	B		34.4	C
TCH NB/ Topsail Road	12.5	B		12.4	B
Topsail Road/ Carlisle Drive	17.4	B		13.9	B
Topsail Road/ Kenmount Road SB	0.5	A		0.7	A
Topsail Road/ Kenmount Road NB	0.5	A		0.3	A
Kenmount Road/ TCH NB – Bruce Street	9.7	A		31.8	C
Kenmount Road/ TCH SB	1.7	A		3.1	A
Kenmount Road/ Karwood Drive	16.7	B		7.4	A

2.3.1 Discussion S0-N1 (2013 Traffic Volumes /Existing Road Network)

Overall, the VISSIM model of the existing conditions during the AM and PM peak traffic periods shows fairly good levels of service with the S0-N1 scenario. There are a number of minor issues at the Topsail Road / Karwood intersection in the AM Peak hour with both the NB and SB thru movements but overall, all intersections perform fairly well during the AM peak hour.

During the PM Peak hour there are a number of minor issues along Topsail Road including the SB through movements at Karwood Drive and the SB right turning movements at the ORR ramp terminal; both movements operate at LOS “E”. There are also some movements operating at a LOS “F” at the Bruce Street intersection with Kenmount Road. Overall al intersections are operating with acceptable levels of service during the PM peak hour.

It should be pointed out that the results of the VISSIM analysis in the AM peak hour of the Topsail Road / Outer Ring Road Ramp terminals shows fairly good levels of service; (S0-N1). This is because optimized signal timings were used in the analysis. Observations of field conditions indicate significant queuing and congestion problems with the eastbound through and left turning movements in the AM peak hour. These field conditions have been replicated with a Synchro model of the intersection using **both** existing timings and signal phasing plans. The results are shown below in Figure 8 below.

Intersection		AM Peak Hour						
		Existing Signal Timing				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Trans-Canada Highway SB/ Topsail Road		27.3	C			90.0	F	
Topsail Road	Eastbound Through	23.0	C	0.70	133.4	95.3	F	330.0
	Eastbound Right - Turn	8.4	A	0.21	22.8	48.9	D	34.4
	Westbound Left - Turn	28.8	C	0.61	24.8	34.7	C	36.2
	Westbound Through	11.9	B	0.23	18.0	8.6	A	22.2
Trans-Canada Highway SB	Southbound Left - Turn	73.0	E	0.93	110.4	190.6	F	310.5
	Southbound Right - Turn	16.2	B	0.33	22.1	157.4	F	35.6
Trans-Canada Highway NB/ Topsail Road		38.7	D			31.9	C	
Topsail Road	Eastbound Left - Turn	151.8	F	1.25	107.5	105.3	F	62.7
	Eastbound Through	11.2	B	0.61	44.7	15.0	B	149.1
	Westbound Through	14.0	B	0.49	60.4	19.1	B	66.7
	Westbound Right - Turn					10.4	B	67.2
Trans-Canada Highway NB	Northbound Left - Turn	35.0	D	0.17	20.2	42.2	D	106.2
	Northbound Right - Turn	32.6	C	0.78	63.1	30.9	C	31.1

Figure 8 - Existing Conditions Topsail Road / Outer Ring Road - Existing Phasing and Timings

As indicated by the results the queuing and delay / congestion on the eastbound approach is significant and the level of service is F. In order to correct these problems at this intersection during the AM peak period it is recommended that the signal phasing be changes to a standard 3 phase Lead – Lead phasing configuration with optimized timings. The level of service results for this signal timing and phasing alternative are shown in Figure 9 below. The improvements are significantly better.

Intersection		AM Peak Hour						
		3 Phase Lead-Lead Scenario				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Trans-Canada Highway SB/ Topsail Road		18.7	B			31.3	C	
Topsail Road	Eastbound Through	15.3	B	0.65	59.5	21.7	C	129.0
	Eastbound Right - Turn	4.4	A	0.20	4.7	14.0	B	34.5
	Westbound Left - Turn	19.4	B	0.42	24.5	31.3	C	39.0
	Westbound Through	7.8	A	0.16	25.0	9.6	A	29.0
Trans-Canada Highway SB	Southbound Left - Turn	55.0	D	0.80	98.9	90.2	F	229.9
	Southbound Right - Turn	6.8	A	0.27	12.3	65.1	E	35.7
Trans-Canada Highway NB/ Topsail Road		21.9	C			23.8	C	
Topsail Road	Eastbound Left - Turn	40.8	D	0.76	98.1	47.5	D	66.3
	Eastbound Through	6.0	A	0.46	46.0	10.2	B	131.3
	Westbound Through	26.0	C	0.65	79.2	31.2	C	51.1
	Westbound Right - Turn					21.3	C	51.1
Trans-Canada Highway NB	Northbound Left - Turn	33.6	C	0.15	19.8	41.0	D	93.8
	Northbound Right - Turn	34.7	C	0.75	70.9	24.4	C	31.4

Figure 9 - Optimized Conditions Topsail Road / Outer Ring Road - Modified Phasing and Optimized Timings

Please note All VISSIM analysis results reported for scenarios S1 and above use the 3 phase Lead – Lead phasing and optimized signal timings at this intersection. The results reported for scenario S0 use the existing phasing with optimized timing plans.

2.4 Improvement Alternative S0-N2

Two additional road networks were also analysed under the S0 existing traffic volumes. These included S0-N2 and S0-N3. The N2 and N3 road networks are fairly similar in features. Both include the following improvements:

- NB auxiliary right turning lane added to Karwood Drive at Topsail Road
- NB and SB dual left turning lanes added to the Outer Ring Road (ORR) ramp terminals with Topsail Road
- Roundabout at Karwood Drive and Kenmount Road
- Traffic Signals at the ORR SB off ramp terminal with Kenmount Road
- NB auxiliary right turning lane added to Bruce Street/Kenmount Road intersection (Identified in the 2010 Transportation Study)

The N3 network also includes:

- NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street traffic signal.

Figure 10 illustrates the lane and traffic control improvements analyzed in the S0-N2 scenario. Figure 11 and Figure 12 illustrate the results of the analysis for both the AM and PM peak traffic periods using 2013 traffic volumes. The LOS for each movement are shown in color in Table 2 .The analysis summaries and detailed results for both the S0-N2 and S0-N3 scenarios are included in Appendix A.

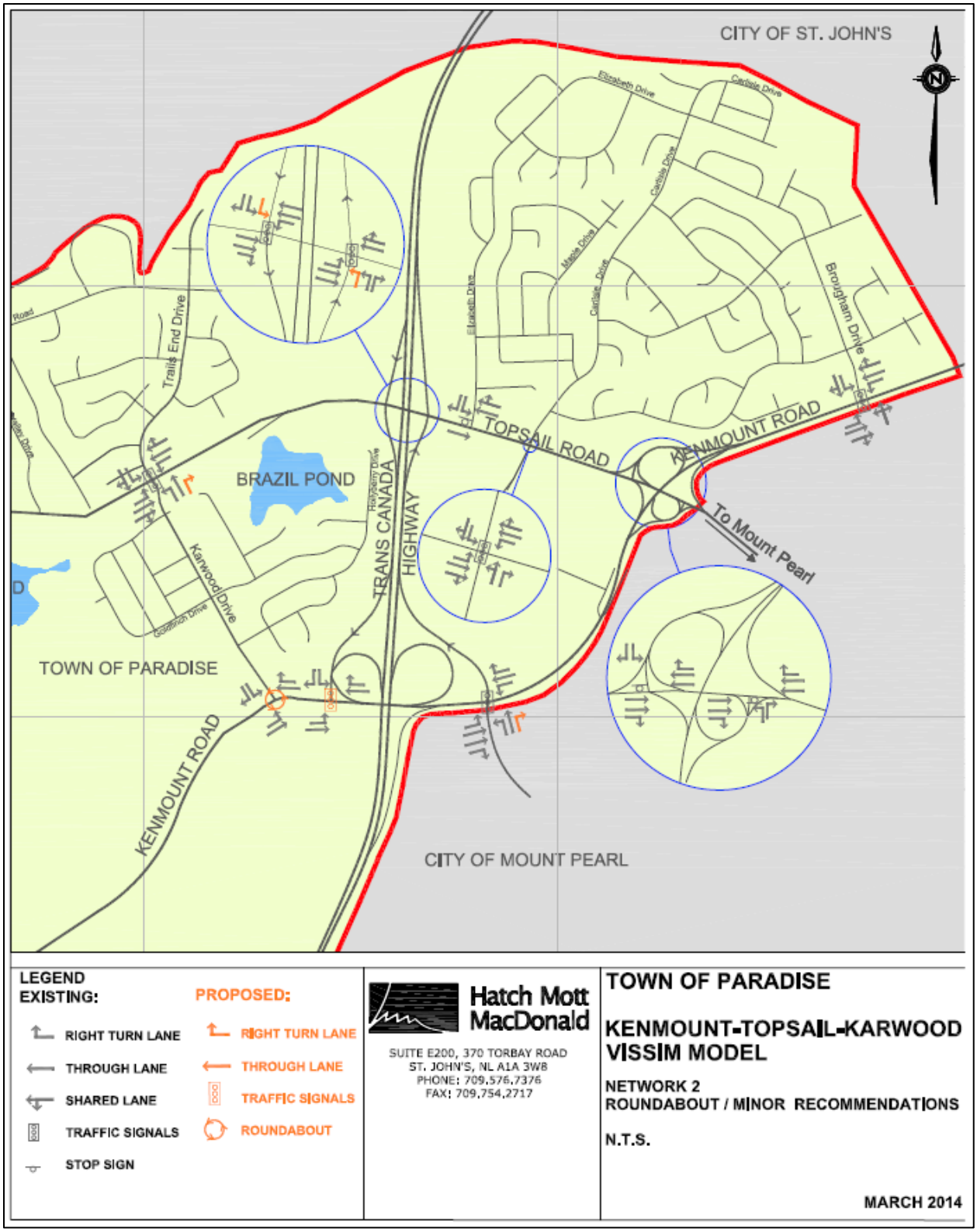


Figure 10: 2013 Minor Lane Improvements Lane Configuration

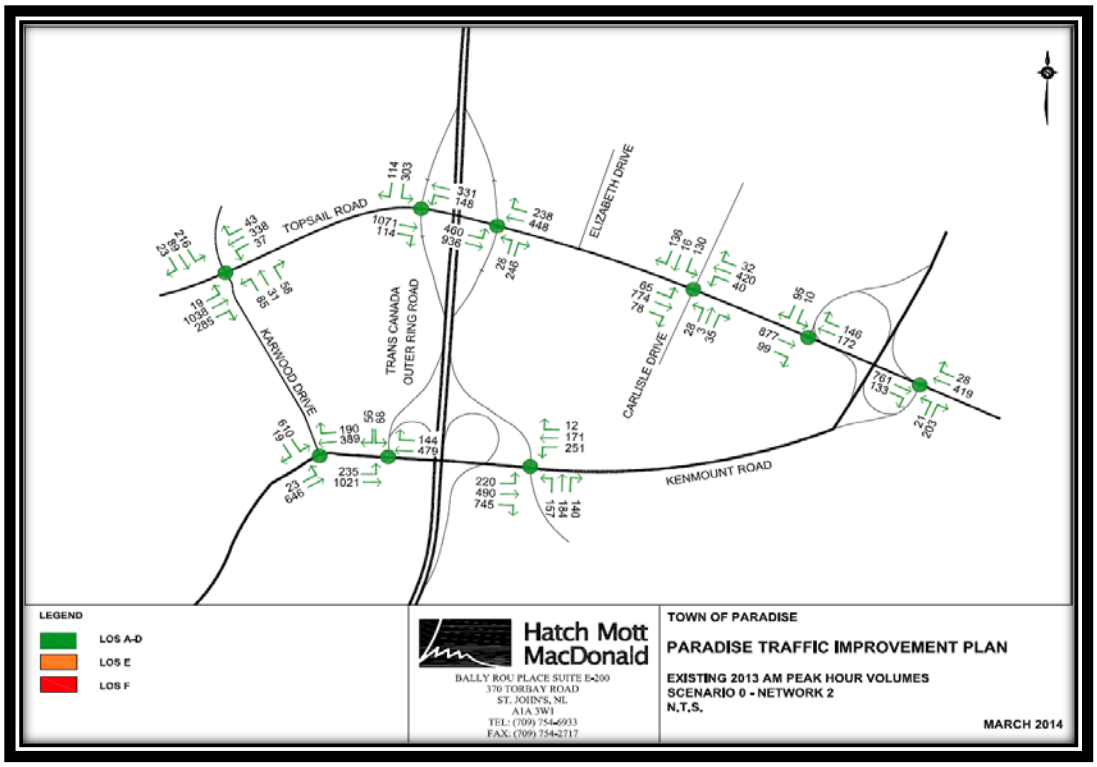


Figure 11: (S0-N2) 2013 AM Peak Hour Traffic – Minor Lane Improvements

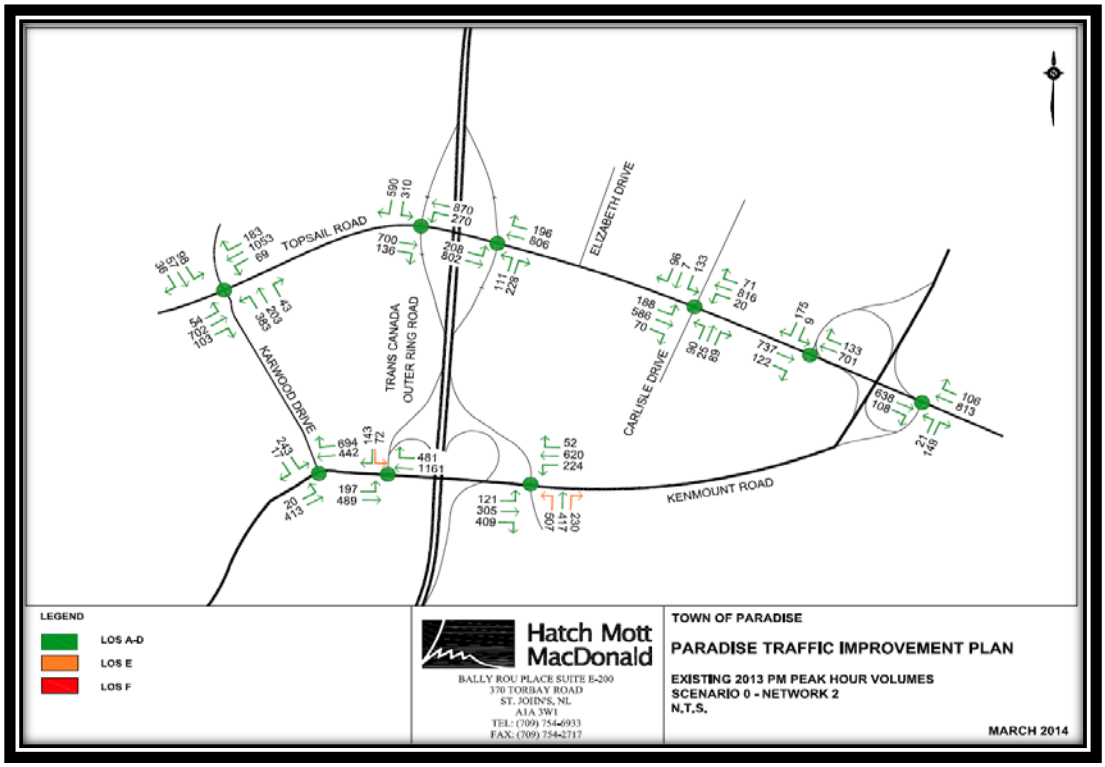


Figure 12: (S0-N2) 2013 PM Peak Hour Traffic – Minor Lane Improvements

The analysis indicates that with minor lane improvements in place as indicated, the intersections analyzed within the network perform well with just a few minor issues. The summary of the network intersections performance are shown in the Table 2 below. Overall, this network performs well during both of the peak traffic periods. There are some minor issues with the NB left and right turning movements at Bruce Street and Kenmount Road intersection during the PM Peak; both movements performing at LOS E. There is also a minor issue with the SB left at the intersection of the ORR SB off ramp terminal with Kenmount Road. This movement operates at a LOS "E" as well.

Table 2: S0-N2 Intersection LOS Existing Volumes/Minor Improvements

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	19.4	B		23.5	C
TCH SB/Topsail Road	12.8	B		11.8	B
TCH NB/Topsail Road	9.0	A		7.5	A
Topsail Road/Carlisle Drive	19.1	B		12.5	B
Topsail Road/Kenmount Road SB	0.7	A		0.6	A
Topsail Road/Kenmount Road NB	0.6	A		0.3	A
Kenmount Road/ TCH NB-Bruce Street	11.3	B		29.2	C
Kenmount Road/ TCH SB	8.7	A		8.6	A
Kenmount Road/Karwood Drive	4.7	A		1.2	A

2.5 Improvement Alternative S0-N3

Figure 13 illustrates the lane and traffic control improvements analysed in the S0-N3 scenario. Figure 14 and Figure 15 illustrate the results of the VISSIM for both the AM and PM peak hour traffic periods using the 2013 traffic volumes.

This road network contains the NLDTW Bruce Street ramp reconfiguration. The NLDTW has some concerns about the weaving between the ORR NB off ramp traffic to Kenmount Road and the WB traffic on Kenmount Road looking to turn right onto Bruce Street. The suggestion was to realign the NB ORR loop ramp to intersect with the Bruce Street/Kenmount Road intersection thereby eliminating the weaving conflict. The existing 2013 traffic operations were analyzed with the improvements to the network in place as shown in Figure 13.

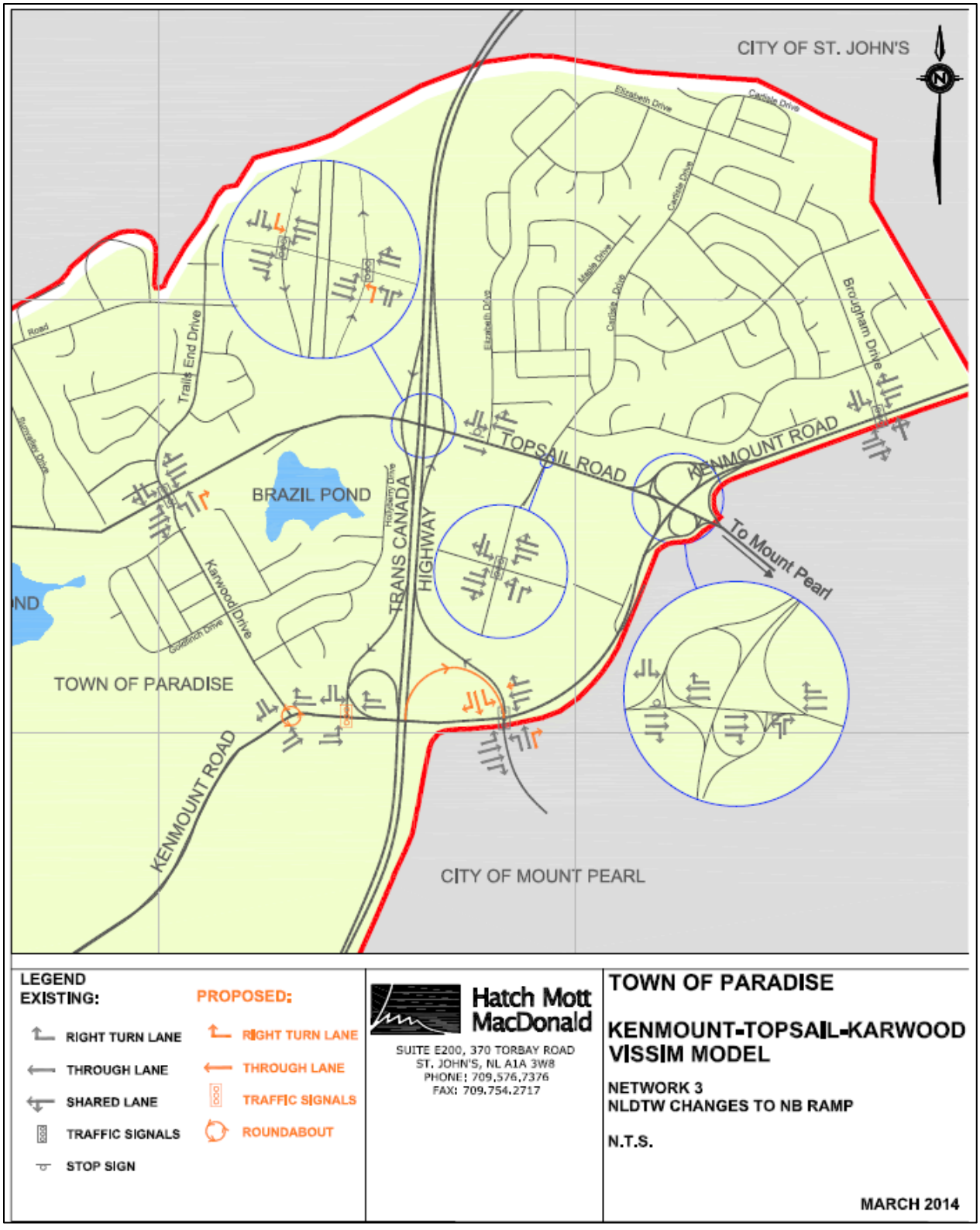


Figure 13: 2013 Kenmount Road/Outer Ring Road Ramp Reconfiguration Lane Configuration

The LOS for each movement as calculated by VISSIM are shown by colour in Figure 14 and Figure 15. The analysis summaries and detailed results are included in Appendix A.

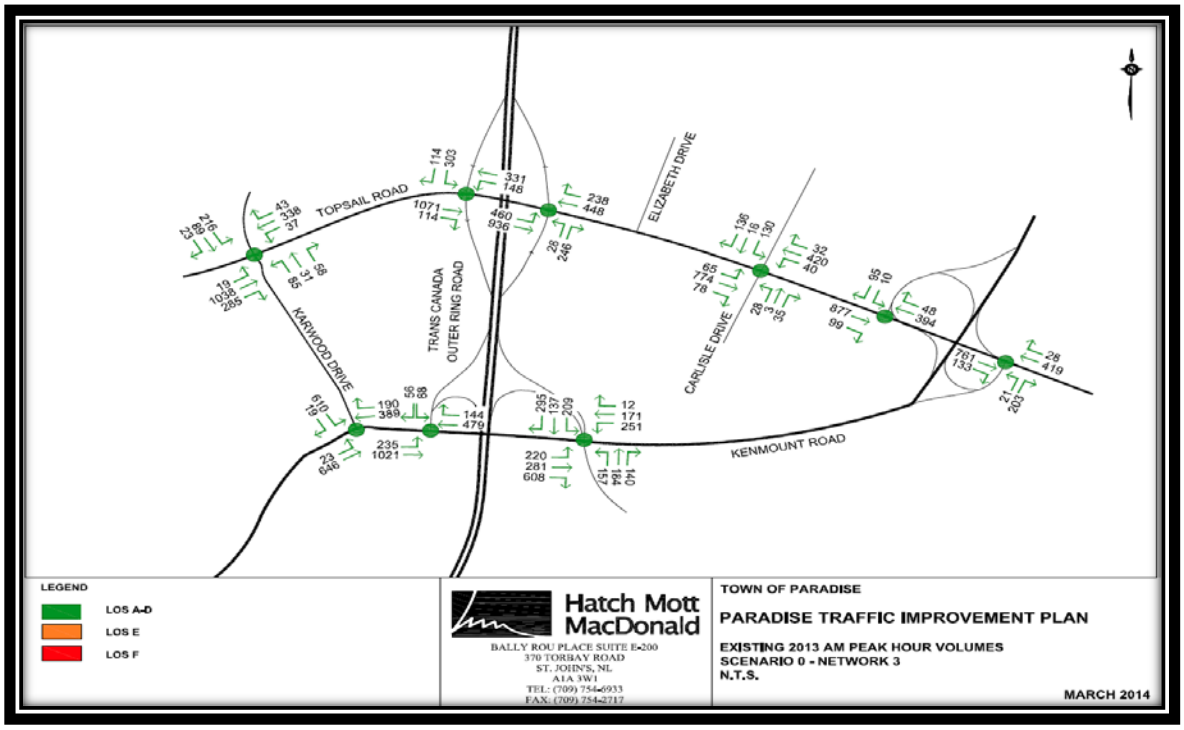


Figure 14: (S0-N3) 2013 AM Peak Hour – Kenmount Road/ORR Ramp Reconfiguration

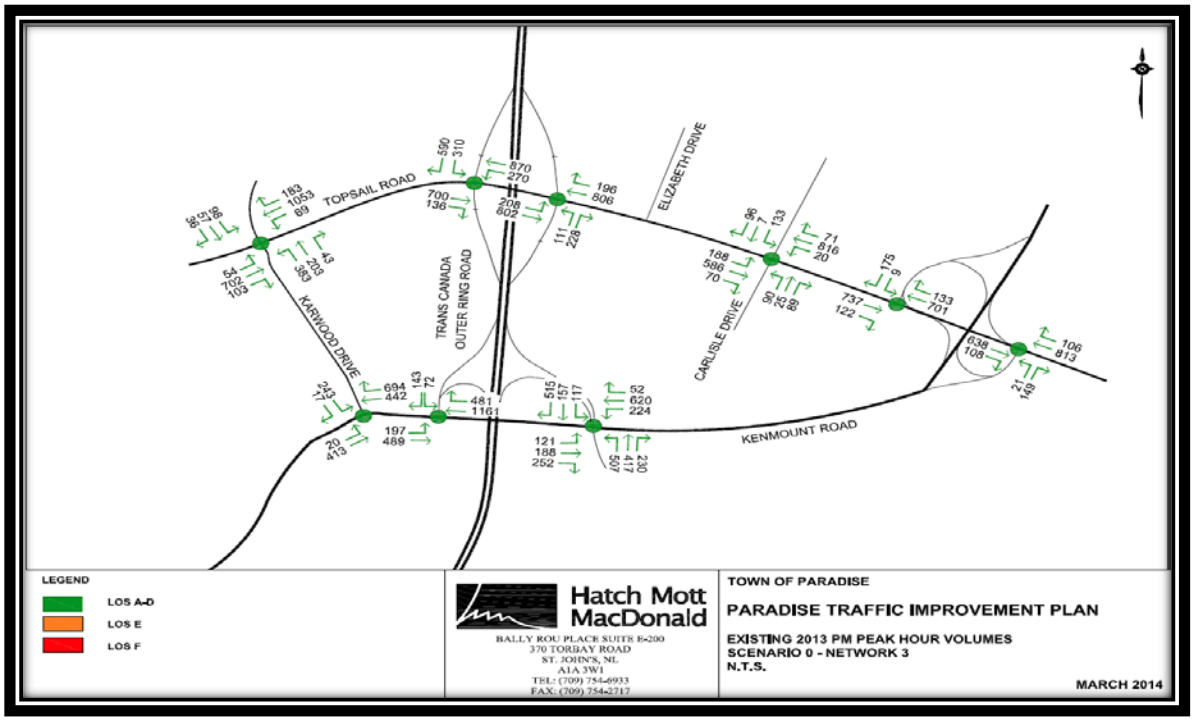


Figure 15: (S0-N3) 2013 PM Peak Hour – Kenmount Road/ORR Ramp Reconfiguration

Table 3: S0-N3 Intersection LOS Existing Volumes/Minor Improvements

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	20.3	C		18.3	B
TCH SB/Topsail Road	15.3	B		12.1	B
TCH NB/Topsail Road	8.7	A		7.8	A
Topsail Road/Carlisle Drive	11.9	B		11.9	B
Topsail Road/Kenmount Road SB	0.6	A		0.7	A
Topsail Road/Kenmount Road NB	0.5	A		0.3	A
Kenmount Road/TCH NB – Bruce Street	14.3	B		27.9	C
Kenmount Road/TCH SB	6.6	A		10.1	B
Kenmount Road/Karwood Drive	3.9	A		2.9	A

As indicated by summary results contained in Table 3 above, all intersections within the analysis area operate an acceptable LOS under the 2013 traffic volumes and the N3 road network configuration.

3.0 2025 Traffic Operations Analysis – VISUM Model

As part of the VISSIM analysis conducted for this report, road network conditions under a variety of different configurations were tested using the traffic projections obtained from the regional VISUM model. Specifically the regional VISUM model was used to obtain AM and PM peak hour forecasted traffic volume projections for the year 2025. The VISUM model includes commercial, industrial and residential development that is likely to occur in the St. John's Metro area by the year 2025. It also includes new road infrastructure such as the Team Gushue Highway that are expected to be completed by that time frame. The model was calibrated in the study area using the actual 2013 traffic volumes.

The 2025 VISUM model includes the following developments in the following areas of the St. John's Metropolitan Area:

- Brookfield Plains
- Kilbride
- Pleasantville
- Bayview Estates and Pine Ridge Estates in Torbay
- Commercial development on Glencoe Drive in Mount Pearl
- Southlands build-out
- Glencrest development (project in approval phase in southeast quadrant of Pitts Memorial Drive/Outer Ring Road interchange)
- Greeleytown Rd./Kerry Ave. (Conception Bay South)

Within the Town of Paradise, the model included development at Octagon Pond, Adams Pond, and at various other areas around the Town. The specific land use assumptions for zones in Paradise are detailed in Appendix B.

3.1 Volume Differences AM and PM Peak periods

In most of the VISUM modelling completed for this study there is a significant difference in the overall traffic volumes predicted in the AM Peak hour as opposed to the PM Peak hour.

This difference can be explained from three aspects: trip generation, trip composition, and departure time distribution. Each aspect contributes to the difference in its own way.

The Paradise development has a mixed land use type that includes commercial and retail. Commercial and retail land use typically generates more trips in the PM peak than in the AM peak. Fields observation shows that many smaller and service-oriented retailers don't open their doors until 10:00 AM or later, thus not generating much (if any) traffic during the AM peak hour. The same goes for many restaurants – if they don't serve breakfast, they won't open until 11:00 AM (after the AM peak hour), but they'll stay open until 8:00 PM or later (which includes the PM peak hour). In addition, people tend to do more shopping in the afternoon or evening compared to the morning. This is partially due some retailers not being open. It is also because some people will wait until after work before they do their shopping.

Another fact is that more "flexible" trips are generated in the afternoon. Flexible trips are the counterpart of "mandatory" trips, which travelers have to make over a certain time period of day. Commute trips are such type of trips. Research shows that approximately 75% of AM peak hour trips are "mandatory," while only 34% of PM peak hour trips are "mandatory." Approximately 66% of the "mandatory" trips are commuter trips (to/from work), with the next highest "mandatory" trip types being work-related travel (16%) and school (5%). "Flexible" trips include "Buying Goods" (i.e. retail) at 24%, restaurants at 14%, and visiting friends/relatives at 10%. These numbers indirectly support the observation that more trips are simply generated in the PM peak than in the AM peak.

In addition, the departure times of commute trips are spread out more in the AM peak period than in the PM peak period. Therefore, commute trips are more concentrated in the PM peak hour.

3.2 Minor Level of Service Discrepancies in the S1 volume models

The VISSIM software is a microscopic simulation software package that provides delay results for a network model simulation which allows the calculation of the Level of Service. The results reported in this study use the average of a total of 5 separate microscopic simulation runs per scenario. Minor discrepancies in the model results have occurred when network volumes near capacity in several of the S1 scenarios. Again, the random nature of the simulation can yield events that under high traffic volumes tend to have cascading influence on other movements in the network; these influences would not be noticed under lower volume conditions and may not occur in a similar network simulation.

3.3 2025 Forecast Traffic – Network Scenario's Tested using S1 Volumes

A total of 4 different network scenarios were modelled and tested with VISSIM using the 2025 forecasted traffic volumes obtained from the 2025 regional VISUM model. These networks include S1-N1, S1-N4, S1-N5, and S1-N7. All four networks are described in detail in section 1.5.

3.4 Scenario (S1-N1) 2025 Traffic Volumes – No Improvements to the network

The existing road network is shown in Figure 16. The AM peak hour and PM peak hour traffic are shown in Figure 17 and Figure 18.

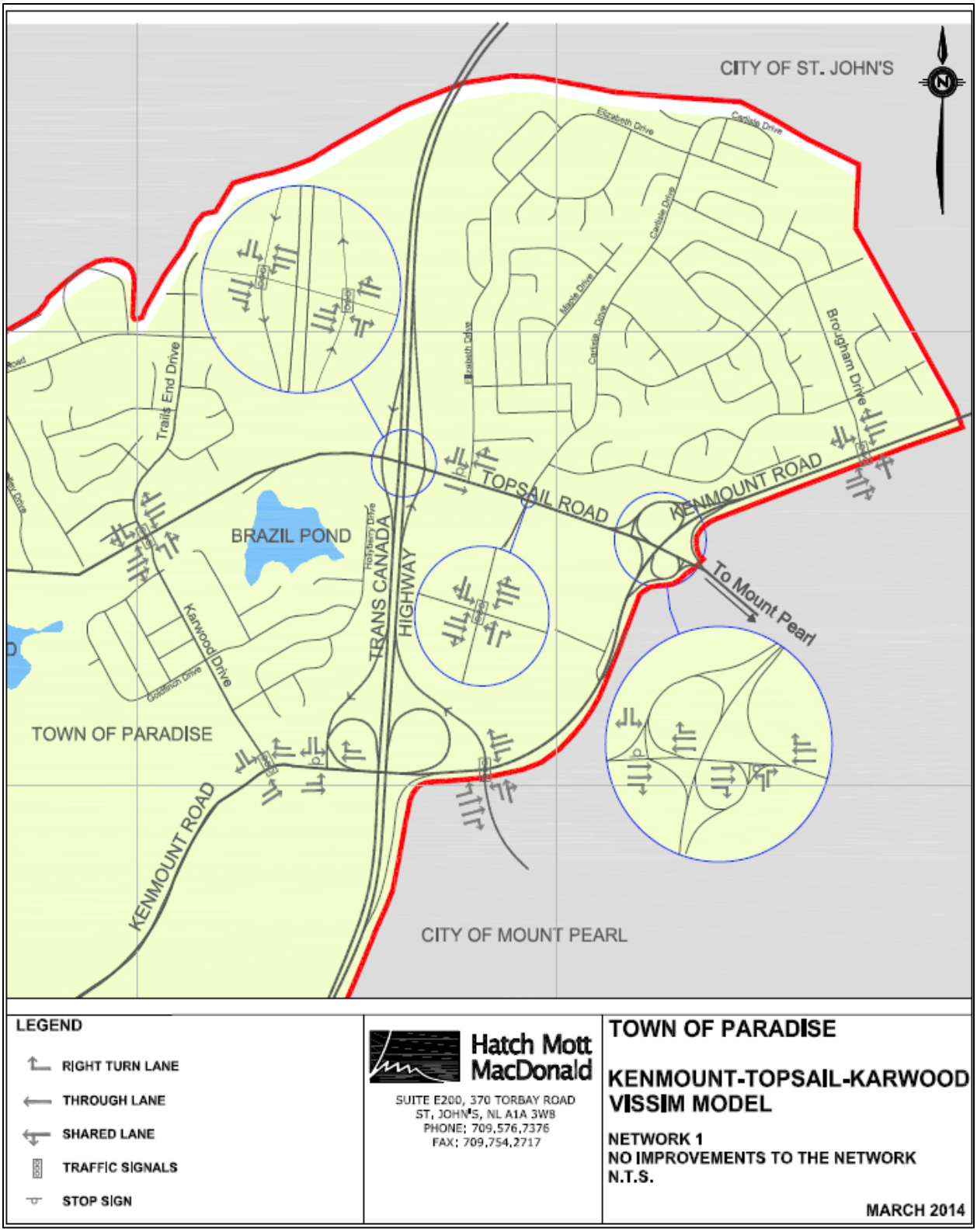


Figure 16: 2025 Forecast Volumes – No Improvements

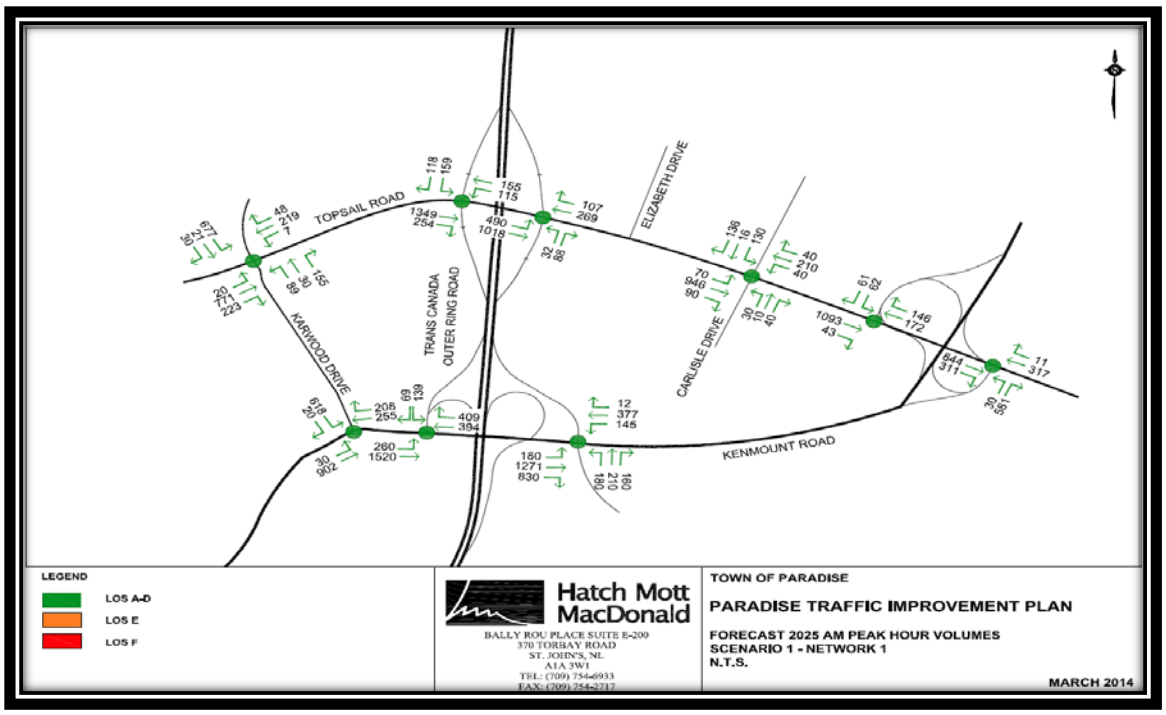


Figure 17: (S1-N1) 2025 Forecast Volumes – No Improvements - AM Peak Hour Traffic

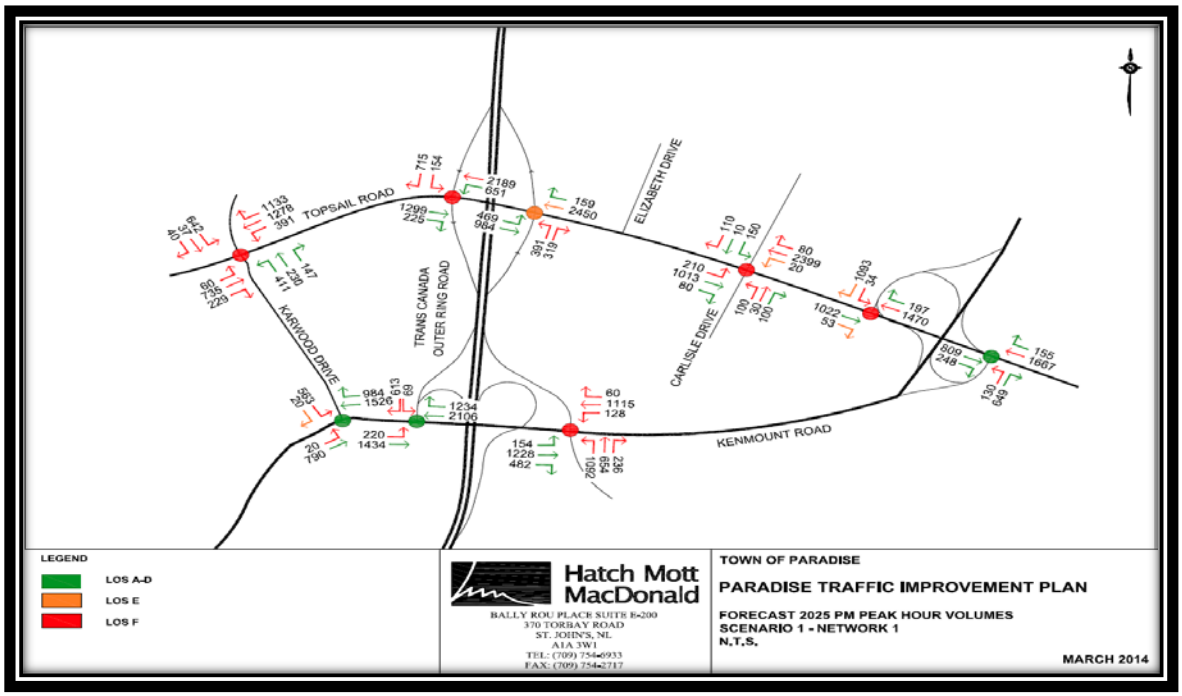


Figure 18: (S1-N1) 2025 Forecast Volumes – No Improvements - PM Peak Hour Traffic

As indicated in Figure 18 and Table 4 below, there are a number of operational related issues expected under the 2025 traffic volumes for the PM peak hour traffic volumes with no improvements having been made to the road network. The analysis indicates that many movements at most of the intersections within the study area operate with very high delays. The overall network is very congested as shown in

Figure 19, Figure 20 and Figure 21. Details of the LOS and delays for each intersection lane group are contained in Appendix C.

Table 4: S1-N1 Intersection LOS 2025 Volumes/No Improvements

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	25.1	C		163.3	F
TCH SB/Topsail Road	12.0	B		120.0	F
TCH NB/Topsail Road	7.8	A		71.3	E
Topsail Road/Carlisle Drive	9.0	A		107.8	F
Topsail Road/Kenmount Road SB	0.6	A		57.2	F
Topsail Road/Kenmount Road NB	1.2	A		30.1	D
Kenmount Road/TCH NB – Bruce Street	18.1	B		121.4	F
Kenmount Road/TCH SB	3.7	A		34.3	D
Kenmount Road/Karwood Drive	25.3	C		30.5	C

Figure 19: 2025 PM Peak Hour Traffic – Kenmount Road

Figure 20: 2025 PM Peak Hour Traffic – Topsail Road/ Karwood Drive

Figure 21: 2025 PM Peak Hour Traffic – Topsail Road/Kenmount Road

3.5 Scenario (S1-N4) 2025 Traffic Volumes – Network 4 Improvements

The improvements for network 4 are shown in Figure 22. The AM peak hour and PM peak hour traffic volumes and LOS are shown in Figure 23 and Figure 24.

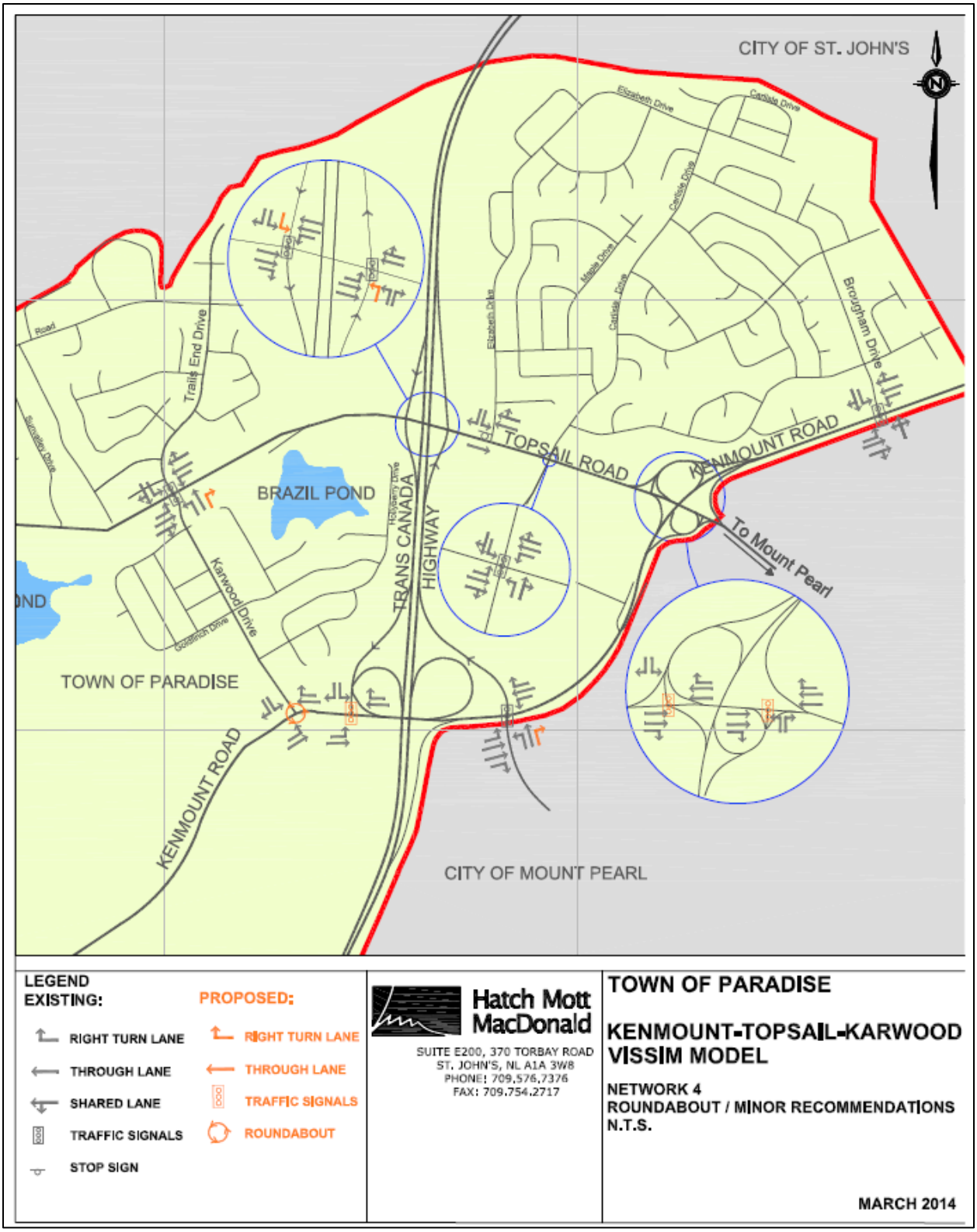


Figure 22: 2025 Minor Lane Improvements – Lane Configurations

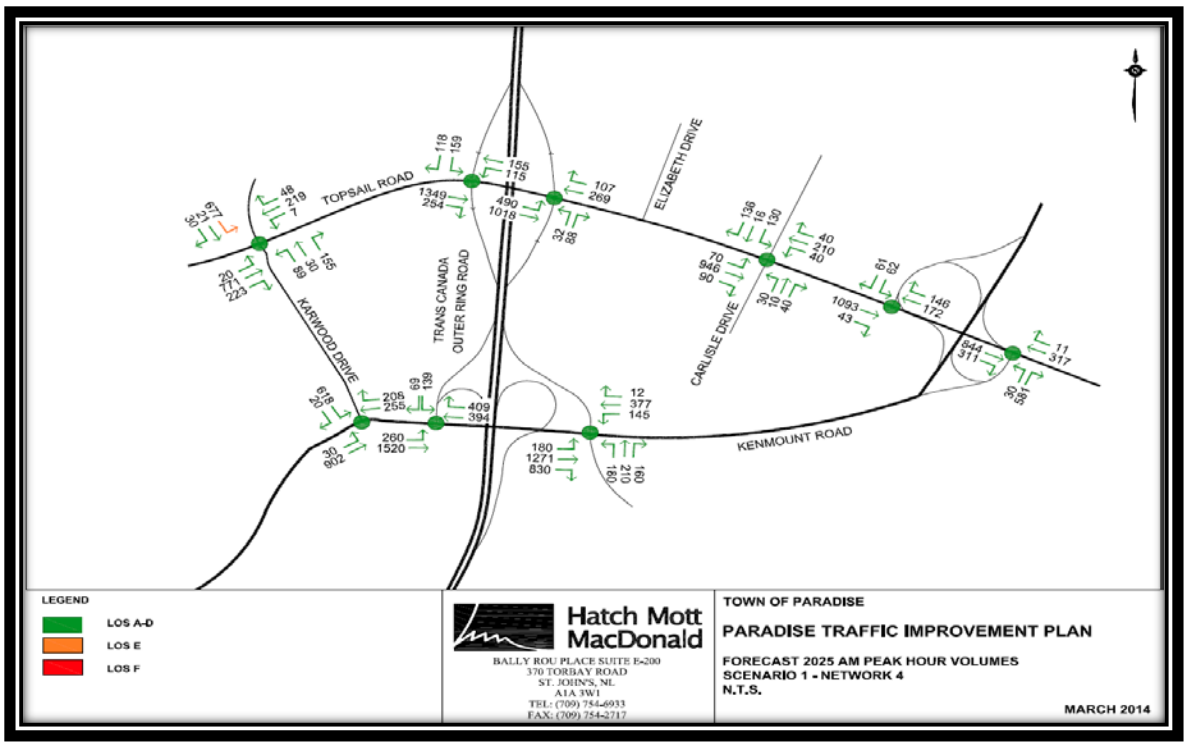


Figure 23: (S1-N4) 2025 AM Peak Hour Traffic – Minor Lane Improvements

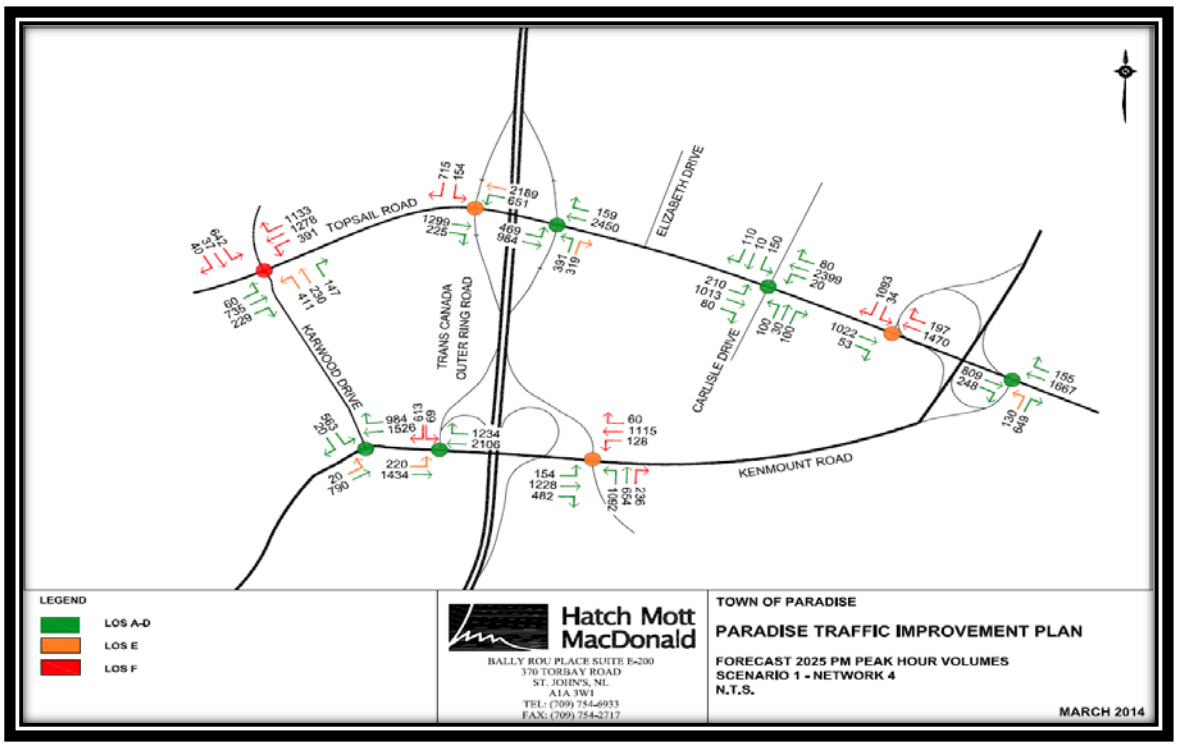


Figure 24: (S1-N4) 2025 PM Peak Hour Traffic – Minor Lane Improvements

While the results for this scenario (S1-N4) show a significant improvement in the LOS at many intersections over the 2025 (S1-N1) results, Figure 24 indicates there remain many problems with poor levels of service and delay during the PM peak hour at many of the intersections in the network including:

- Topsail Road at Karwood
  - All SB Movements - LOS F
  - All WB Movements - LOS F
  - All NB Movements - LOS E &F
- Topsail Road Ramp Terminal with ORR
  - All SB Movements - LOS F
  - NB Right - LOS E
  - WB thru at SB ramp terminal LOS F
- Topsail Road at Kenmount Road
  - All SB Movements - LOS F
  - All WB Movements at SB ramp Junction - LOS F
  - NB Left -LOS F
- Kenmount Road at Karwood
  - EB left - LOS F
  - WB right - LOS F
- Kenmount Road at ORR
  - All SB Movements - LOS F
- Kenmount Road at Bruce Street
  - All WB Movements - LOS F
  - NB Right - LOS F

It should be noted that there are significant traffic volumes at all intersections in the study area during the PM peak hour under the S1 volumes. Minor improvements to these intersections such as the addition of auxiliary turning lanes, and signal timing optimization will only go so far to improving the LOS. Additional capacity and/or reductions in the traffic volumes appear to be needed.

Table 5: S1-N4 Intersection LOS 2025 Volumes /Minor Improvements

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	30.6	C		109.6	F
TCH SB/Topsail Road	9.4	A		75.7	E
TCH NB/Topsail Road	4.8	A		22.2	C
Topsail Road/Carlisle Drive	8.3	A		29.45	C
Topsail Road/Kenmount Road SB	3.8	A		73.3	E
Topsail Road/Kenmount Road NB	2.5	A		9.5	A
Kenmount Road/TCH NB – Bruce Street	13.6	B		67.6	E
Kenmount Road/TCH SB	10.4	B		38.1	D
Kenmount Road/ Karwood Drive	5.3	A		14.4	B

3.6 Scenario (S1-N5) 2025 Traffic Volumes – Network 5 Improvements

Similar to the N4 network, the N5 network involves a Route 1 ramp configuration change at the Kenmount Road Bruce Street intersection. This network configuration had been suggested by the NL Department of Transportation and Works. This option in essence removes the Route 1/ ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street traffic signal. By eliminating the NB off-ramp the goal was to significantly reduce the weaving problems with the off-ramp traffic and the EB traffic coming from the Town of Paradise wanting to turn right onto Bruce Street.

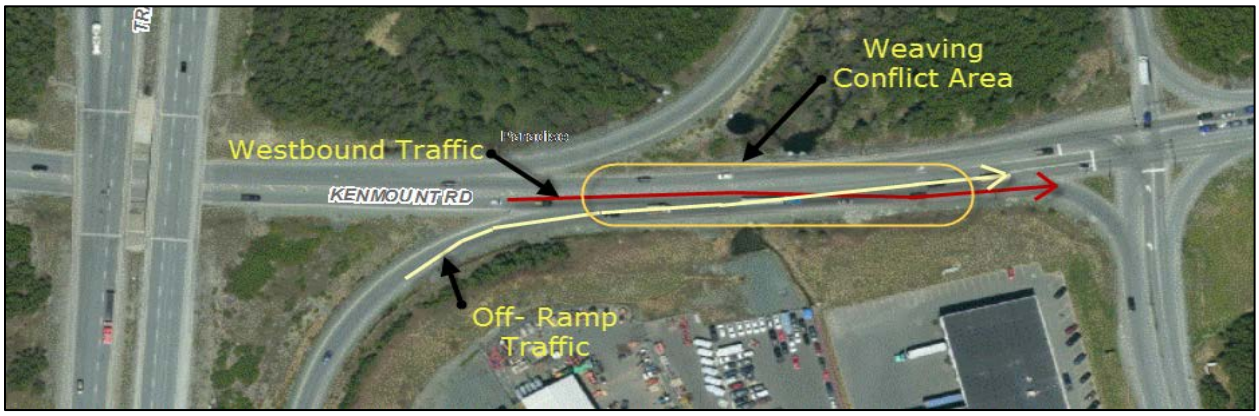


Figure 25: Weaving Conflict Area - Kenmount Road

The road network improvements for Network 5 are shown in Figure 26 below.

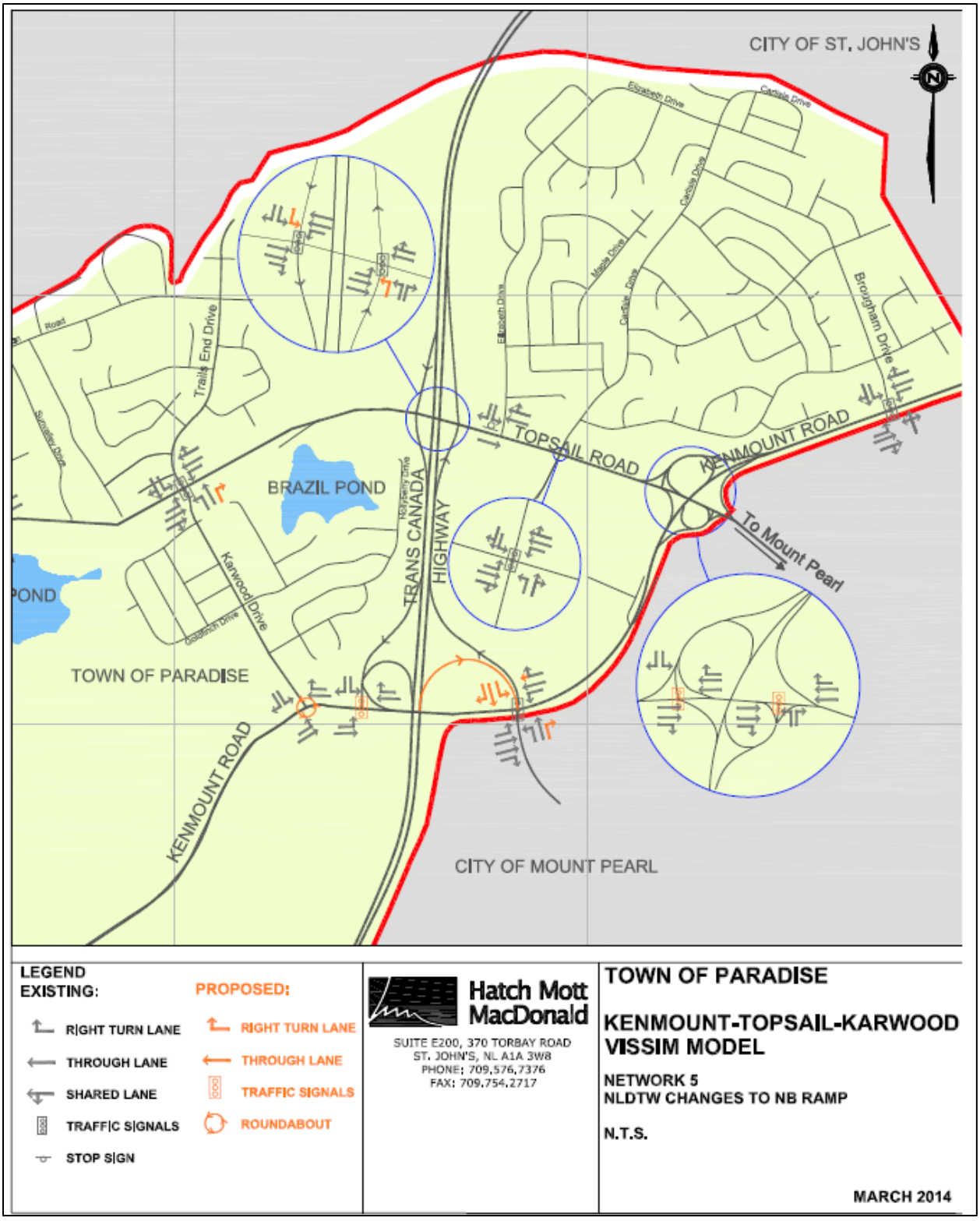


Figure 26: 2025 Kenmount Road/Route1/ORR Ramp Reconfiguration – Lane Configuration

The LOS for each movement as calculated by VISSIM are shown by colour in Figure 27 and Figure 28. The analysis summaries and detailed results are included in Appendix D.

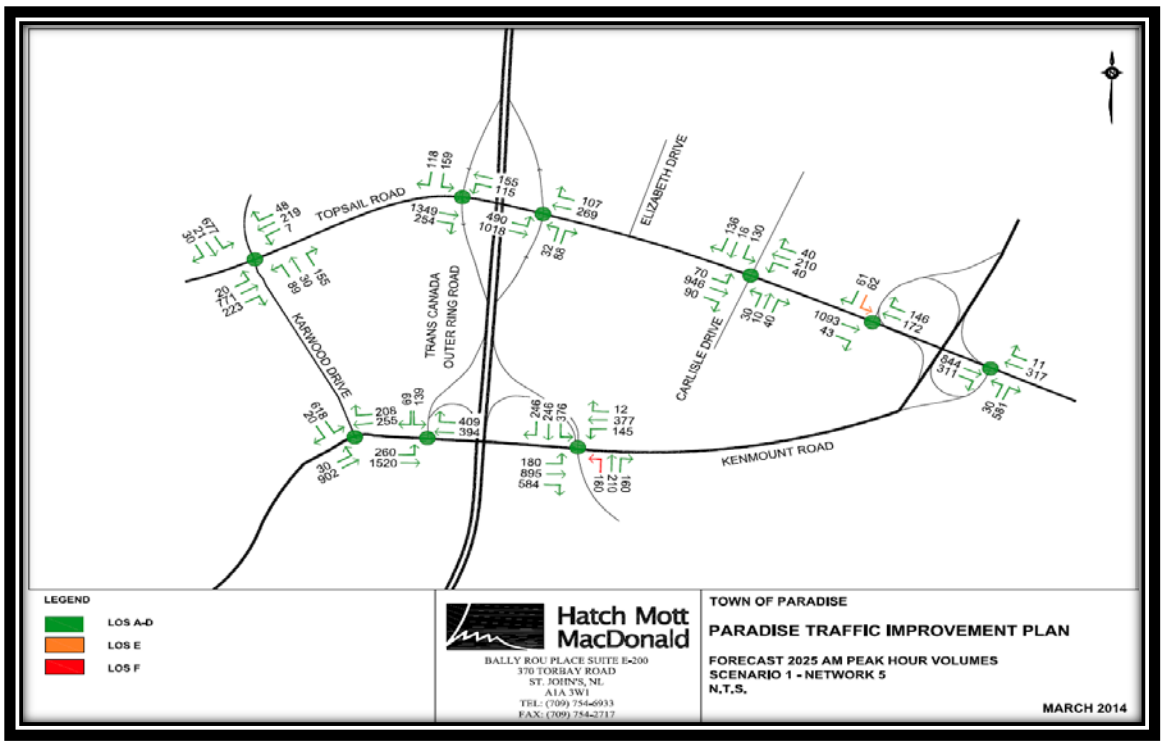


Figure 27: (S1-N5) 2025 AM Peak Hour Traffic – Kenmount Road/ ORR Ramp Reconfiguration

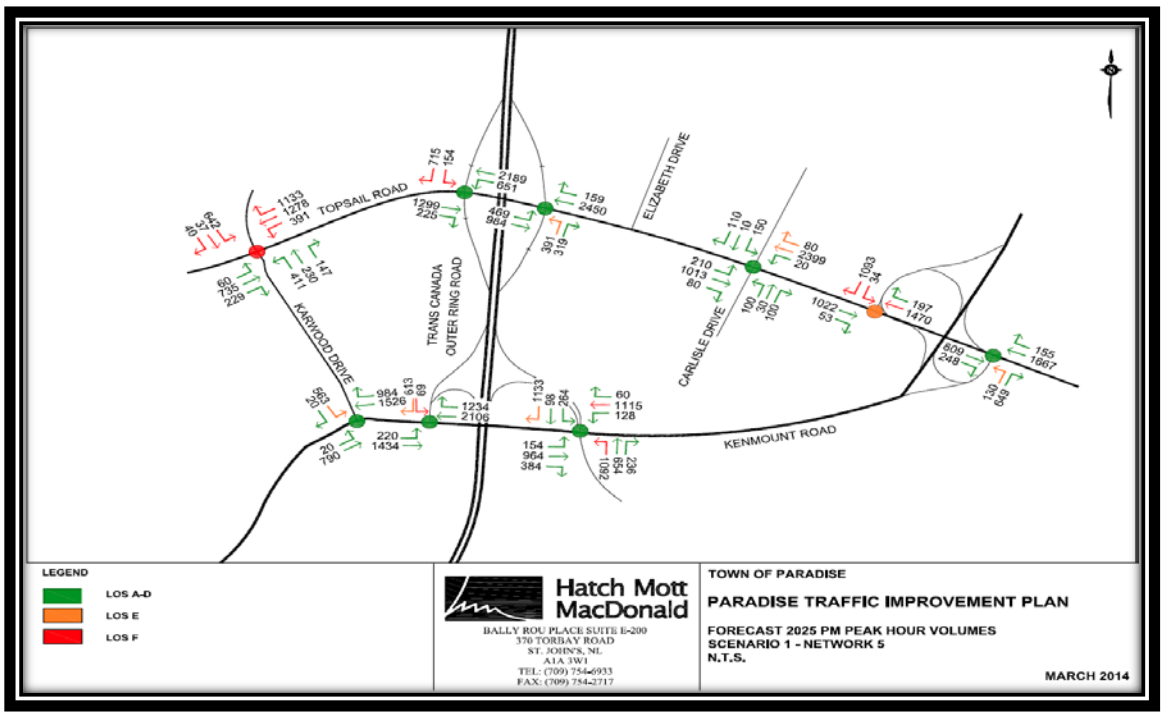


Figure 28: (S1-N5) 2025 PM Peak Hour Traffic – Kenmount Road/ ORR Ramp Reconfiguration

The ramp reconfiguration shown in Figure 26 certainly deals effectively with any weaving problems that that may have been present between the NB off-ramp traffic and the WB traffic on Kenmount Road

wanting to turn right onto Bruce Street. The NB loop–ramp, however, operates at a poor level of service with queuing that extends back onto the Outer Ring Road; LOS F. Problems are also present with the with the NB left turning movements from Bruce Street and with all the SB off-ramp terminal movements; operating at LOS F. Figure 29, Figure 30, and Figure 31 are screenshots from the VISSIM analysis which show how congested the road network becomes with 2025 traffic volumes under the N5 road network.

Table 6: S1-N5 2025 – Kenmount Road/ ORR Ramp Reconfiguration Summary Analysis

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	25.6	C		80.6	F
TCH SB/Topsail Road	9.7	A		51.2	D
TCH NB/Topsail Road	6.0	A		24.3	C
Topsail Road/Carlisle Drive	8.0	A		43.8	D
Topsail Road/Kenmount Road SB	3.5	A		62.5	E
Topsail Road/Kenmount Road NB	1.2	A		25.5	C
Kenmount Road/TCH NB – Bruce Street	32.8	C		53.2	D
Kenmount Road/TCH SB	7.5	A		14.5	B
Kenmount Road/Karwood Drive	7.4	A		13.2	B

Figure 29: S1-N5 2025 PM Peak Hour Traffic – Kenmount Road

Figure 30: S1-N5 2025 PM Peak Hour Traffic – Topsail Road/ Karwood Drive

Figure 31: S1-N5 2025 PM Peak Hour Traffic – Topsail Road/Kenmount Road

3.7 Scenario (S1-N7) 2025 Traffic Volumes – Network 7 Improvements

The network 7 scenario is the roundabouts option. This VISSIM model (S1-N7) used roundabouts at the Kenmount Road intersections with Karwood Drive, the ORR SB off- ramp terminal and at Bruce Street. Roundabouts were also used at the ORR ramp terminals with Topsail Road. Auxiliary right turn lanes were added to all approaches to the Karwood Drive/Topsail Road intersection. The NLDTW ORR ramp reconfiguration at Kenmount Road at Bruce Street was also used. This option in essence removes the ORR NB off-ramp at Kenmount Road and realigns the NB loop ramp to connect with the Bruce Street roundabout. Traffic Signals were used at the Kenmount Road ramp terminals with Topsail Road.

The traffic volumes forecasted using the 2025 regional model are fairly substantial in the pm peak hour. In fact the capacity of many of the signalized intersections, even with signal timing changes and the addition of auxiliary lanes is exceeded resulting in long delays, queues and poor levels of service. Roundabouts, when designed properly, do have the ability to service higher volumes of traffic with better levels of service than traffic signals.

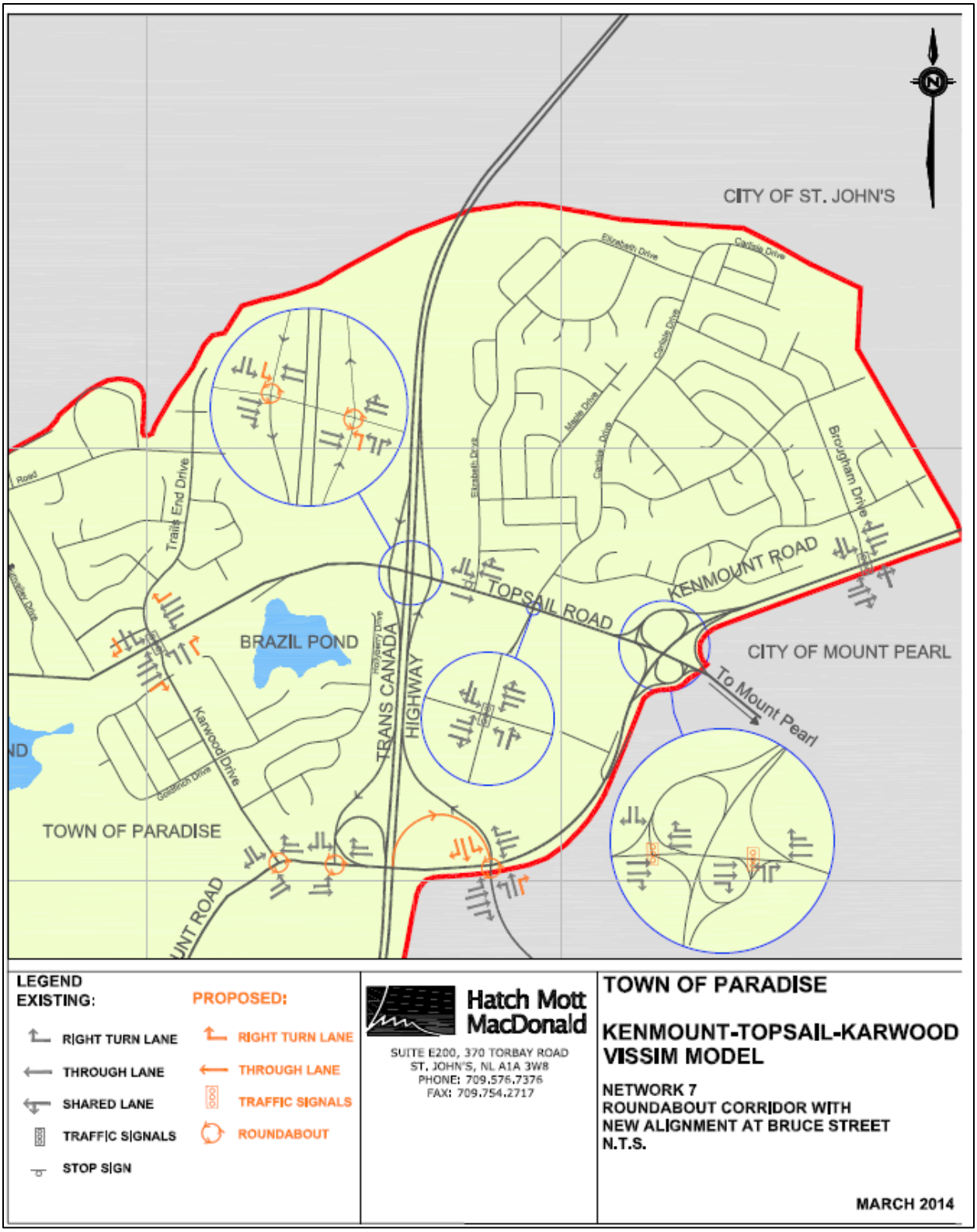


Figure 32: 2025 Roundabout Corridor – Lane Configuration

The LOS for each movement as calculated by VISSIM are shown by colour in Figure 33 and Figure 34. The analysis summaries and detailed results are included in Appendix B.

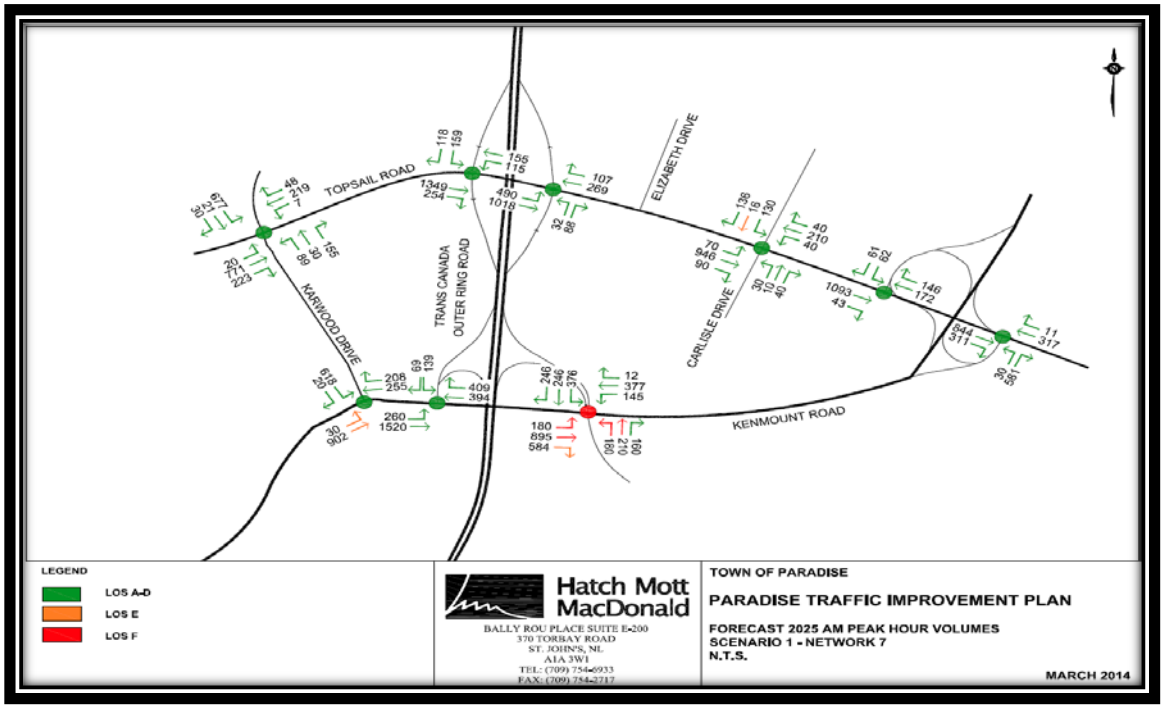


Figure 33: S1-N7 2025 AM Peak Hour Traffic – Roundabout Corridor

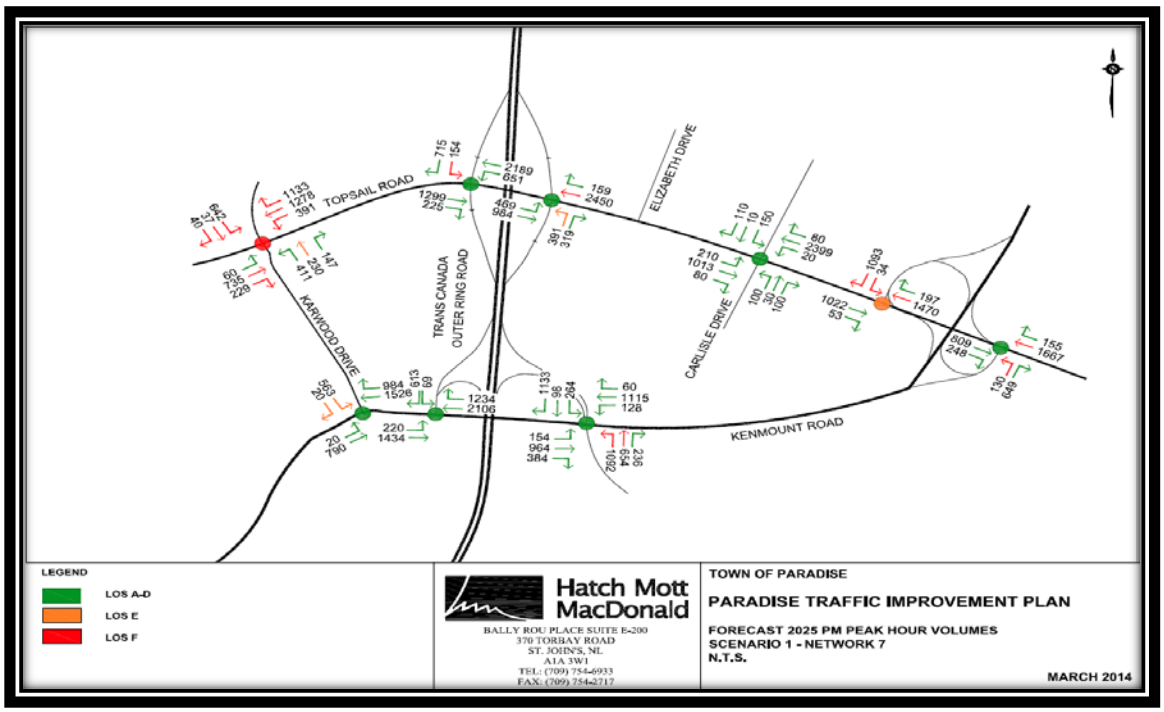


Figure 34: S1-N7 2025 PM Peak Hour Traffic – Roundabout Corridor

The overall summary results for each intersection in this scenario are shown for both the AM and PM peak hours in Table 7 below. It's clear from the analysis that while the roundabouts do provide some improvement to the intersections performance there is simply too much traffic on the road network; the forecasted volumes are beyond the capacities of both Topsail Road and Kenmount Road. There is a need look at other alternatives that can provide additional access provided to the Town from the Outer Ring Road and the Conception Bay By-Pass Road.

Table 7: S1-N7 2025 – Roundabout Corridor Summary LOS Analysis

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	27.4	C		155.1	F
TCH SB/Topsail Road	11.0	B		29.8	D
TCH NB/Topsail Road	5.1	A		33.1	D
Topsail Road/Carlisle Drive	13.6	B		29.4	C
Topsail Road/Kenmount Road SB	2.6	A		76.4	E
Topsail Road/Kenmount Road NB	1.0	A		51.5	D
Kenmount Road/TCH NB – Bruce Street	65.9	F		27.6	D
Kenmount Road/ CH SB	21.3	C		8.3	A
Kenmount Road/ Karwood Drive	28.9	E		12.6	B

3.8 2025 Forecast Traffic – Additional Interchange Connections to both Route 1 and Route 2, Scenarios (S3-N7), (S5-N6), (S5-N7)

The results of the analyses of the previous VISSIM scenarios (S1-N1, S1-N4, S1-N5, S1-N7) indicate that the study area road network volumes are simply too high during the PM peak hour and exceed the ability of the intersections on both Topsail Road and Kenmount Road to accommodate the traffic within a reasonable LOS. Other access options need to be explored; access options that will reduce the traffic volumes on the study area intersections.

Additional accesses to both the Conception Bay Bypass Road and to the Outer Ring Road were both incorporated into the 2025 regional VISUM model. The first connection made to the model was a connection from the Conception Bay By-Pass Road to the Kenmount Road and Topsail Road as shown in the lower portion of Figure 35. This connection alone was used to obtain the S3 volumes in VISUM. Both interchange connections were added to the model to obtain the S5 volumes.

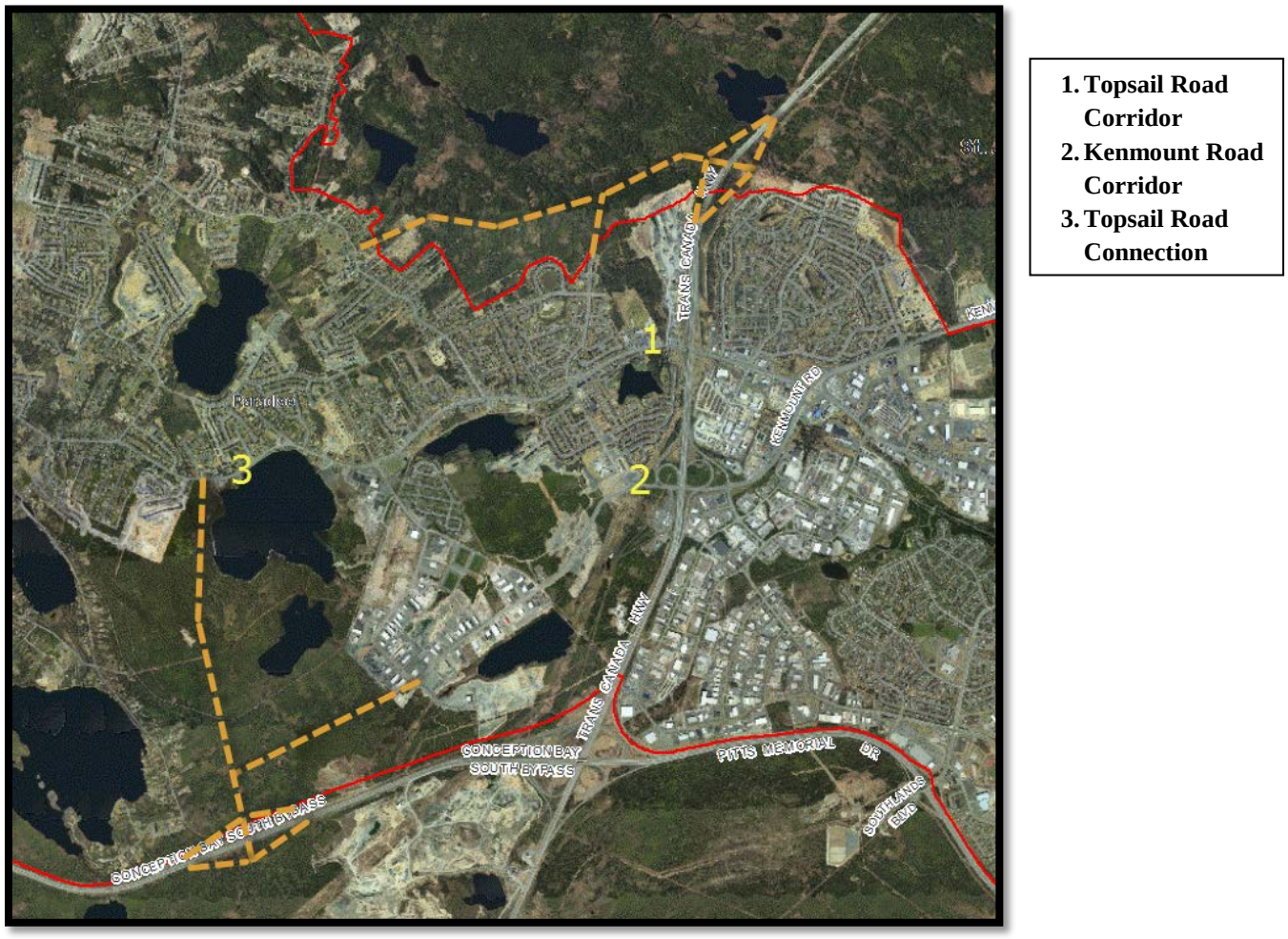


Figure 35: New Access to Route 1 and Route 2

The proposed Conception Bay Bypass/Route 2 interchange connection to the both Topsail Road and to Kenmount Road has a substantial impact on reducing volumes along the Kenmount Road corridor. The Kenmount Road portion of the connection to Route 2 has the greatest impact in terms of providing relief to the intersections in the study area along the Kenmount Road corridor. The Topsail Road connection provides some relief to the Topsail Road corridor but should be considered secondary to the Kenmount Road connection. This connection does allow the Route 2 interchange to intercept some traffic that would otherwise end up at the intersections along the Topsail Road corridor in the study area but the volumes are not substantial. This connection provides good access for the planned future residential developments in this area.

Please note that the proposed connection point on Topsail Road conflicts with the proposed location of the new K-6 School planned for Paradise. The Town should still strive to make this connection point to Topsail and while the connection point shown in Figure 35 may not be feasible it may be possible to make the connection in a more circuitous manner via the road networks of the planned future residential developments in this area. Care will have to be taken to ensure the route is designed to be compatible with the residential land use; traffic calming measures may be required upfront in the design process for the development of the subdivisions in this area.

The proposed Outer Ring Road/Route 1 interchange connection to both Trails End Drive and Paradise Road will have the greatest effect on reducing the traffic volumes along the Topsail Road corridor. This connection allows traffic from many residential neighbourhoods north of Topsail Road an alternative route to Topsail Road and the Route 1 interchange with Topsail Road.

3.9 Scenario (S3-N7) 2025 Traffic Volumes – Network 7 Improvements

The traffic volumes from the S3 VISUM model which include the Route 2 interchange connection to Kenmount Road and Topsail Road were used in a VISSIM model that reflects the roundabouts option N7. The results of the analysis are reflected in Figure 37 and Figure 38 for the AM and PM Peak hours respectively.

The results of the VISSIM analysis are summarized in Table 8. The analysis indicates that although the number of movements operating at LOS E or F has decreased significantly from the base 2025 analysis, there are still certain intersections with movements operating at an unacceptable LOS, including Topsail Road / Karwood Drive, Topsail Road / Outer Ring Road (TCH), and Kenmount Road / Bruce Street. The analysis summaries and detailed results are included in Appendix B.

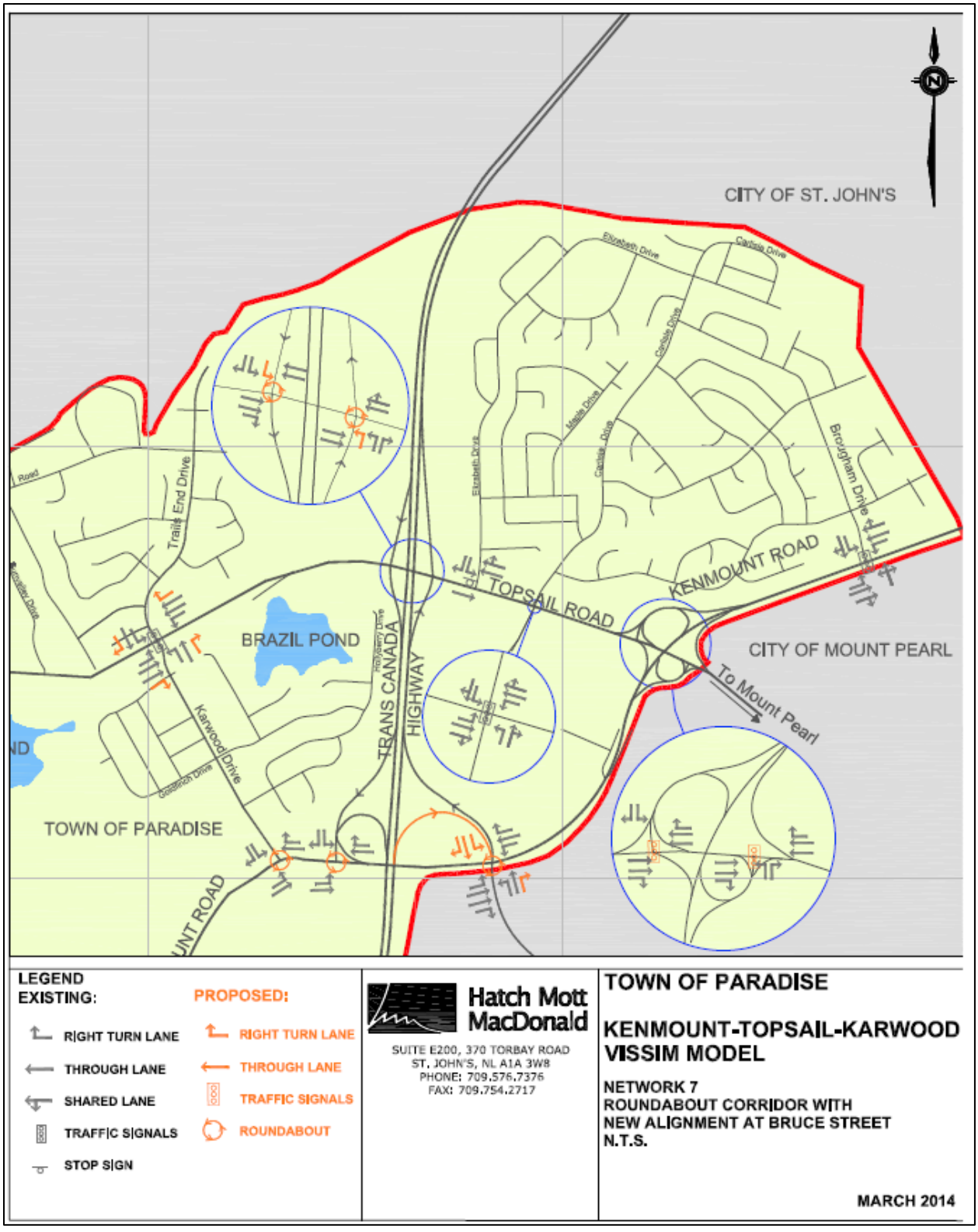


Figure 36: 2025 Roundabout Corridor – Lane Configuration

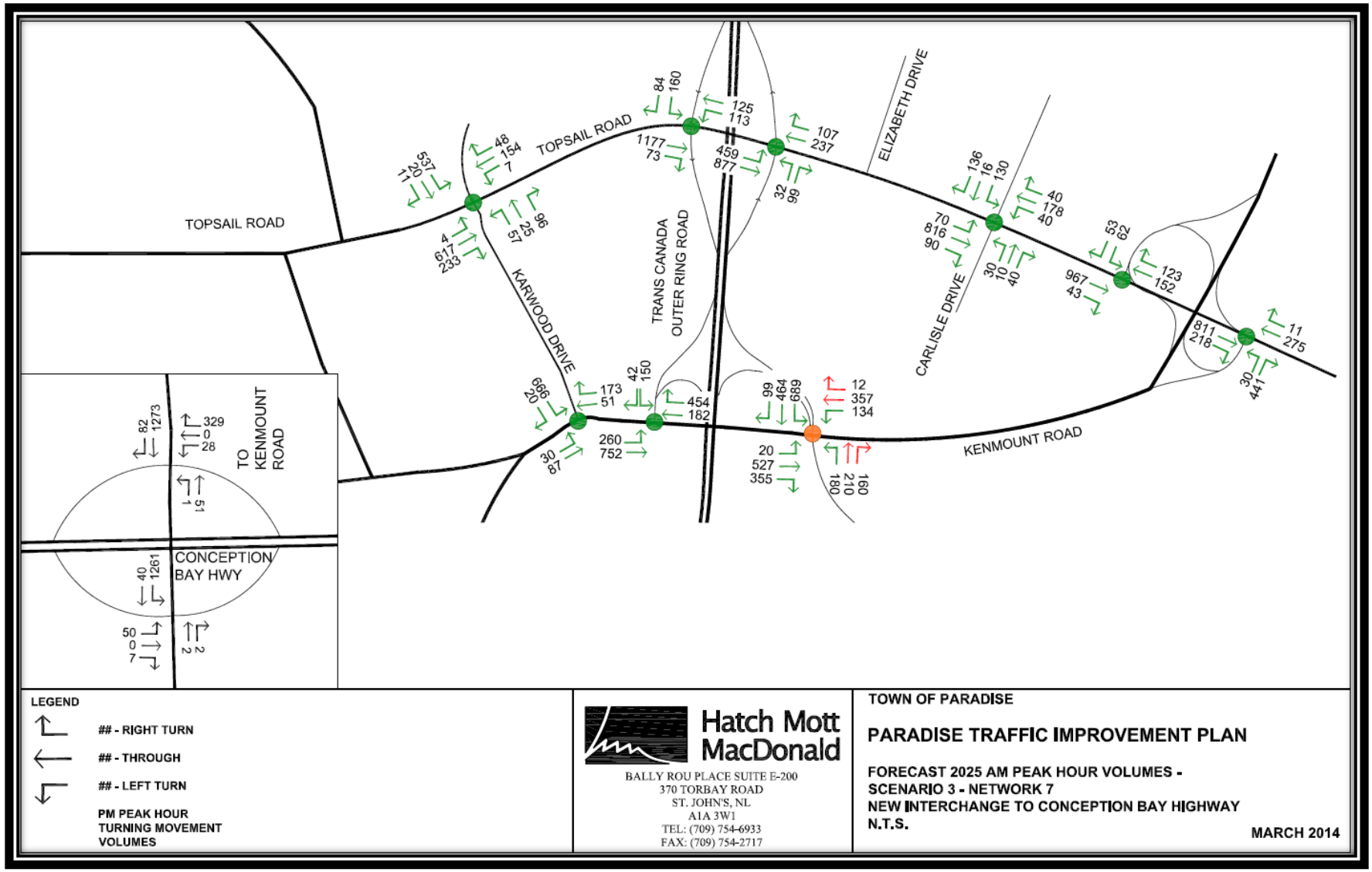


Figure 37: 2025 AM Peak Hour Traffic – Interchange to Conception Bay Bypass

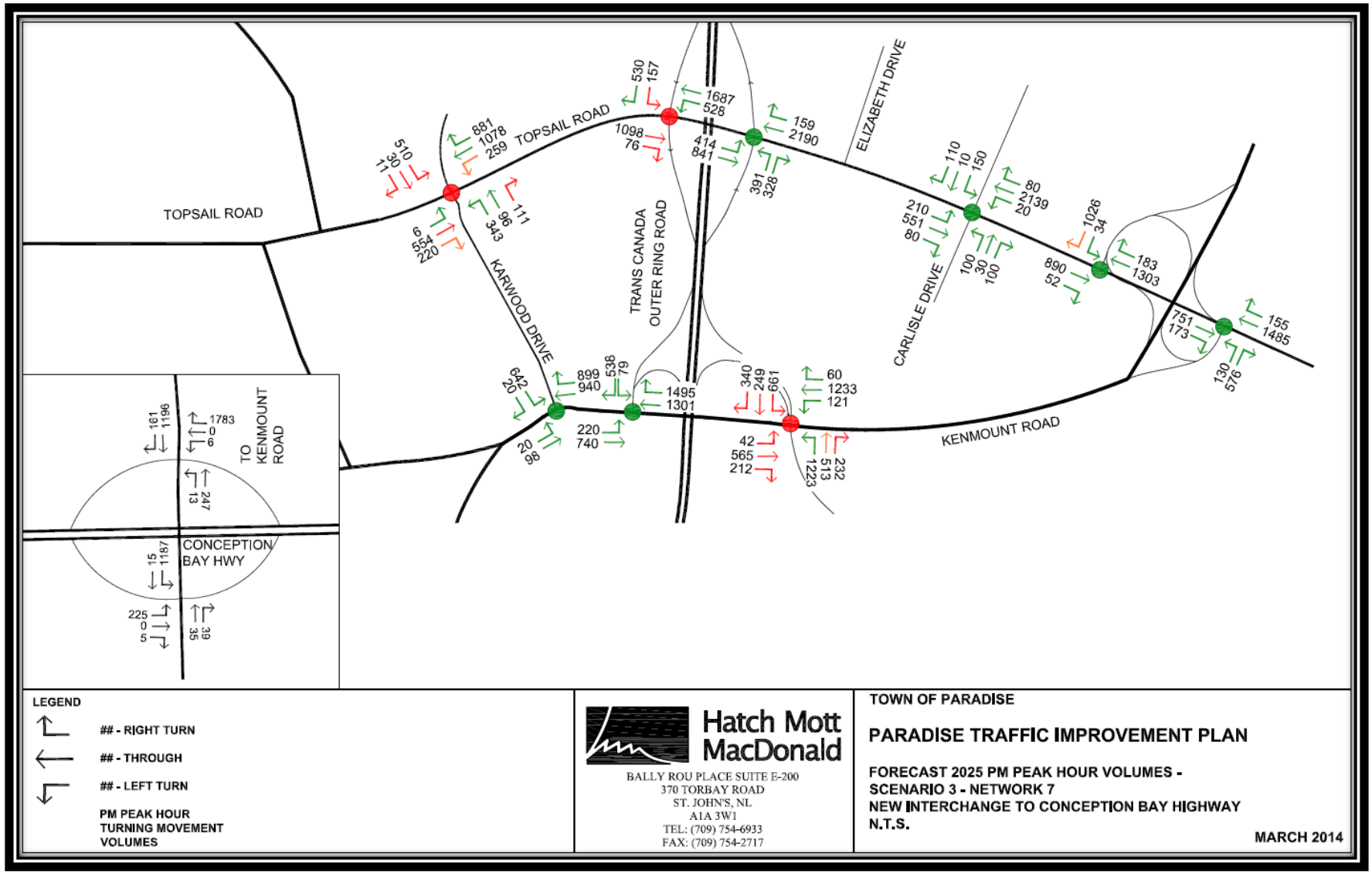


Figure 38: 2025 PM Peak Hour Traffic – Interchange to Conception Bay Bypass

Table 8: 2025 – Interchange to Conception Bay By-pass with Roundabout Corridor Summary LOS Analysis

Intersection	AM Peak Hr			PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS		VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	22.0	C		93.8	F
TCH SB/Topsail Road	16.5	C		55.6	F
TCH NB/Topsail Road	4.9	A		12.5	B
Topsail Road/Carlisle Drive	14.0	B		28.4	C
Topsail Road/Kenmount Road SB	3.9	A		4.1	A
Topsail Road/Kenmount Road NB	1.3	A		1.6	A
Kenmount Road/TCH NB – Bruce Street	38.8	E		65.7	F
Kenmount Road/TCH SB	0.0	A		3.3	A
Kenmount Road/Karwood Drive	1.1	A		5.1	A

3.10 Scenario (S5-N6) (S5-N7) 2025 Traffic Volumes, New Interchange Connections in place to both Route 1 and to Route 2– Network 6 and Network 7 Improvements

The S5-N6 scenario and the S5-N7 are very similar in structure. This VISSIM models for both scenarios used the 2025 VISUM forecasted traffic volumes that were generated reflecting interchange connections to Topsail Road and Kenmount Road from Route 2 and interchange connections to both Trails End Drive and to Paradise Road from Route 1. Traffic signal timings in both scenarios were optimized and a number of common intersection improvements were made to the both road networks including:

- An auxiliary right turn lane at all approaches to the Karwood Drive / Topsail Road intersection,
- Roundabouts at the ORR ramp terminals with Topsail Road,
- Roundabout at Karwood Drive and Kenmount Road,
- Roundabout at ORR SB ramp terminal with Kenmount Road,
- Roundabout at Kenmount Road and Bruce Street, and
- Traffic Signals at the Kenmount Road ramp terminals with Topsail Road.

The only difference between the S5-N6 and the S5-N7 models is the configuration of the Route 1 ramp systems leading into the Bruce Street / Kenmount Road roundabout. Under the N6 network, the existing ramp system is used. Under the N7 scenario, the Northbound Route 1 off ramp is redirected onto the Northbound Route 1 loop ramp and that loop ramp is reconfigured and incorporated into the Bruce Street

intersection. The results of the S5-N6 scenario are shown in Figures 40 and 41. The summary LOS and Delay summaries are shown in Table 9.

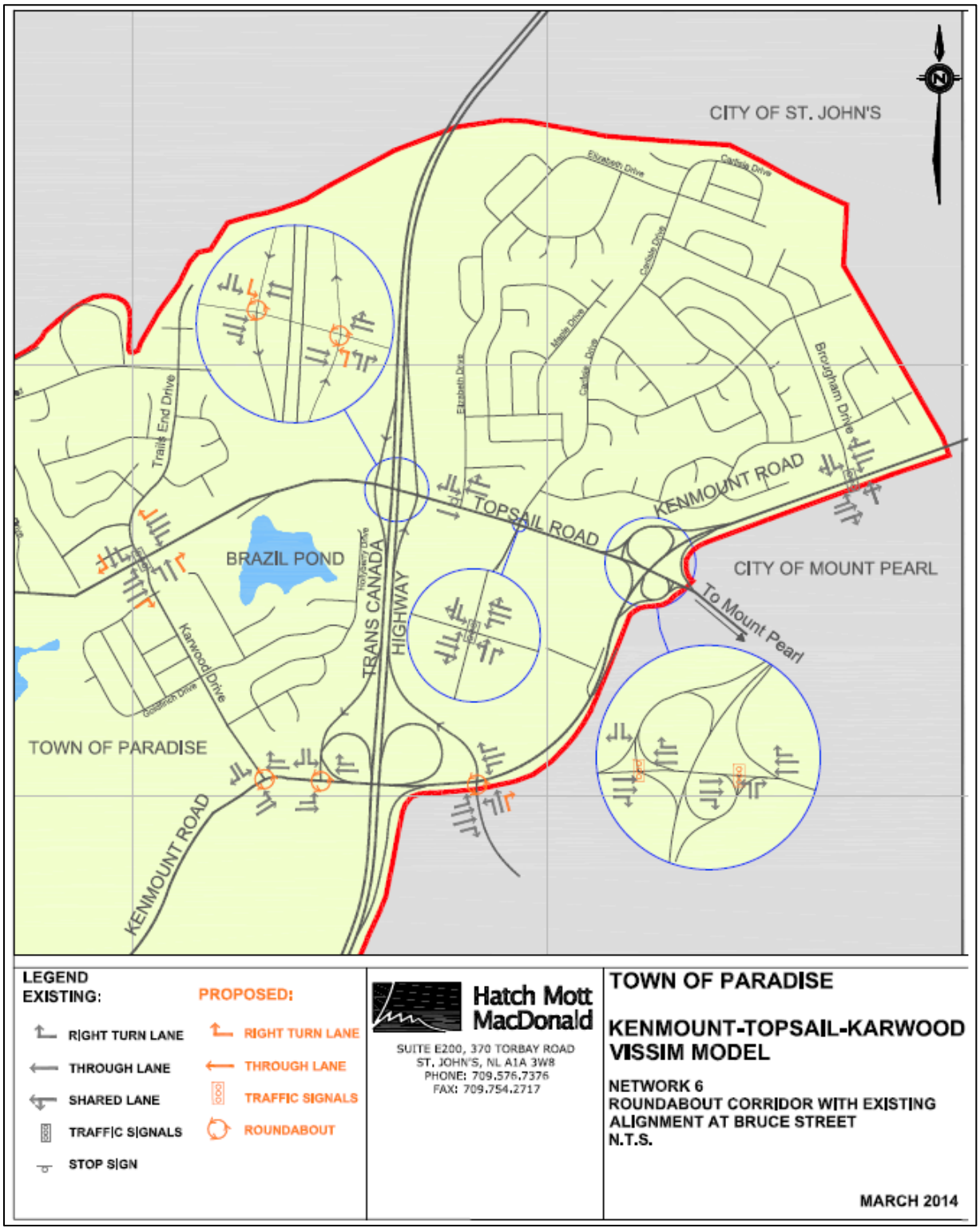


Figure 39: 2025 Roundabout Corridor without new Bruce Street Alignment – Lane Configuration

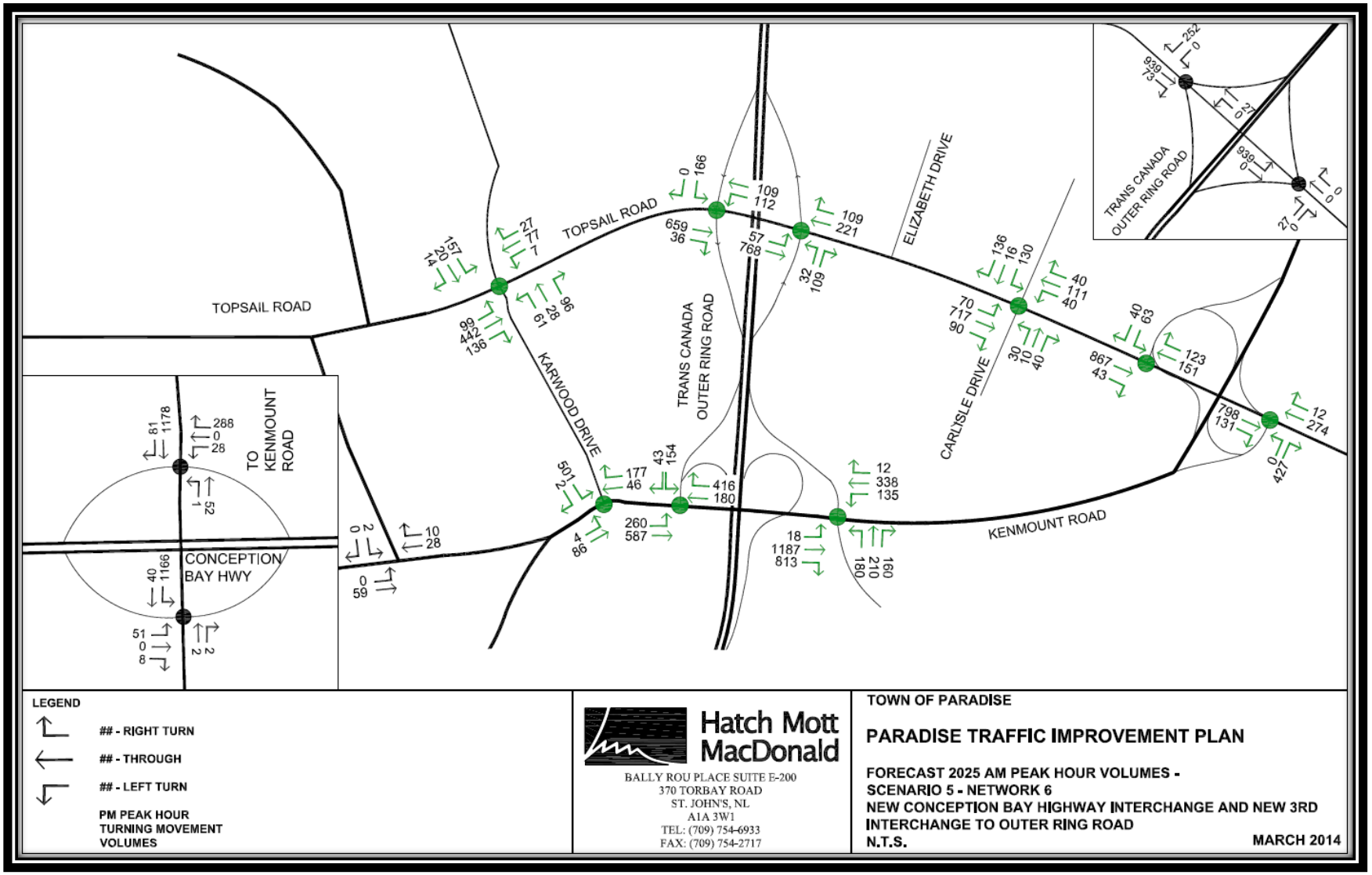


Figure 40: 2025 AM Peak Hour Traffic – Interchange to Conception Bay Bypass & Outer Ring Road without new Bruce Street Alignment

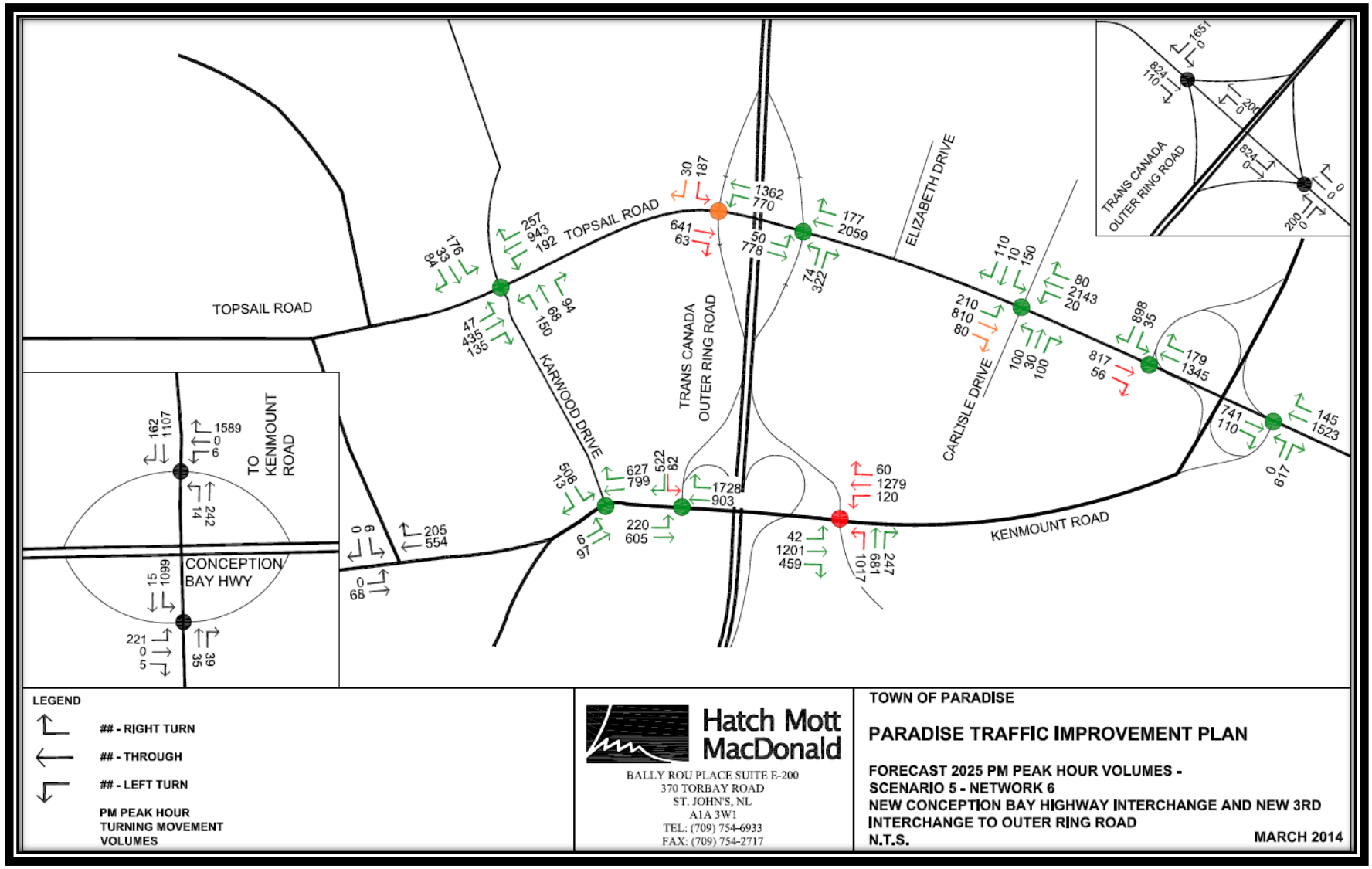


Figure 41: 2025 PM Peak Hour Traffic – Interchange to Conception Bay Bypass & Outer Ring Road without new Bruce Street Alignment

Table 9: S5-N6 2025 – Kenmount Road/ ORR Ramp Reconfiguration without new Bruce Street Alignment Summary LOS Analysis

Intersection	AM Peak Hr		PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS	VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	14.0	B	20.9	C
TCH SB/Topsail Road	5.3	A	45.8	E
TCH NB/Topsail Road	1.5	A	4.3	A
Topsail Road/Carlisle Drive	14.4	B	43.5	D
Topsail Road/Kenmount Road SB	3.9	A	26.8	C
Topsail Road/Kenmount Road NB	0.4	A	0.5	A
Kenmount Road/TCH NB – Bruce Street	7.7	A	58.1	F
Kenmount Road/TCH SB	3.3	A	15.3	C
Kenmount Road/Karwood Drive	0.8	A	6.0	A

The analysis of the 2025 traffic with both interchanges to Conception Bay Bypass and Outer Ring Road (TCH) without the new Bruce Street Alignment indicates that there would only be poor LOS at Topsail Road/Trans-Canada Highway Southbound Ramp and Kenmount Road/Bruce Street.

Figure 42: 2025 PM Peak Hour Traffic – Kenmount Road

Figure 43: 2025 PM Peak Hour Traffic – Topsail Road/Karwood Drive

Figure 44: 2025 PM Peak Hour Traffic – Topsail Road/Kenmount Road

The results of the S5-N7 scenario are shown in figures 46 and 47. The summary LOS and Delay summaries are shown in Table 10.

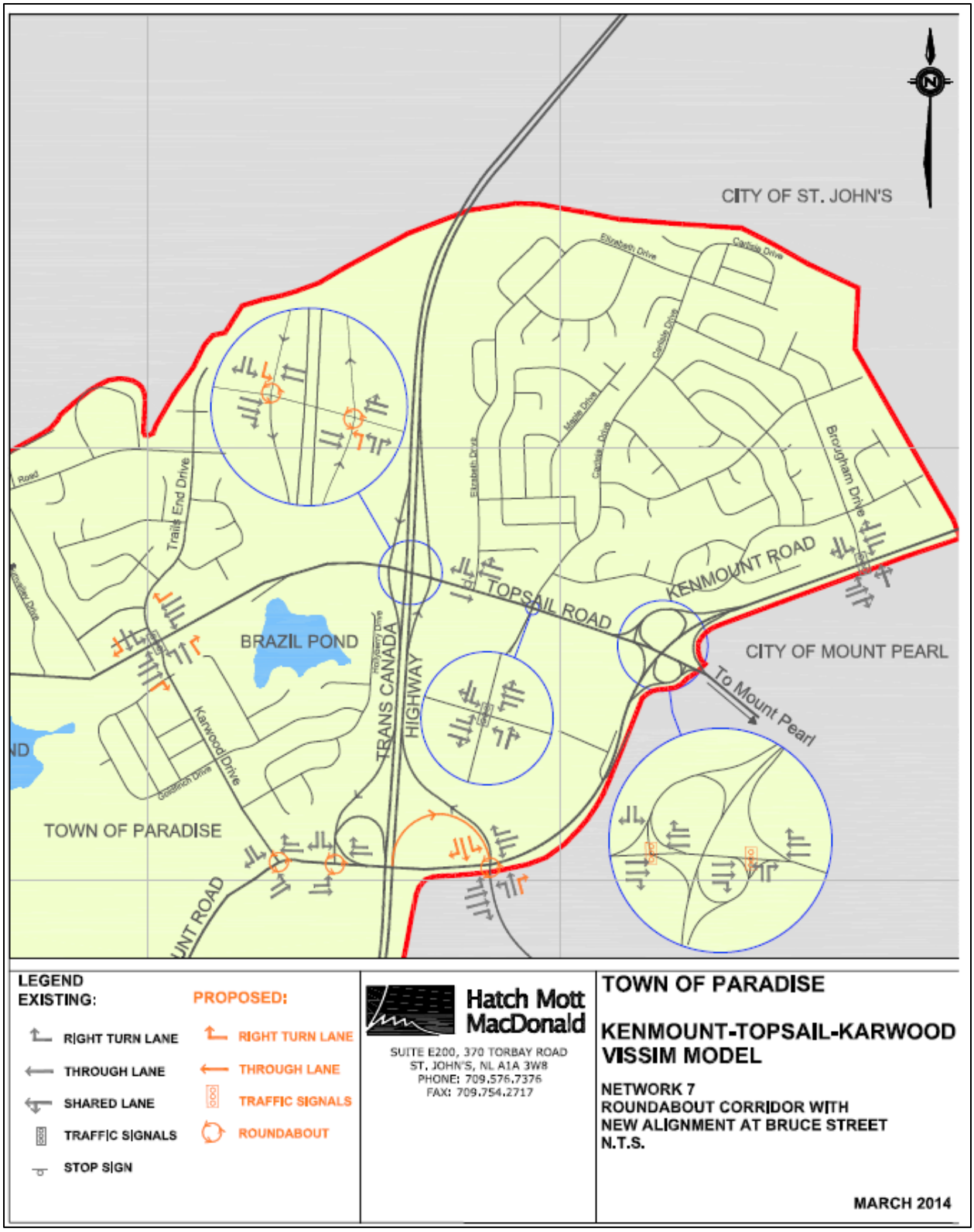


Figure 45: 2025 Roundabout Corridor with new Bruce Street Alignment – Lane Configuration

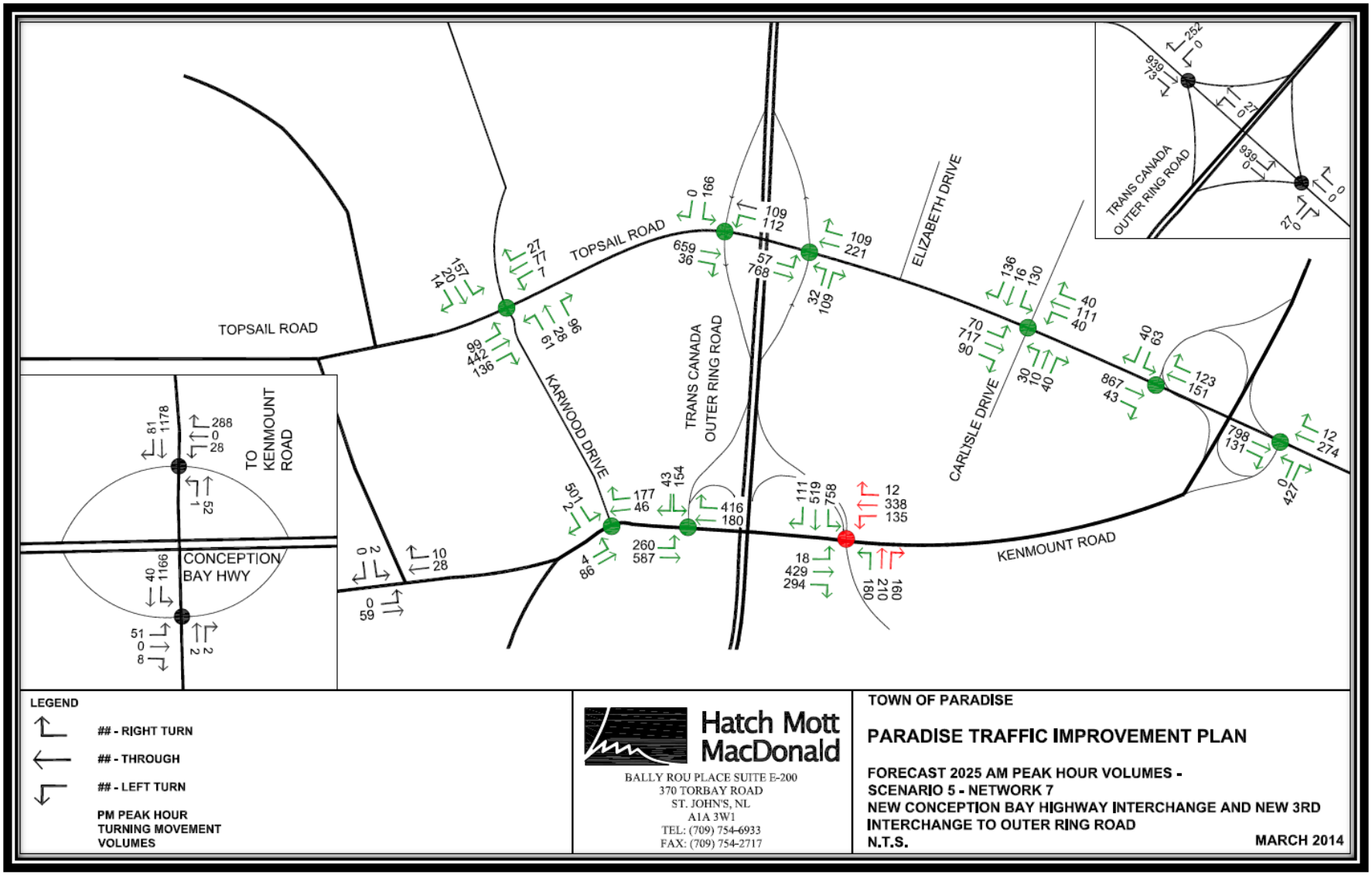


Figure 46: 2025 AM Peak Hour Traffic – Interchange to Conception Bay Bypass & Outer Ring Road with new Bruce Street Alignment

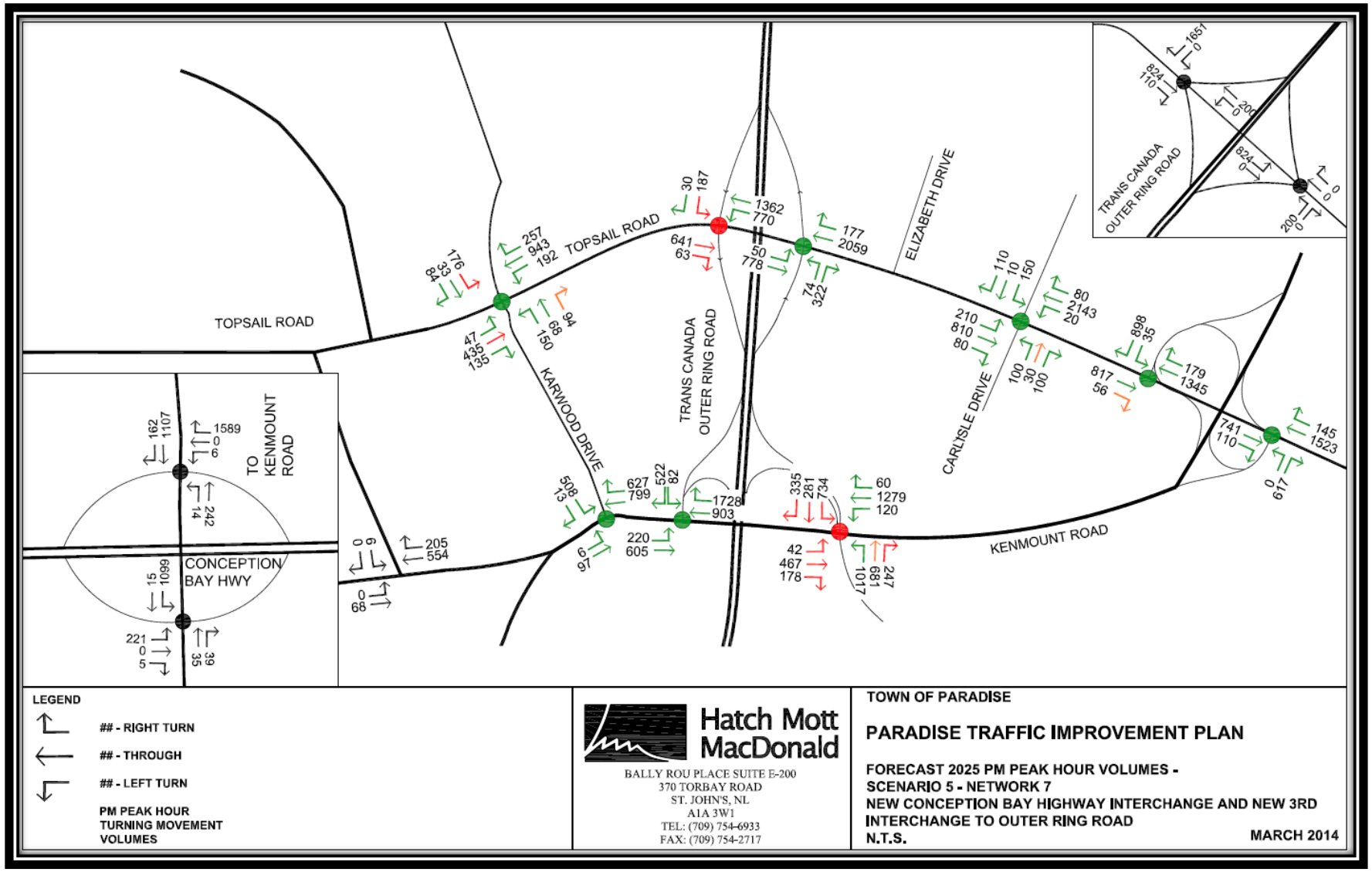


Figure 47: 2025 PM Peak Hour Traffic – Interchange to Conception Bay Bypass & Outer Ring Road with new Bruce Street Alignment

Table 10: S5-N7 2025 – Kenmount Road/ORR Ramp Reconfiguration with new Bruce Street Alignment Summary LOS Analysis

Intersection	AM Peak Hr		PM Peak Hr	
	VISSIM Int Delay (Secs)	Int Equivalent LOS	VISSIM Int Delay (Secs)	Int Equivalent LOS
Topsail Road/Karwood Drive	14.1	B	40.8	D
TCH SB/Topsail Road	6.2	A	78.9	F
TCH NB/Topsail Road	1.5	A	4.0	A
Topsail Road/Carlisle Drive	14.2	B	36.3	D
Topsail Road/Kenmount Road SB	4.1	A	9.2	A
Topsail Road/Kenmount Road NB	0.6	A	0.4	A
Kenmount Road/TCH NB – Bruce Street	57.7	F	88.3	F
Kenmount Road/TCH SB	0.0	A	0.0	A
Kenmount Road/Karwood Drive	0.6	A	3.6	A

The results of the LOS analysis for the S5-N7 scenario indicate that there will be poor levels of service on the SB approach of the Outer Ring Road off-ramp terminal with Topsail Road. The Bruce Street intersection is also experiencing problems in both the AM and PM peak traffic periods.

Based on a comparison of the LOS results shown in Tables 10 and 11, the S5-N6 scenario has a better road network configuration over that of the S5-N7 scenario.

3.11 Discussion of the VISSIM modeling and Road Network Improvements

3.11.1 The Scenario S0 Results

In total, there were 3 different network scenarios tested using the S0 traffic volumes; which are the 2013 existing traffic volumes that are present on the Town's road network. The S0-N1 scenario represents the existing traffic volumes on the existing road network but with optimized traffic signal timings. The results seem to indicate that overall the LOS on the study area's road network is fairly good with some exceptions at certain approaches of the Karwood Drive/Topsail intersection, the Topsail Road Ramps Terminals with Topsail Road and at the Bruce Street intersection with Kenmount Road. The improvements tested under the S0-N3 network indicate that all the problems encountered on the network with the S0 volumes can be resolved effectively under the N3 network improvement plan.

Please Note:

Field observations on Topsail Road, and more specifically in the AM Peak periods, seem to show conditions that are somewhat worse that those shown in the results of the VISSIM analysis for the S0-N1 model. This is due in large part to the existing signal timings at the Topsail Road/Outer Ring Road ramp terminals which are less than ideal at the present time. The signal timing/phasing and the detector assignments for this intersection need to be revised.

The traffic volumes used in the model at the Topsail Road intersection with the Outer Ring Road were also checked with a newer traffic count. The traffic volumes observed in the February 2014 count were consistent with the traffic volumes observed in the August 2013 count.

3.11.2 The Scenario S1 Results

A total of four different road networks were analysed using the growth forecasted under the 2025 regional VISUM model. See section 3.1 for details on what is included in the 2025 model from a growth perspective. The S1-N1 scenario, which is the do nothing network scenario, is completely over capacitated during the PM peak hour. Virtually all approaches of all intersections in the study area operate at poor levels of service. While the scenario's S1-N4, S1-N5 and S1-N7 show some degree of improvement over the S1-N1 scenario it is clear that the Town's road network will not be able to handle the anticipated development pressures in the Town that will materialize over the next 15 years. Even with some road improvements, Topsail Road and Kenmount Road would still be handling volumes that far exceed their capacity.

The analysis supports the earlier conclusions that additional interchanges that provide access to the Outer Ring Road (Route 1) and to the Conception Bay Bypass Road (Route 2) will be needed by the year 2025 to support the growth anticipated in the study area.

3.11.3 The Scenario S3 Results

The S3-N7 was the first scenario tested that provides an additional access to the Town's road network to the regional road network with a connection to Route 2. While this scenario reduces the traffic volumes on Kenmount Road it does little to reduce the volumes in any substantial way on Topsail Road and as a result many of the intersections along Topsail Road still suffer from poor levels of service.

3.11.4 The Scenario S5 Results

The S5 scenario's tested included two additional access connections to the regional road network system including the connection described in the S3 model (the new interchange on Route 2 with connections to Kenmount Road and Topsail Road) and an additional connection to the Outer Ring Road north of the Topsail Road interchange with that roadway. The two new interchange connections together provide substantial relief/reductions in the traffic volumes on both Kenmount Road and along Topsail Road in the study area.

The S5-N6 scenario is a better option to the S5-N7 road network. The reconfigured ramps from the Outer Ring Road in the N7 road network configuration do not work as well as the original ramp configuration under the S5 volumes. The S5-N6 scenario as shown in Figure 48 below is the preferred network option.

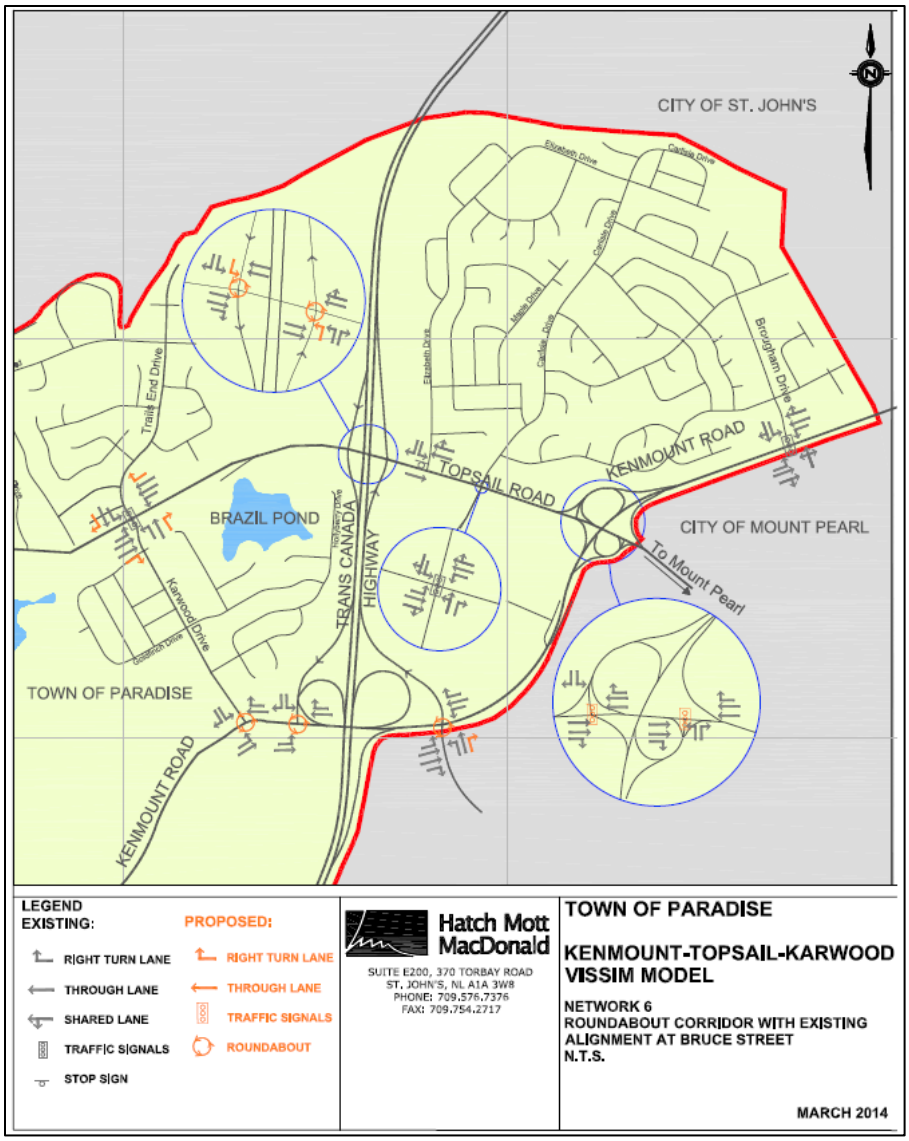


Figure 48: Preferred Network Configuration N6

4.0 The Improvement Plan

4.1 Topsail Road

The Topsail Road corridor between Karwood Drive and Kenmount Road under the N6 road network scenario will require a number of different improvements including:

The Topsail Road intersection with Karwood Drive is expected to operate at an overall LOS of B and C during the AM and PM peak hour periods respectively under the 2025 S5-N6 scenario. This intersection will require the following improvements:

- Auxiliary right turning lanes on all approaches to the intersection.
- Signal timing optimization.

The Topsail Road ramp terminals with the Outer Ring Road will have to be upgraded to accommodate two lane roundabouts at each junction. A concept plan of the layout is shown below in Figure 49.

Figure 49: Topsail Road / Outer Ring Road Ramp Terminals – Roundabout Option

The Topsail Road ramp terminals with Kenmount Road will have to be signalized and the signals timings optimized for the traffic volumes present.

4.2 Kenmount Road

The Kenmount Road corridor between Karwood Drive and Topsail Road under the N6 road network scenario will also require a number of different improvements including: a two lane roundabout at the Karwood Drive intersection with Kenmount Road, a two lane roundabout at the SB Outer Ring Road Ramp terminal with Kenmount Road, and a two lane roundabout at the Bruce Street intersection with Kenmount Road. The network configuration along the Kenmount Road corridor is shown in Figure 50 below.

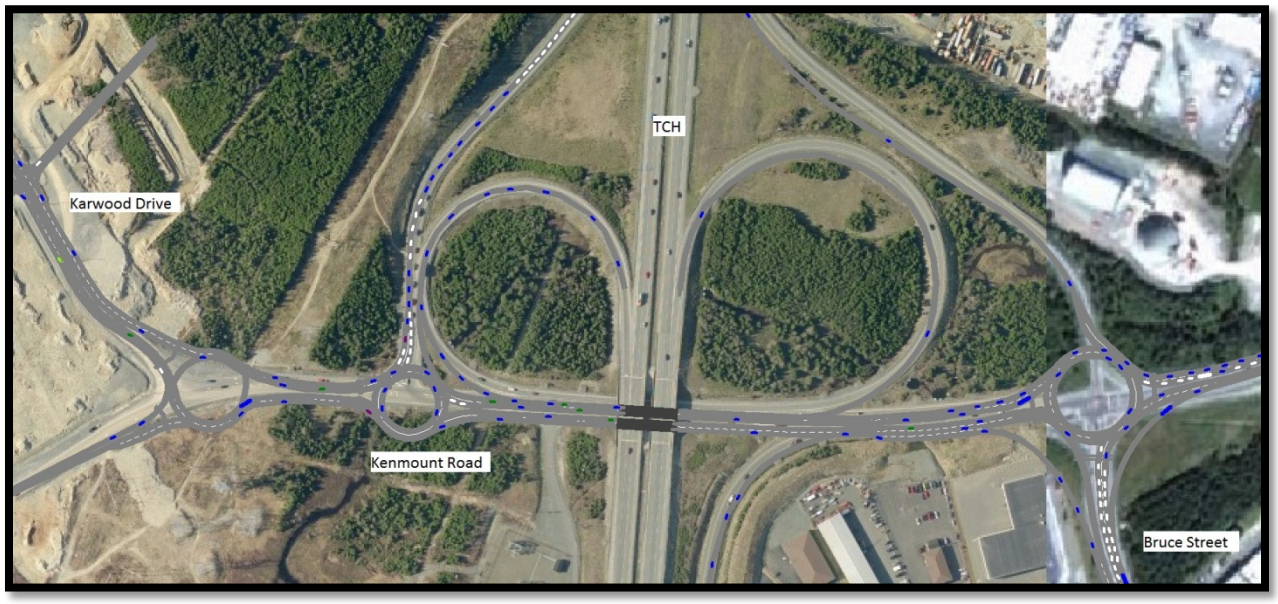


Figure 50: Kenmount Road Corridor Intersection Configurations

Improvements to Karwood Drive are currently underway including the widening of Karwood Drive and the construction of a roundabout at the Kenmount Road/Karwood Drive intersection. The improvements which will be completed in 2014 are expected to improve traffic operations on Karwood Drive and at the Topsail Road/Karwood Drive intersection for some time to come.

4.3 Conception Bay Bypass Route 2 Interchange

The S5-N6 road network option includes provision for a new access to Route 2 from Kenmount Road and Topsail Road. This new access/interchange with Route 2 in conjunction with similar improvements to Route 1 lowers traffic volumes on the study area's intersections to more manageable levels; levels that can be accommodated with the N6 road network.

Hatch Mott MacDonald (HMM) has completed a preliminary design on this interchange and the roadway connections from it to both Topsail Road and Kenmount Road. The concept drawing is shown in Figure 51. A more complete preliminary design including the plan and profile drawings are included in Appendix E.

The interchange was designed to conform to the Transportation Association of Canada's Geometric Design Guide for Canadian Roads. Roundabouts were used at the interchange ramp terminals to provide increased capacity and improved safety over the traditional ramp terminal intersection designs.

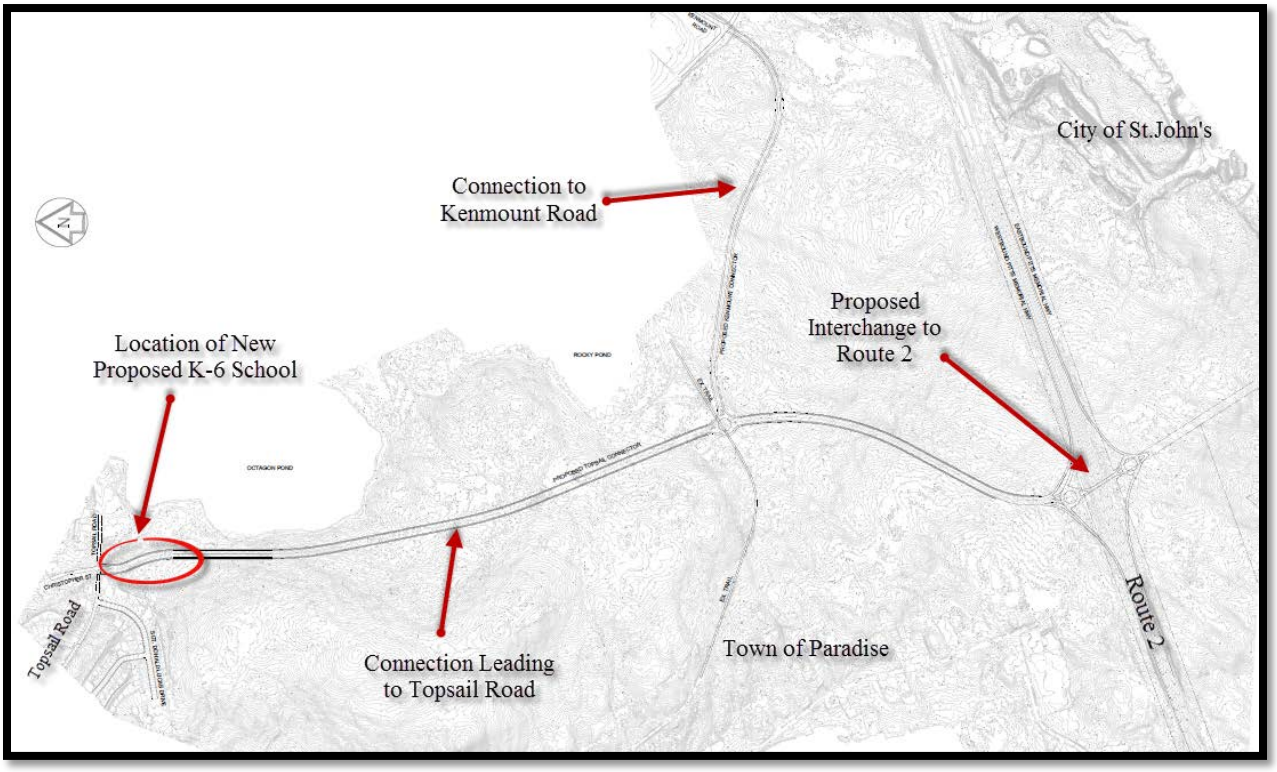


Figure 51: Proposed Route 2 Interchange

The estimated cost of the proposed interchange on Route 2 with provisions made to accommodate additional developments within the City of St. John's on the opposite side of the interchange is $10.1 million dollars. The estimated cost of the connecting roadways is $9,800,000. There may be opportunities for the Town of Paradise to explore cost sharing arrangements for the interchange with the City of St. John's, Oceanex Inc., and the Provincial Government. Oceanex Inc., is currently considering the possibility of developing lands on the St. John's side of Route 2 in this area which will require an interchange to facilitate the necessary access to the property.

Please note as well that the original route selected by HMM from the Route 2 Interchange to Topsail Road as shown in Figure 49 may no longer be available. The NLESD has acquired the land between Octagon Pond and Sgt Donald Lucas Drive for the construction of a new K-6 school. Other options should be explored by the Town to ensure this connection is possible when required in 2025.

4.4 Outer Ring Road Route 1 Interchange

The S5-N6 road network option also includes provision for a new access to Route 1 from Trails End Drive and from a connection to Paradise Road. This new access/interchange with Route 1 in conjunction with similar improvements to Route 2 lowers traffic volumes on the study area's intersections to more manageable levels; levels that can be accommodated with the N6 road network.

Again, HMM has completed a preliminary concept design on this interchange and the roadway connections from it to both Trails End Drive and to Paradise Road. The concept drawing is shown in Figure 52 below.

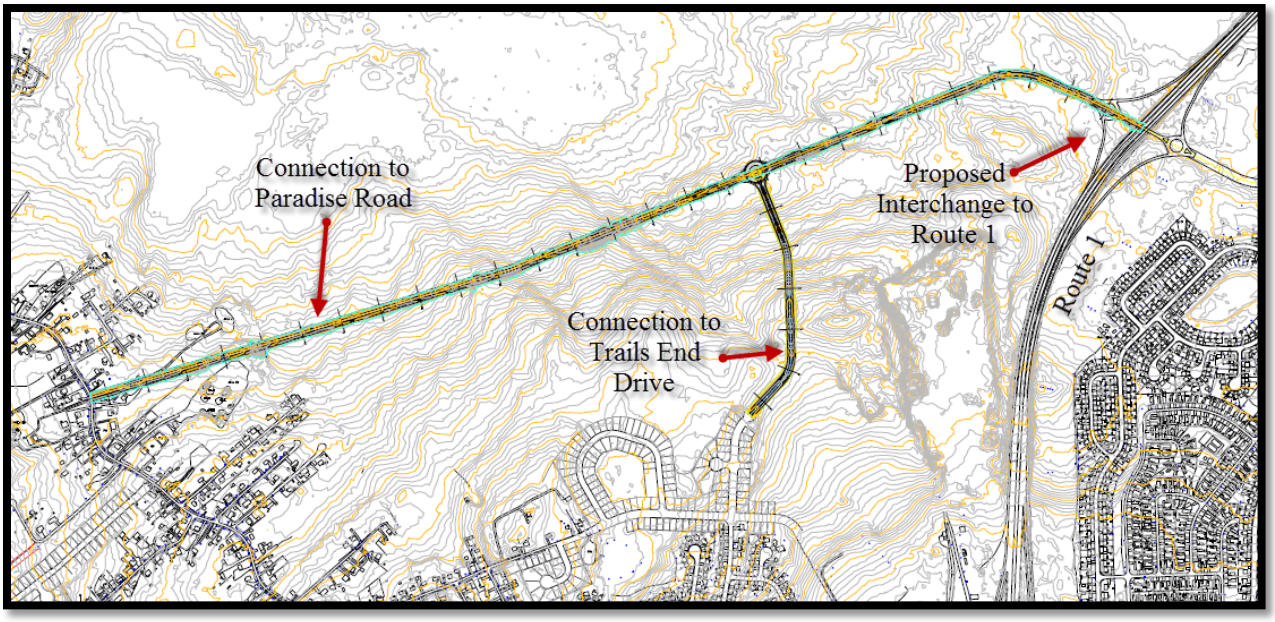


Figure 52: Proposed Route 1 - Interchange and Roadway Connections

Based on the projected traffic volumes, two lanes in each direction will be required from the interchange roundabout to the connection with Paradise Road. A single lane in each direction is required for the connection to Trails End Drive. The cost of the interchange, ramps and roundabout ramps terminals is estimated to be $10 million dollars. The cost of the connection roadways is estimated to be at $11,500,000.

There may also be opportunities for the Town of Paradise to explore cost sharing arrangements for the proposed Route 1 interchange with both the City of St. John's and the Provincial Government. The City of St. John's will benefit from the proposed interchange in terms of providing required for the development of the lands above the 190 meter contour. It should also be noted that additional access may also be possible for Elizabeth Park area which would provide some relief to the Carlisle Drive intersection with Topsail Road.

The Town of Paradise is growing quickly. Much of the growth within the Town in expected to occur in areas north of Topsail Road. The Adams Pond development is expected to fully mature in the next ten year. Also a series of developments along St. Thomas' Line are anticipated. As such, Paradise Road and Milton Road are expected to experience increases in traffic demand. The proposed connections from Trails End Drive and to Paradise Road will provide alternative routes for residents to the Topsail Road corridor that is presently well used.

4.5 The Trails End Connection

When the third Outer Ring Road interchange was initially conceived, consideration was only given to connecting it with Milton Road or to the end of Trails End Drive. There were issues with both of these concepts. Completing the loop by connecting Milton Road to Topsail Road results in an intersection very close to the Topsail Road / Outer Ring Road interchange. Connecting Trails End Drive to the new interchange also seemed inappropriate because of the residential nature of Trails End Drive. There are many residential driveways already in place, and speed humps have already been installed on the street in order to calm traffic. Connecting either of these streets directly to the proposed interchange would result in a significant increase in traffic; not only a major nuisance for residents but also grounds to be concerned about safety on the street. Adding a secondary connection to Paradise Road lessens the focus on the Trails End connection and reduces the anticipated traffic volumes to more manageable levels in 2025 during both peak traffic periods.

4.6 Analysis of the Proposed Interchange

The proposed interchange to Outer Ring Road/TCH was analyzed with the forecast 2025 traffic volumes. The roundabouts were analyzed assuming the connection to St. John's was in place. It was expected that this would represent the worst scenario. The roundabouts were analyzed using ARCADY/Junctions 8. The configuration of the roundabouts was based on:

- Inscribed Circle Diameter (ICD) of 60 m
- Two circulating lanes
- Two-lane approaches for the New street
- One-lane plus right-turn by-pass for the ramp approaches

The results of the analysis are shown in Table 11. The analysis indicates that with the above configuration, the interchange will operate at an acceptable LOS with the forecast 2025 traffic (including development of the 190 Contour lands). It may be possible to construct the roundabouts smaller (ie. One-lane approaches) in the interim but it is expected that this configuration will operate well with the ten-year traffic volumes.

Table 11: 2025 Analysis of New Outer Ring Road (TCH) Interchange

	AM Peak Hour					PM Peak Hour				
	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
Northbound Outer Ring Road Ramp / New Street										
New Street EB	3.61	0.57	A	3.97	A	3.44	0.55	A	9.41	A
TCH/ORR NB Ramp	7.17	0.2	A			24.76	0.78	C		
New Street WB	2.49	0.09	A			5.88	0.55	A		
Southbound Outer Ring Road (TCH) Ramp / New Street										
New Street WB	1.67	0.1	A	4.86	A	2.88	0.48	A	4.77	A
TCH/ORR SB Ramp	3.14	0.08	A			5.1	0.07	A		
New Street EB	5.73	0.72	A			5.72	0.72	A		

5.0 Other Medium-Term / Long –Term Improvements

The Paradise Transportation Study identified a number of medium-term and long-term improvements which were recommended prior to the 10-year horizon:

- Installation of traffic signals at the Topsail Road/St. Thomas' Line
- A new roadway from McNamara Road to Kenmount Road
- Upgrades to the Kenmount Road / Bruce Street intersection
- Construction of an additional north-south connector road (alignment to be determined)

The following sections discuss several of the above noted improvements and prioritize them based on the impact they will have on traffic operations.

5.1 Topsail Road / St. Thomas' Line

The Paradise Transportation Study (2011) indicated that at some point within the next ten years that traffic signals would be warranted at the Topsail Road / St. Thomas' Line intersection. The need for traffic signals will be triggered by development along St. Thomas' Line. Also, the construction of new interchanges on Outer Ring Road and Conception Bay By-Pass may impact traffic patterns for new development along St. Thomas' Line.

It is difficult to determine the timing for traffic signals at the intersection. It is recommended that development charges be dedicated to the installation of traffic signals at the intersection.

5.2 Road from McNamara Road to Kenmount Road

The Town has planned a road from McNamara Road to Kenmount Road. The road would open up access to certain development parcels and a planned soccer fields. It would also provide a more direct route between McNamara Road / Topsail Road and Kenmount Road. The approximate alignment of the new road is indicated in the Zoning Plan as shown in Figure 53.

The 2025 VISUM model indicates that the forecast traffic volumes on the new roadway will be approximately 210 to 450 vehicles per hour in the peak hour or approximately 2,100 to 4,500 vehicles per day. Based on the forecast daily traffic, it is expected that the new roadway would be built to a collector standard of traffic.

It is recommended that the new street be constructed to a two-lane cross-section. A sidewalk and/or multi-use path are recommended on one or both sides. The street should be constructed with narrowing in order to control speeds. The speed limit should be set to 50 km/hr at most with a playground zone near the proposed soccer fields. A possible cross-section for the proposed roadway is shown below:

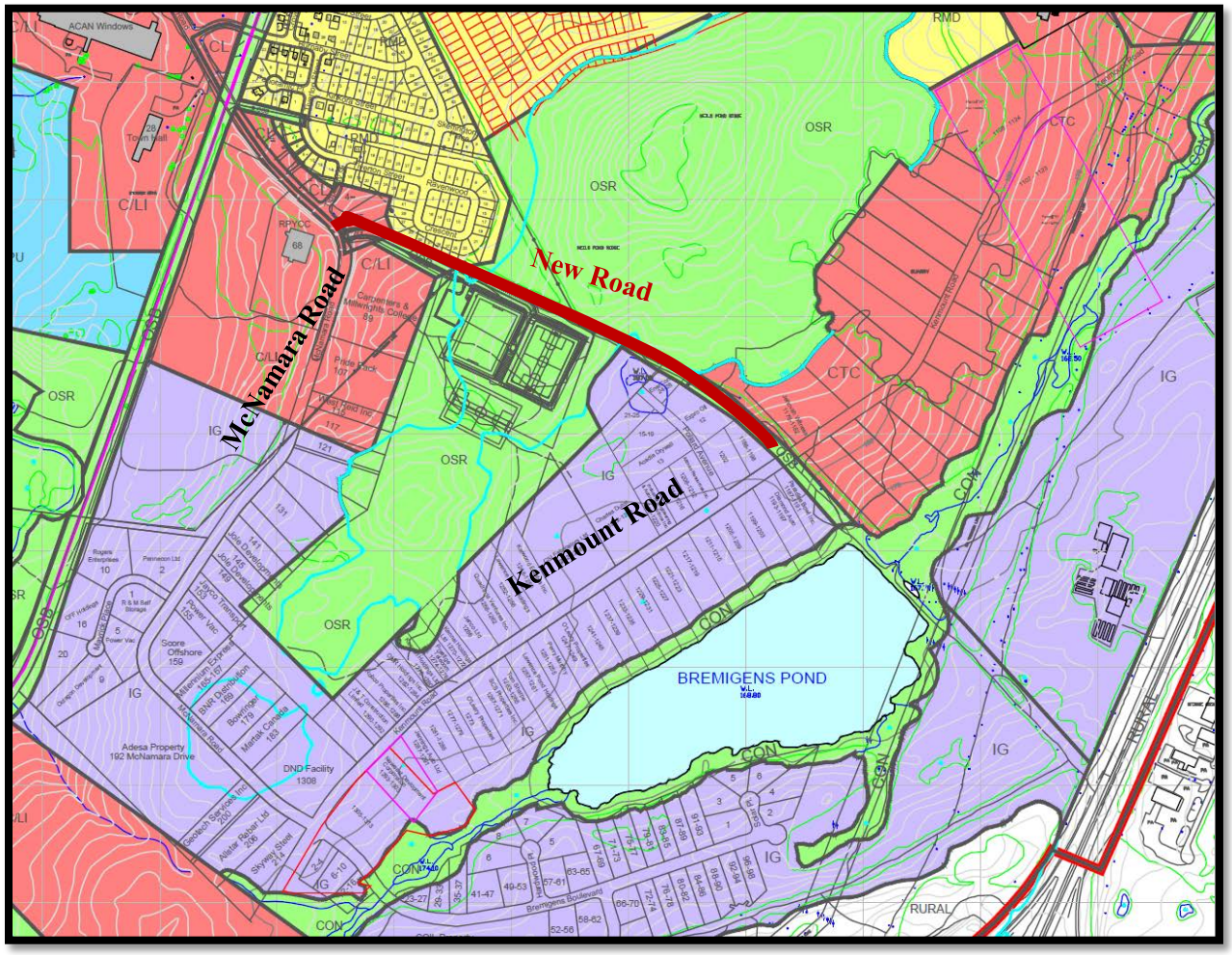


Figure 53: Alignment of Proposed Road from McNamara Road to Kenmount Road

5.3 North- South Connector Road

In the 2011 Paradise Transportation Study was recommended that the Town of Paradise start planning for an additional North- South connector Route. This connector is still recommended as a long term initiative that should be implemented as the lands in the north western portion of the Town develop. The non-watershed alternative would the preferred route. A conceptual alignment is shown in Figure 54 below.

Figure 54 - North-South Connector Road System

6.0 Conclusions and Recommendations/ Improvement Plan

The VISSIM analysis completed for this report looked at 4 different traffic volume scenarios in various combinations with 7 different road network configurations; in total 10 different scenarios were investigated. The goal was to determine the best overall road network configuration that will meet the traffic demands associated with the future growth of the Town. **The best overall configuration was achieved under the S5-N6 scenario.**

The S5 volumes reflect the presence of two new interchanges on the regional road network; one on Route 1 (refer to Figure 52) and another on Route 2 (refer to Figure 51). These proposed interchanges, in combination, provide the means to lower the traffic volumes on both Topsail Road and Kenmount Road to more manageable levels.

In 2014, the Town of Paradise will lead the Province with the installation of its first modern roundabout at the intersection of Karwood Drive and Kenmount Road. Along the Kenmount Road corridor east of Karwood Drive the Town should look to plan for the installation of traffic signals at the Outer Road SB off-ramp and the installation of a NB right turning auxiliary lane at the Bruce Street/Kenmount Road intersection in the short term.

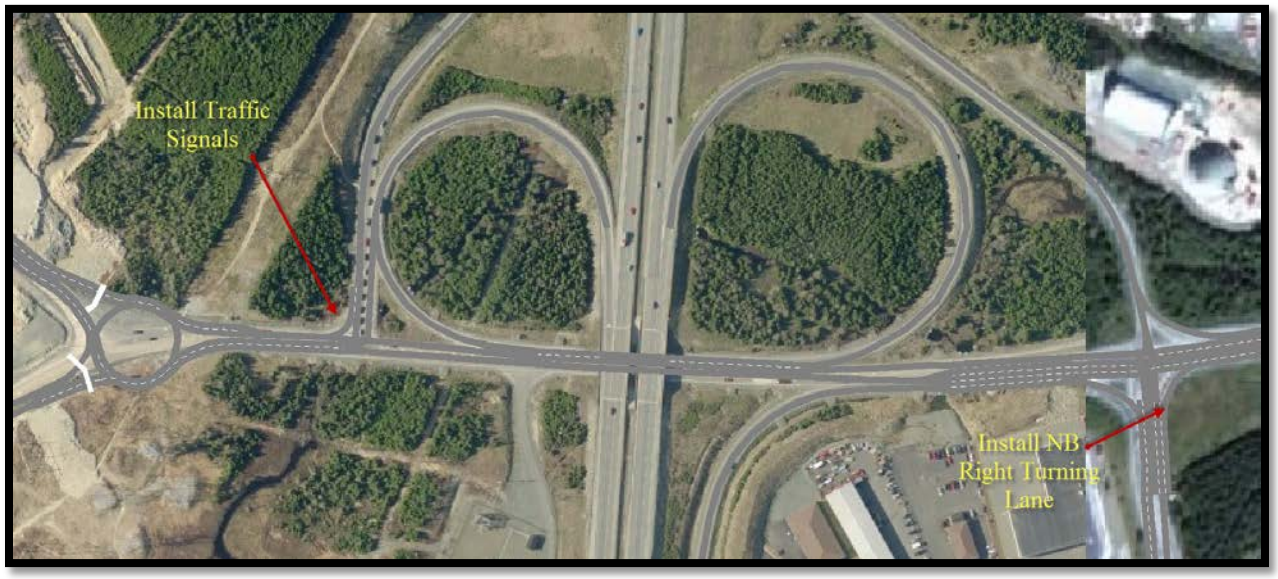


Figure 55: Short to Medium Term Improvements on Kenmount Road

Both of these improvements work well under the existing S0 traffic volumes. When the volumes increase, however, to the S5 scenario (which includes the construction of the new interchanges on Route 1 and Route 2) a roundabout should be installed at the Outer Ring Road SB off-ramp. A roundabout should also be installed on Kenmount Road at Bruce Street. Two (2) through lanes in each direction are required on Kenmount Road. The configuration is shown in Figure 56 below.

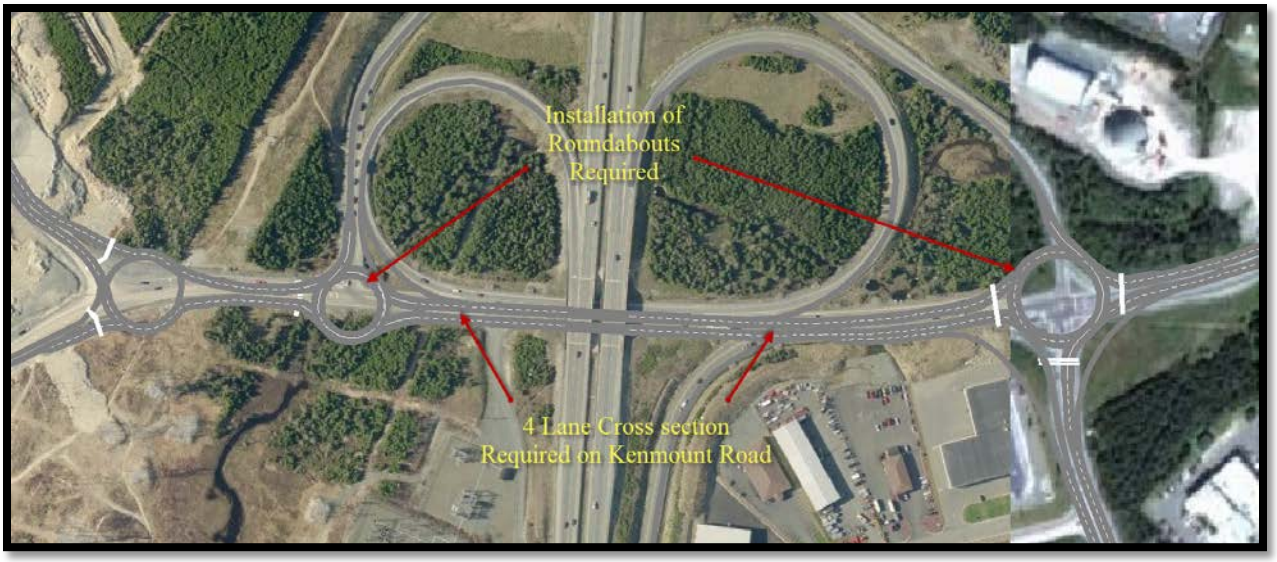


Figure 56: Medium to Long Term Improvements on Kenmount Road

Along the Topsail Road corridor during the short to medium term an auxiliary right turning lane will be required on the NB approach all approach of the Topsail Road intersection with Karwood Drive. Dual left turning lanes should also be considered in both the NB and SB directions on the ramp terminals with the Outer Ring Road.

When traffic volumes increase to the 2025 S5 scenario (which reflects the construction of the new interchanges on Route 1 and Route 2) auxiliary right turning lanes will be required on all approaches to the Karwood Drive intersection with Topsail Road. Roundabouts will have to be installed on the ramp terminals of the Outer Ring Road with Topsail Road and traffic signals will have to be installed at the Topsail Road ramp terminals with Kenmount Road (see Figure 49).

Network Improvement Costs and Priority Plan

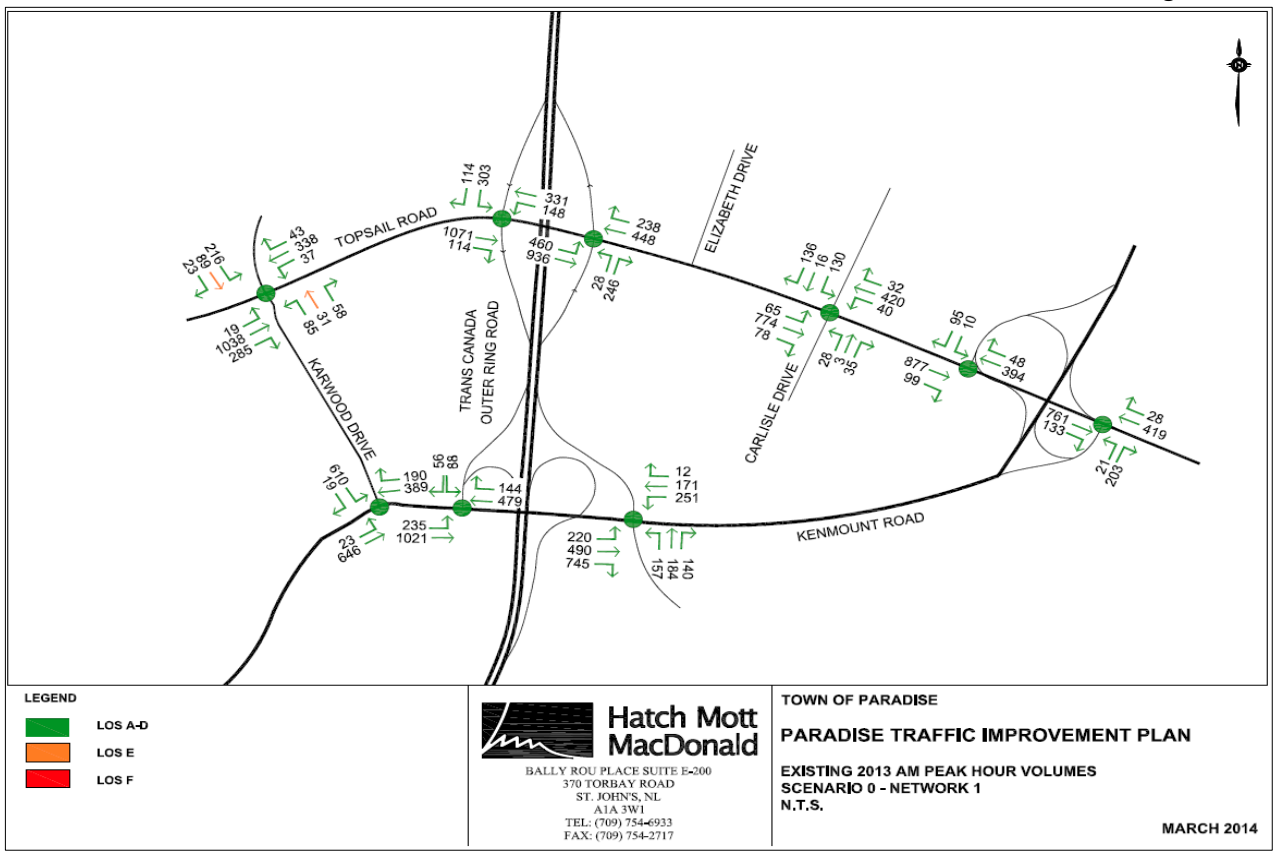
Short Term Improvements (0-5 Years)		**Description**	**Estimated Cost**
	1	Install Traffic Signals at the SB ORR Off-ramp intersection with Kenmount Road	$ 162,500
	2	Install NB Auxiliary Right Turning Lane at Bruce Street Intersection with Kenmount Road	$ 105,000
	3	Install NB Auxiliary Right Turning Lane at Karwood Street Intersection with Topsail Road	$ 52,600
	4	Install NB & SB Dual Left turning Lanes at ORR Ramp terminals with Topsail Road	$ 330,500
	5	Optimize and coordinate signal timings	$ 25,000
Medium Term Improvements (5-10 Years)		**Description**	**Estimated Cost**
	1	Re-evaluate the need for Traffic Signals at Topsail Road and St. Thomas's Line Intersection	$ 200,000
	2	Widen Kenmount Road and Install Roundabouts at SB ORR Ramp terminal and at Bruce Street	$ 5,710,000
	3	Install Roundabouts at Ramp terminals of ORR with Topsail Road	$ 3,000,000
	4	Install new Road between McNamara Drive and Kenmount Road	$ 2,810,000
	5	Install Auxiliary Lanes at Karwood Drive Intersection and Topsail Road	$ 150,000
	6	Traffic Signals at Topsail Road and Kenmount Road Ramps	$ 325,000
Long Term Improvements (> 10 years)		**Description**	**Estimated Cost**
	1	Install the Route 2 Interchange and make initial connection to Kenmount Road and Topsail Road	$ 9,800,000
	2	Install the Route 1 Interchange and make connections to Paradise Road and to Trails End Drive	$ 11,500,000
	3	North- South Connector Road System	N/A

APPENDIX A

EXISTING 2013 TRAFFIC OPERATIONS ANALYSIS – VISSIM OUTPUT SUMMARIES

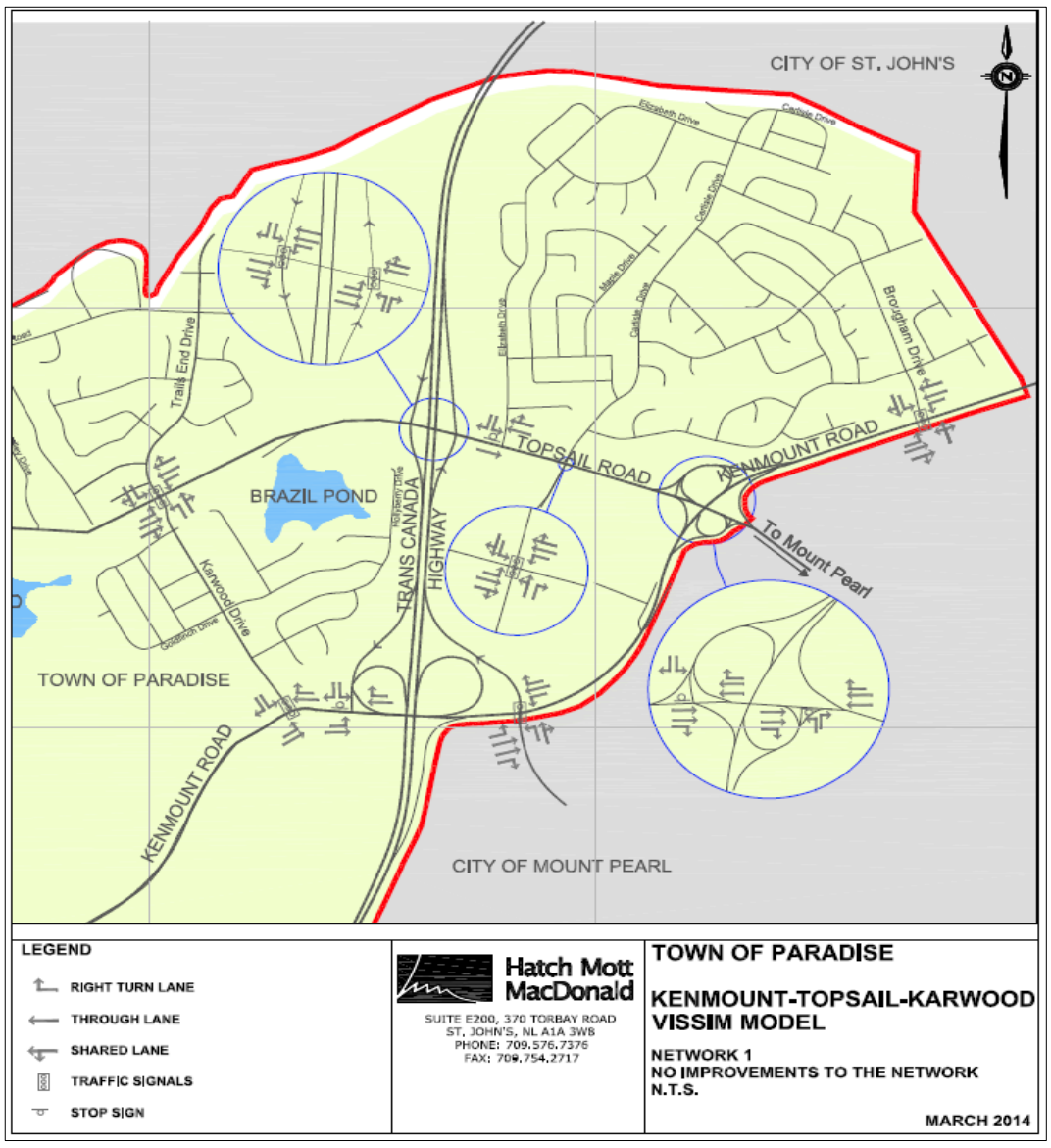
Scenario 0 - Network 1 AM

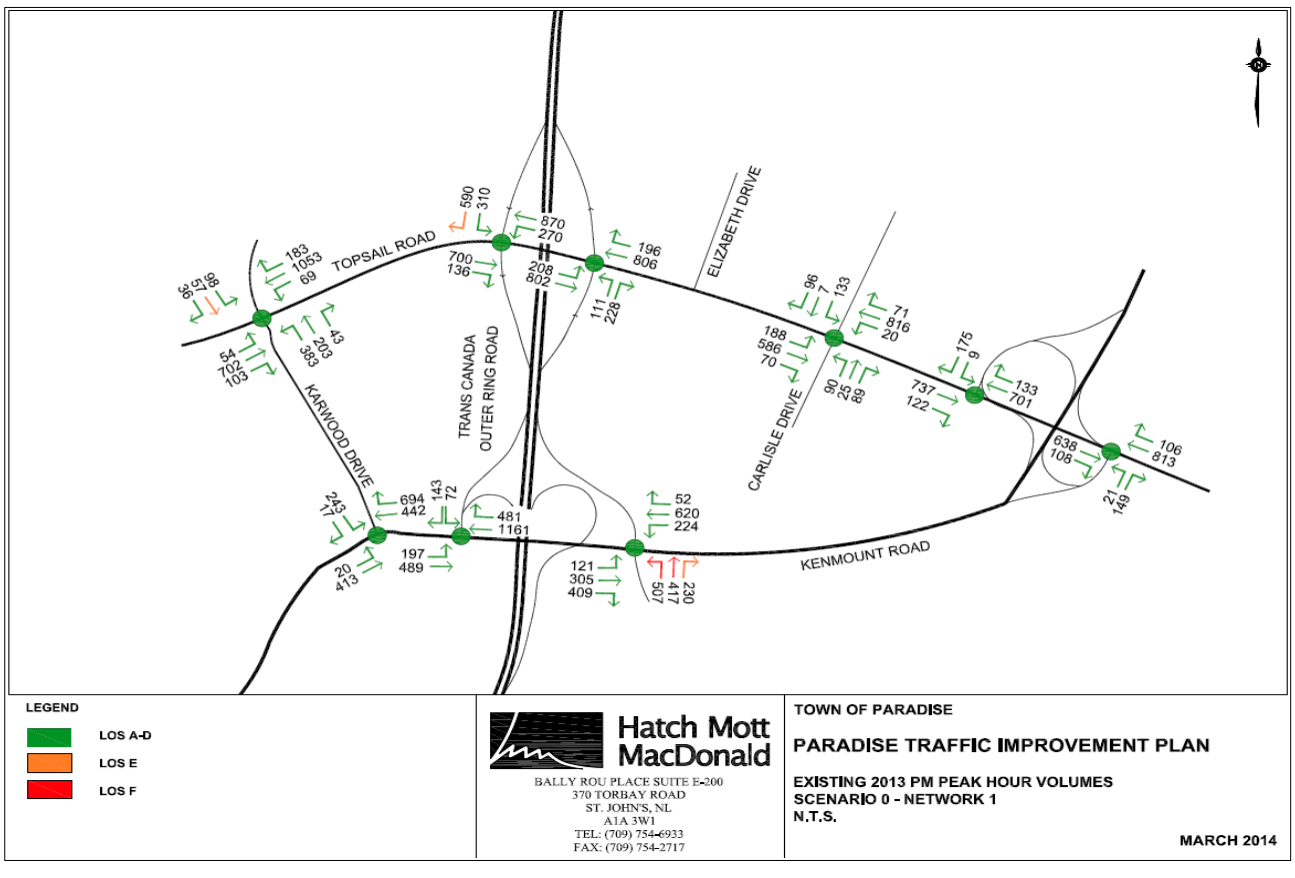
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	D	42.16	139.94
	Southbound Left-Turn	D	52.92	140.2
	Southbound Through	E	60	140
	Eastbound Left-Turn	B	15.54	182.56
	Eastbound Through	C	21.8	182.56
	Eastbound Right-Turn	B	19.94	182.56
	Westbound Right-Turn	A	8.74	40.74
	Westbound Through	B	12.08	40.66
	Westbound Left-Turn	D	37.48	40.66
	Northbound Through	E	64.82	48.2
	Northbound Left-Turn	D	46.86	48.2
	Northbound Right-Turn	C	20.54	48.3
	All	**C**	**26**	**182.56**
Topsail Rd / Southbound Ramp	Southbound Right-Turn	A	3.5	0
	Southbound Left-Turn	D	43.2	102.68
	Eastbound Right-Turn	A	7.64	141.7
	Eastbound Through	B	19.72	141.2
	Westbound Left-Turn	C	21.5	47.3
	Westbound Through	A	9.4	48.9
	All	**B**	**19.38**	**141.7**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	C	23.34	20.42
	Northbound Right-Turn	A	5.68	22.06
	Eastbound Left-Turn	C	20.5	105.46
	Eastbound Through	A	9.22	105.46
	Westbound Right-Turn	B	10.22	73.6
	Westbound Through	B	15.5	73.58
	All	**B**	**12.52**	**105.46**
Topsail Rd / Carlisle Dr	Northbound Through	D	42.5	15.5
	Northbound Left-Turn	D	42.5	15.5
	Northbound Right-Turn	A	0.5	0
	Southbound Through	A	7.1	17.1
	Southbound Right-Turn	A	7.1	17.1
	Southbound Left-Turn	C	29.9	37
	Eastbound Left-Turn	B	19.9	18.7
	Eastbound Right-Turn	C	21.8	96
	Eastbound Through	C	21.8	96
	Westbound Right-Turn	B	10.6	33.8
	Westbound Left-Turn	B	10.9	8.6
	Westbound Through	B	10.6	33.8
	All	**B**	**17.4**	**99.24**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Right-Turn	A	1.56	0
	Southbound Left-Turn	B	11.08	0
	Eastbound Through	A	0.36	0
	Eastbound Right-Turn	A	1.38	0
	Westbound Through	A	0.06	0
	Westbound Right-Turn	A	0.5	0
	All	**A**	**0.48**	**0**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0
	Westbound Through	A	0	0
	Eastbound Right-Turn	A	0.72	24.48
	Eastbound Through	A	0.1	24.48
	Northbound Right-Turn	A	2.74	0
	Northbound Left-Turn	A	9.66	0
	All	**A**	**0.46**	**24.48**
Kenmount Rd Bruce Street TransCanada Hwy	Northbound Through	C	30.04	83.44
	Northbound Right-Turn	A	6.32	1.16
	Northbound Left-Turn	C	27.7	82.68
	Westbound Left-Turn	B	14.7	53.46
	Westbound Right-Turn	A	2.92	0
	Westbound Through	B	11.84	53.46
	Eastbound Right-Turn	A	5.66	0
	Eastbound Left-Turn	A	7.06	33.44
	Eastbound Through	A	5.6	33.44
	All	**A**	**9.7**	**83.44**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	9.42	0
	Southbound Right-Turn	A	9.12	0
	Westbound Right-Turn	A	0.38	0
	Westbound Through	A	0.86	0
	Eastbound Left-Turn	A	3.38	0
	Eastbound Through	A	0.82	0
	All	**A**	**1.66**	**0**
Kenmount Rd Karwood Dr	Eastbound Through	B	16.52	129.64
	Eastbound Left-Turn	C	21.76	129.64
	Westbound Through	B	13.08	79.8
	Westbound Right-Turn	A	1.78	80.66
	Southbound Right-Turn	B	10.32	148.06
	Southbound Left-Turn	C	23.28	148.06
	All	**B**	**16.66**	**157.28**



Scenario 0 - Network 1 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	D	35.6	70.74
	Southbound Left-Turn	D	42.66	71
	Southbound Through	E	64.74	70.82
	Eastbound Left-Turn	B	13.58	95.12
	Eastbound Through	B	17.08	95.12
	Eastbound Right-Turn	B	15.42	95.12
	Westbound Right-Turn	A	7.54	22.62
	Westbound Through	B	17.38	22.56
	Westbound Left-Turn	C	26.68	22.56
	Northbound Through	D	48.48	194.8
	Northbound Left-Turn	D	42.2	194.8
	Northbound Right-Turn	C	31.18	194.9
	All	**C**	**27.74**	**194.9**
Topsail Rd / Southbound Ramp	Southbound Right-Turn	E	57.96	9.5
	Southbound Left-Turn	D	46	231.38
	Eastbound Right-Turn	A	6.82	95.08
	Eastbound Through	B	16.88	94.56
	Westbound Left-Turn	B	11.6	33.82
	Westbound Through	D	44.24	35.4
	All	**C**	**34.44**	**231.38**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	C	28.14	32.66
	Northbound Right-Turn	A	5.6	31.16
	Eastbound Left-Turn	B	16	48.44
	Eastbound Through	B	12.18	48.44
	Westbound Right-Turn	A	9.2	85.82
	Westbound Through	B	11.72	85.76
	All	**B**	**12.4**	**85.82**
Topsail Rd / Carlisle Dr	Northbound Through	D	36.72	52.08
	Northbound Left-Turn	D	38.28	52.64
	Northbound Right-Turn	A	4.56	52.52
	Southbound Through	C	31.06	52.26
	Southbound Right-Turn	A	7.76	52.56
	Southbound Left-Turn	D	45.48	51.8
	Eastbound Left-Turn	C	28.26	66.7
	Eastbound Right-Turn	A	7.18	66.7
	Eastbound Through	A	8.3	66.7
	Westbound Right-Turn	A	7.38	61.12
	Westbound Left-Turn	B	11.74	61.12
	Westbound Through	A	9.02	61.12
	All	**B**	**13.9**	**69.3**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Right-Turn	A	3.46	0
	Southbound Left-Turn	B	13.88	0
	Eastbound Through	A	0.22	0
	Eastbound Right-Turn	A	1.26	0
	Westbound Through	A	0.1	8
	Westbound Right-Turn	A	0.34	7.5
	All	**A**	**0.72**	**8**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0
	Westbound Through	A	0.08	0
	Eastbound Right-Turn	A	0.62	11.16
	Eastbound Through	A	0.1	11.16
	Northbound Right-Turn	A	2.18	0
	Northbound Left-Turn	B	10.04	0
	All	**A**	**0.3**	**11.16**
Kenmount Rd Bruce Street TransCanada Hwy	Northbound Through	F	99.7	201.08
	Northbound Right-Turn	E	74.66	19.5
	Northbound Left-Turn	F	122.48	200.3
	Westbound Left-Turn	A	8.04	134.68
	Westbound Right-Turn	A	4.26	0
	Westbound Through	B	12.24	134.68
	Eastbound Right-Turn	A	5.86	0
	Eastbound Left-Turn	B	10.58	29.94
	Eastbound Through	A	9.48	29.94
	All	**C**	**31.78**	**201.08**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	C	19.44	0
	Southbound Right-Turn	C	16	0
	Westbound Right-Turn	A	0.62	0
	Westbound Through	A	1.56	0
	Eastbound Left-Turn	B	11.66	0
	Eastbound Through	A	0.24	0
	All	**A**	**3.1**	**0**
Kenmount Rd Karwood Dr	Eastbound Through	A	8.56	63.36
	Eastbound Left-Turn	C	21.6	63.36
	Westbound Through	A	4.8	32.06
	Westbound Right-Turn	A	2	30.84
	Southbound Right-Turn	A	7.16	63.52
	Southbound Left-Turn	C	23.22	63.52
	All	**A**	**7.38**	**68.02**



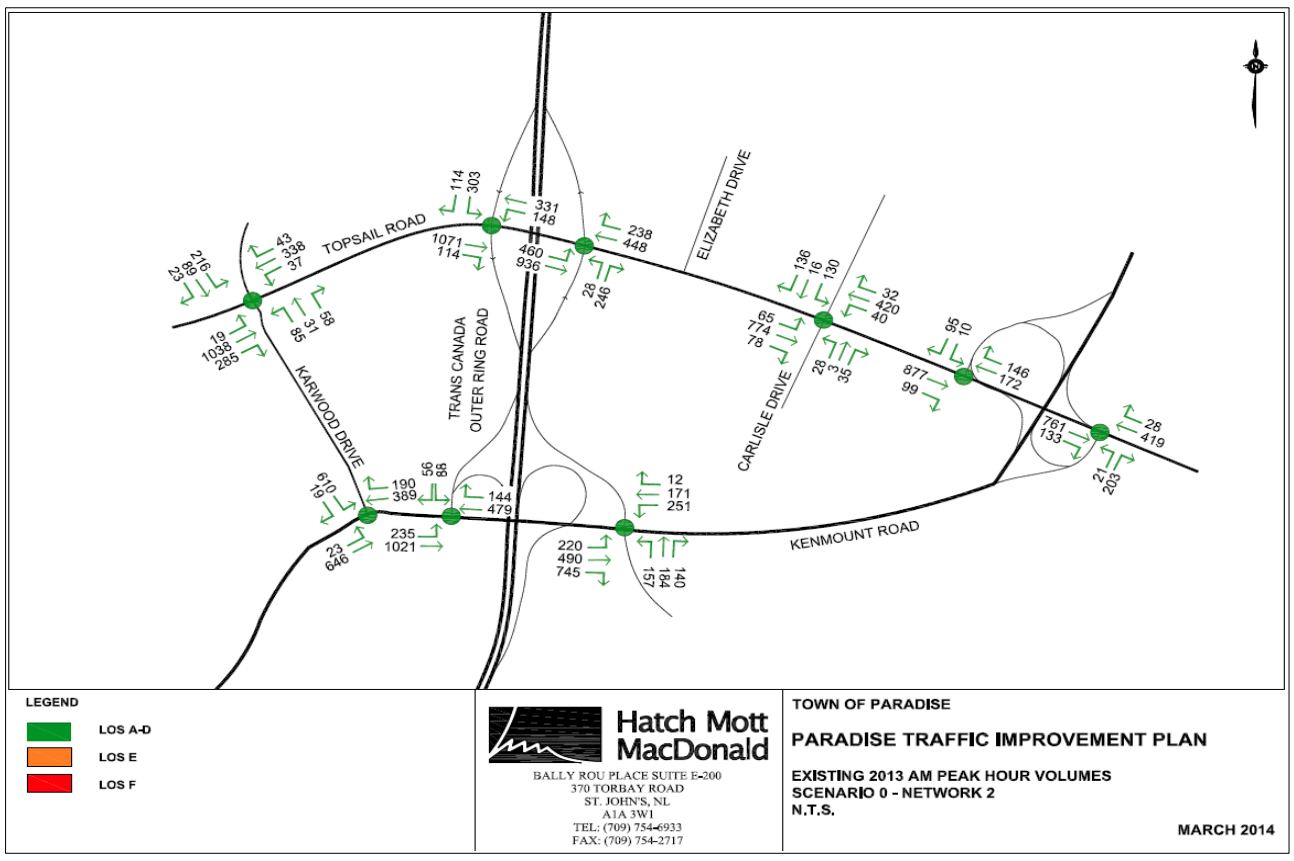


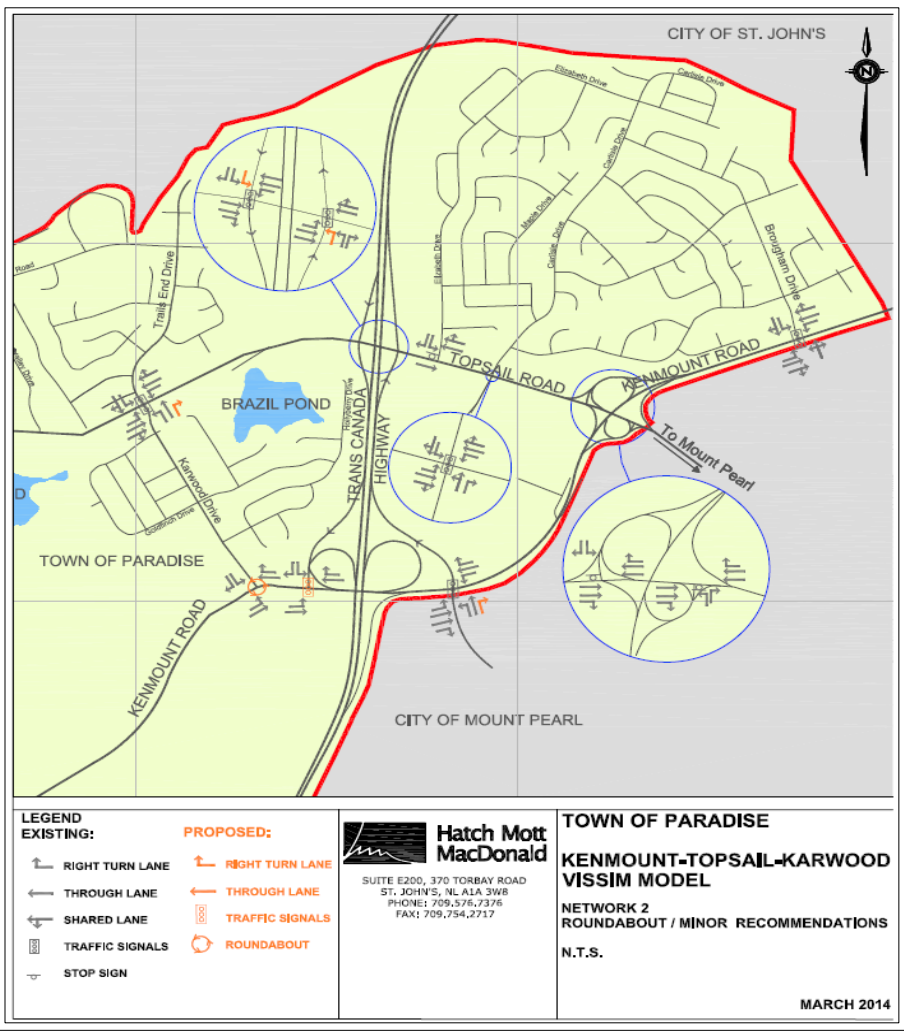
Scenario 0 - Network 2 AM

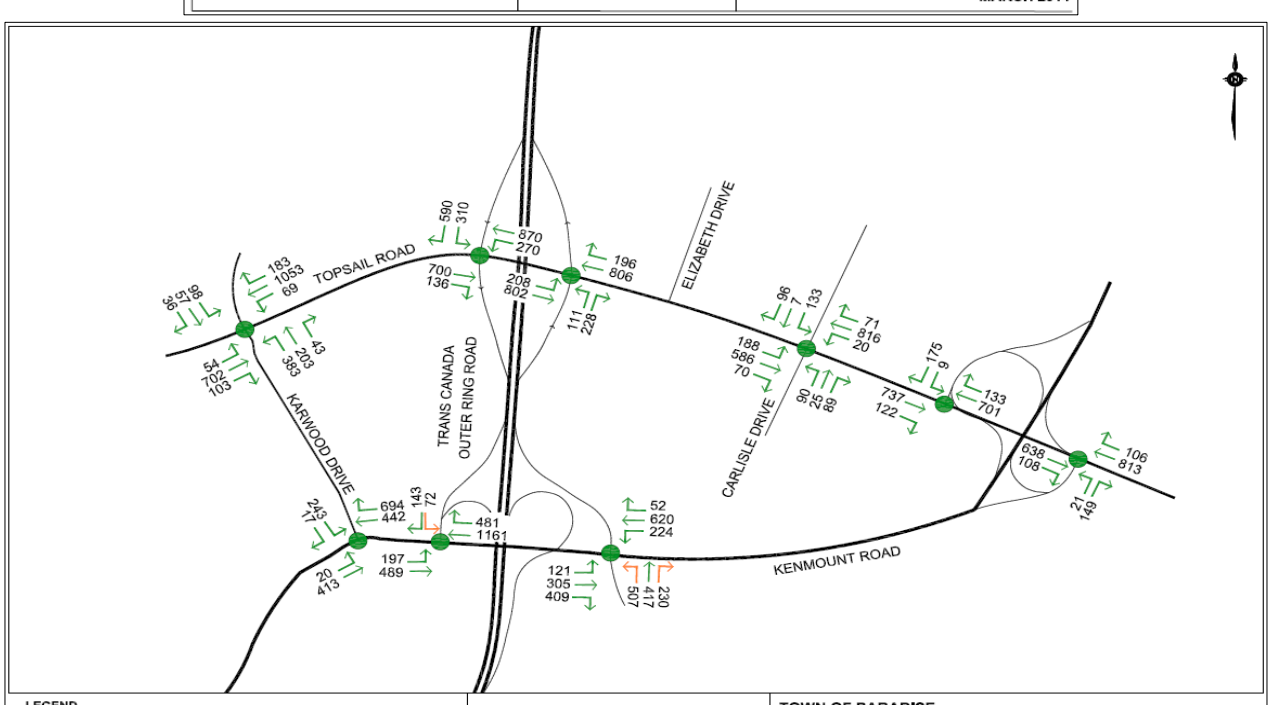
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	19.32	85.12
	Southbound Left-Turn	C	31.22	85.36
	Southbound Through	D	35.54	85.2
	Eastbound Left-Turn	B	11.96	152.8
	Eastbound Through	B	18	152.8
	Eastbound Right-Turn	C	24.94	152.8
	Westbound Right-Turn	A	4.42	28.86
	Westbound Through	A	7.26	28.78
	Westbound Left-Turn	C	32.7	28.78
	Northbound Through	D	36.48	28.06
	Northbound Left-Turn	C	25.64	28.16
	Northbound Right-Turn	A	4.36	25.94
	All	**B**	**19.42**	**152.8**
Topsail Rd / TransCanada Hwy	Southbound Right-Turn	A	3.46	0
	Southbound Left-Turn	D	46.6	49.38
	Eastbound Right-Turn	A	1.48	0
	Eastbound Through	A	7.12	48.34
	Westbound Left-Turn	C	34.54	54.56
	Westbound Through	A	3.04	56.14
	All	**B**	**12.82**	**58.38**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	D	44.16	14.44
	Northbound Right-Turn	A	1.38	0
	Eastbound Left-Turn	B	13.14	104.86
	Eastbound Through	A	5.42	104.86
	Westbound Right-Turn	A	9.88	34.38
	Westbound Through	B	14.28	70.9
	All	**A**	**8.96**	**104.86**
Topsail Rd / Carlisle Dr	Northbound Through	C	24.16	26.52
	Northbound Left-Turn	C	34.96	27.72
	Northbound Right-Turn	A	5.18	27.24
	Southbound Through	C	33.62	50.7
	Southbound Right-Turn	A	9.26	51.62
	Southbound Left-Turn	D	38.16	51.62
	Eastbound Left-Turn	C	25.1	111.46
	Eastbound Right-Turn	B	19.78	111.4
	Eastbound Through	C	24.66	111.4
	Westbound Right-Turn	A	5.12	35.18
	Westbound Left-Turn	A	9.46	35.18
	Westbound Through	A	5.96	35.2
	All	**B**	**19.08**	**111.46**
Topsail Rd / Kenmount Rd Southbound Ramp	Westbound Through	A	1.74	0
	Westbound Right-Turn	B	12.18	0
	Eastbound Through	A	0.64	0
	Eastbound Right-Turn	A	1.46	0
	Southbound Right-Turn	A	0.04	0
	Southbound Left-Turn	A	0.24	0
	All	**A**	**0.66**	**0**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0
	Westbound Through	A	0	0
	Eastbound Right-Turn	A	0.86	25.14
	Eastbound Through	A	0.1	25.14
	Northbound Right-Turn	A	3.2	0
	Northbound Left-Turn	B	12.26	0
	All	**A**	**0.58**	**25.14**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Right-Turn	D	37.2	66.32
	Northbound Through	A	2.78	0
	Northbound Left-Turn	D	39	66.76
	Westbound Left-Turn	A	8.78	46.22
	Westbound Right-Turn	A	1.9	0
	Westbound Through	A	8.82	46.22
	Eastbound Right-Turn	A	7.2	0
	Eastbound Through	A	8.62	46.84
	Eastbound Left-Turn	B	11.42	46.84
	All	**B**	**11.34**	**66.76**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	36.16	40.68
	Southbound Right-Turn	A	4.94	0
	Westbound Right-Turn	A	0.4	0
	Westbound Through	A	9.04	79.24
	Eastbound Left-Turn	B	11	102.98
	Eastbound Through	A	8.2	102.86
	All	**A**	**8.66**	**105.84**
Karwood Dr Kenmount Road	Eastbound Through	A	7.8	36.34
	Eastbound Left-Turn	B	13.04	36.34
	Westbound Through	A	1.06	21.94
	Westbound Right-Turn	A	1.6	21.94
	Southbound Right-Turn	A	4.08	23.34
	Southbound Left-Turn	A	4.12	23.34
	All	A	**4.68**	**38**

Scenario 0 - Network 2 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	15.04	41.38
	Southbound Left-Turn	C	29.7	41.6
	Southbound Through	D	35.32	41.46
	Eastbound Left-Turn	C	20.96	85.68
	Eastbound Through	B	18.76	85.68
	Eastbound Right-Turn	B	16.14	85.68
	Westbound Right-Turn	B	18.76	99.44
	Westbound Through	B	19.02	99.38
	Westbound Left-Turn	B	19.64	99.38
	Northbound Through	D	39.32	170.4
	Northbound Left-Turn	C	34.12	169.04
	Northbound Right-Turn	B	12.92	170.82
	All	**C**	**23.54**	**170.82**
Topsail Rd / Southbound Ramp	Southbound Right-Turn	B	12.92	3.22
	Southbound Left-Turn	D	46.24	199.1
	Eastbound Right-Turn	A	2.42	0
	Eastbound Through	A	6.84	59.32
	Westbound Left-Turn	A	8.96	28.52
	Westbound Through	A	3.04	30.06
	All	**B**	**11.82**	**199.1**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	D	38.98	24.96
	Northbound Right-Turn	A	1.4	0
	Eastbound Left-Turn	C	20.7	56.46
	Eastbound Through	A	6.5	56.46
	Westbound Right-Turn	A	3.22	25.64
	Westbound Through	A	3.68	46.66
	All	**A**	**7.54**	**56.46**
Topsail Rd / Carlisle Dr	Northbound Through	C	33.14	48.12
	Northbound Left-Turn	D	36.16	48.12
	Northbound Right-Turn	A	5.3	48.12
	Southbound Through	D	36.82	57.3
	Southbound Right-Turn	A	6.9	57.2
	Southbound Left-Turn	D	42.68	56.14
	Eastbound Left-Turn	C	28.16	60.9
	Eastbound Right-Turn	A	3.78	60.86
	Eastbound Through	A	5.62	60.9
	Westbound Right-Turn	A	8.06	60.3
	Westbound Left-Turn	A	9.26	60.3
	Westbound Through	A	8.04	60.32
	All	**B**	**12.46**	**68.3**
Topsail Rd / Kenmount Rd Southbound Ramp	Westbound Through	A	3.2	0
	Westbound Right-Turn	B	13.52	0
	Eastbound Through	A	0.16	0
	Eastbound Right-Turn	A	1.02	0
	Southbound Right-Turn	A	0.1	6.76
	Southbound Left-Turn	A	0.32	6.26
	All	**A**	**0.64**	**6.76**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0
	Westbound Through	A	0.08	0
	Eastbound Right-Turn	A	0.58	7.92
	Eastbound Through	A	0.02	7.92
	Northbound Right-Turn	A	2.34	0
	Northbound Left-Turn	B	11.24	0
	All	**A**	**0.34**	**7.92**
Kenmount Rd Bruce Street TransCanada Hwy	Northbound Right-Turn	E	64.46	200.42
	Northbound Through	C	28.92	18.82
	Northbound Left-Turn	E	72.1	200.92
	Westbound Left-Turn	C	21.42	167.78
	Westbound Right-Turn	A	9.4	0
	Westbound Through	C	31.34	167.78
	Eastbound Right-Turn	A	3.14	0
	Eastbound Through	C	21.34	52.86
	Eastbound Left-Turn	C	21.94	52.86
	All	**C**	**29.2**	**200.92**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	E	56.88	55.14
	Southbound Right-Turn	C	21.82	0
	Westbound Right-Turn	A	1.24	98.68
	Westbound Through	A	9.82	256.68
	Eastbound Left-Turn	C	26.66	54.74
	Eastbound Through	A	2.38	55.06
	All	**A**	**8.64**	**256.68**
Karwood Dr Kenmount Road	Eastbound Through	A	2.18	20.26
	Eastbound Left-Turn	A	2.38	20.26
	Westbound Through	A	0.5	10.94
	Westbound Right-Turn	A	0.74	10.94
	Southbound Right-Turn	A	2.58	19.66
	Southbound Left-Turn	A	2.4	19.66
	All	A	**1.24**	**20.66**

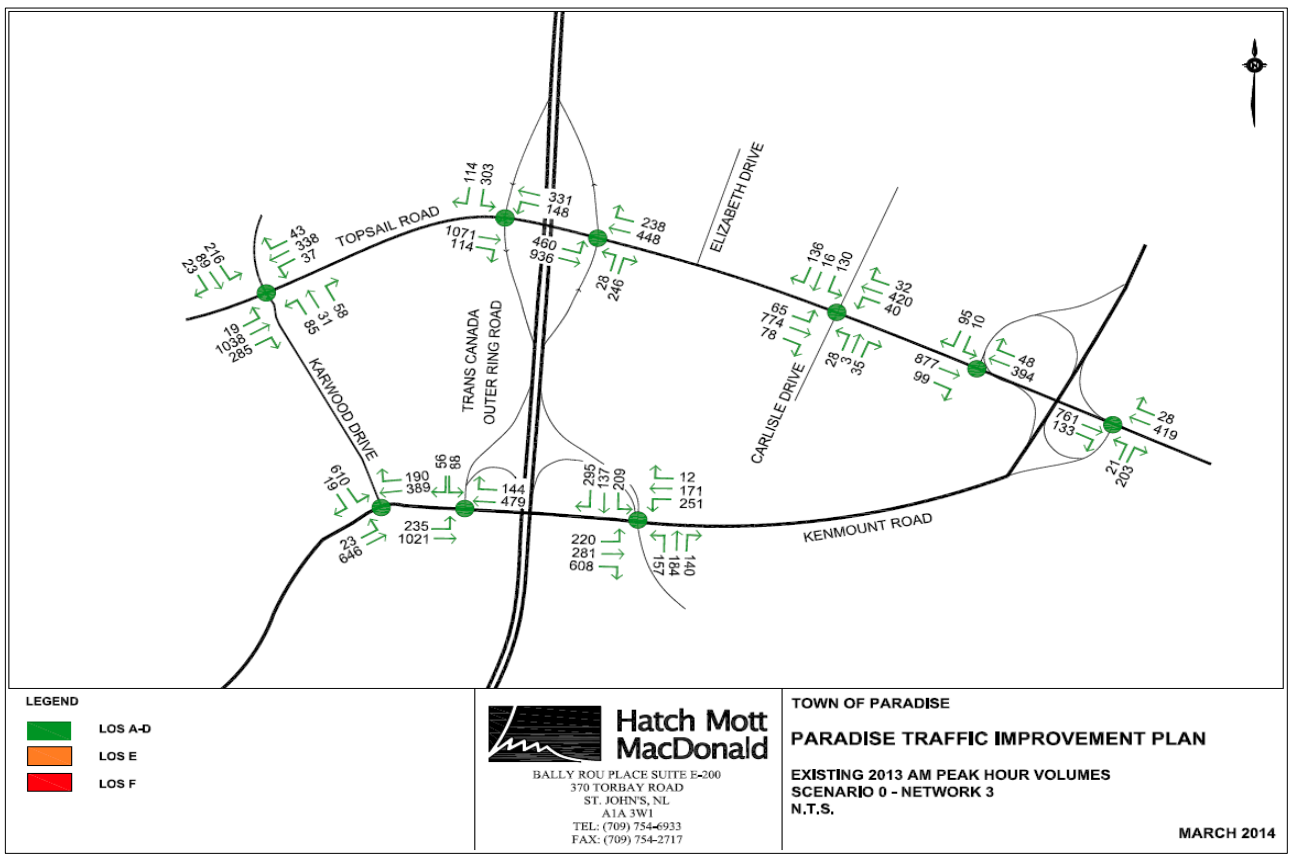






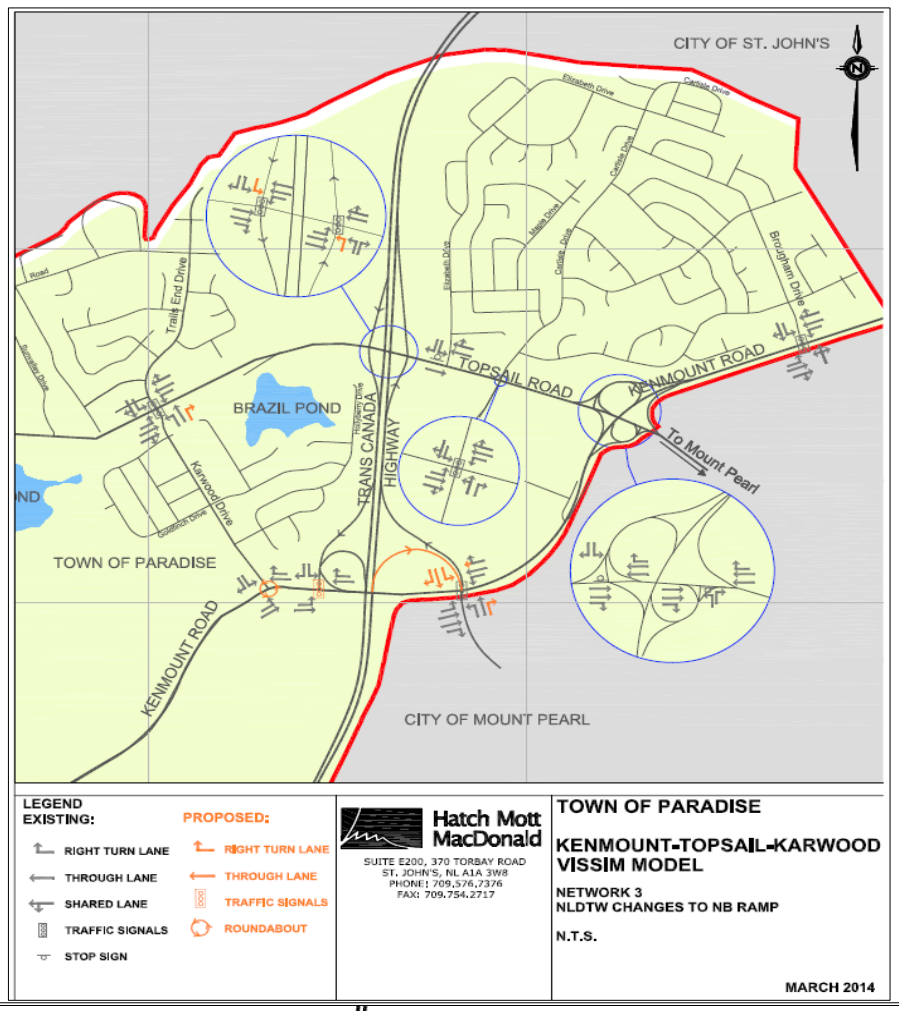
Scenario 0 - Network 3 AM

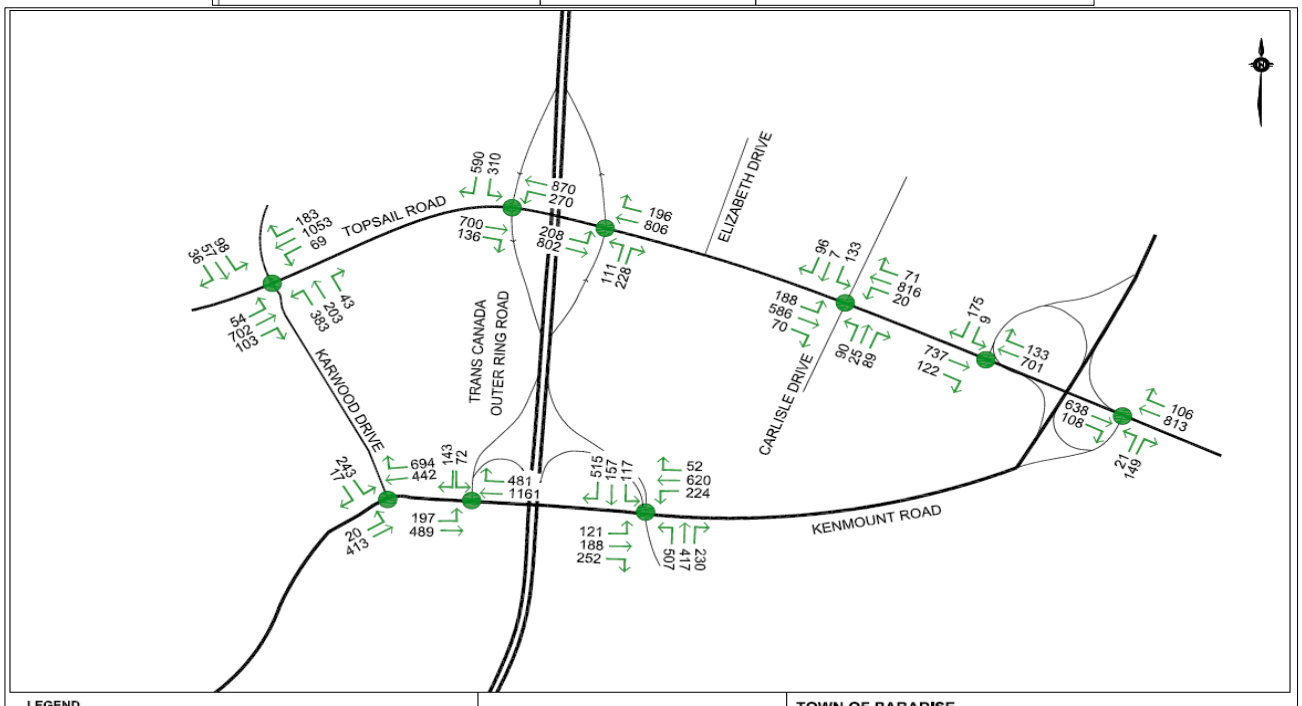
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	17.76	85.16
	Southbound Left-Turn	C	30.16	84.96
	Southbound Through	D	35.48	84.96
	Eastbound Left-Turn	B	12.68	143.78
	Eastbound Through	C	20.28	143.78
	Eastbound Right-Turn	C	25.14	143.78
	Westbound Right-Turn	A	2.86	22.2
	Westbound Through	A	6.12	22.2
	Westbound Left-Turn	C	33.54	22.2
	Northbound Through	D	38.28	25
	Northbound Left-Turn	C	25.78	24.9
	Northbound Right-Turn	A	4.56	24.72
	All	**C**	**20.26**	**143.78**
Topsail Rd / TransCanada Hwy	Southbound Right-Turn	A	3.6	0
	Southbound Left-Turn	D	48.22	53.94
	Eastbound Right-Turn	A	1.6	0
	Eastbound Through	B	11.06	49.4
	Westbound Left-Turn	C	24.74	46.32
	Westbound Through	B	12.9	47.9
	All	**B**	**15.34**	**55.58**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	D	43.66	14.42
	Northbound Right-Turn	A	1.56	0
	Eastbound Left-Turn	B	19.1	149.84
	Eastbound Through	A	6.88	149.84
	Westbound Right-Turn	A	4.2	19.54
	Westbound Through	A	5.84	42.16
	All	**A**	**8.74**	**149.84**
Topsail Rd / Carlisle Dr	Northbound Through	C	23.1	26.44
	Northbound Left-Turn	C	32.14	26.46
	Northbound Right-Turn	A	5.92	26.54
	Southbound Through	D	37.1	54.46
	Southbound Right-Turn	A	9.76	54.42
	Southbound Left-Turn	D	35.64	53.12
	Eastbound Left-Turn	B	15.52	104.96
	Eastbound Right-Turn	A	9.4	104.9
	Eastbound Through	B	11.14	104.92
	Westbound Right-Turn	A	4.56	33.92
	Westbound Left-Turn	A	9.5	33.92
	Westbound Through	A	5.82	33.94
	All	**B**	**11.94**	**104.96**
Topsail Rd / Kenmount Rd Southbound Ramp	Westbound Through	A	1.72	0
	Westbound Right-Turn	B	12.44	0
	Eastbound Through	A	0.52	0
	Eastbound Right-Turn	A	1.46	0
	Southbound Right-Turn	A	0	4.62
	Southbound Left-Turn	A	0.28	4.3
	All	**A**	**0.6**	**4.62**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0
	Westbound Through	A	0	0
	Eastbound Left-Turn	A	0.82	31.94
	Eastbound Through	A	0.1	31.94
	Northbound Right-Turn	A	3.2	0
	Northbound Left-Turn	A	9.3	0
	All	**A**	**0.5**	**31.94**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	C	30.42	64.74
	Northbound Right-Turn	A	2.06	3.94
	Northbound Left-Turn	C	22.68	62.78
	Eastbound Left-Turn	B	16.14	57.1
	Eastbound Right-Turn	A	3.68	0
	Eastbound Through	B	19.32	57.1
	Westbound Left-Turn	A	5.54	0
	Westbound Right-Turn	B	14.86	56.62
	Westbound Through	B	19.4	56.62
	All	**B**	**14.32**	**67.38**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	45	44.38
	Southbound Right-Turn	A	5.06	0
	Westbound Right-Turn	A	0.42	0
	Westbound Through	A	6.7	58.98
	Eastbound Left-Turn	A	6.68	86.52
	Eastbound Through	A	4.9	86.4
	All	**A**	**6.6**	**86.52**
Karwood Dr Kenmount Road	Eastbound Through	A	6.44	34.7
	Eastbound Left-Turn	B	11.44	34.7
	Westbound Through	A	1	13.84
	Westbound Right-Turn	A	1.52	13.84
	Southbound Right-Turn	A	3.22	24.96
	Southbound Left-Turn	A	3.32	24.96
	All	**A**	**3.92**	**34.7**



Scenario 0 - Network 3 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	13.48	37.24
	Southbound Left-Turn	C	26.06	37.48
	Southbound Through	C	34.98	37.32
	Eastbound Left-Turn	C	20.18	81.3
	Eastbound Through	B	17.16	81.3
	Eastbound Right-Turn	B	18.84	81.3
	Westbound Right-Turn	B	14.46	102.9
	Westbound Through	B	17.36	102.84
	Westbound Left-Turn	B	17.36	102.84
	Northbound Through	C	29.46	40.14
	Northbound Left-Turn	C	23	40.02
	Northbound Right-Turn	A	3.54	39.94
	All	**B**	**18.32**	**102.9**
Topsail Rd / Southbound Ramp	Southbound Right-Turn	B	13.16	3
	Southbound Left-Turn	D	46.72	194.08
	Eastbound Right-Turn	A	2.22	0
	Eastbound Through	A	6.84	58.54
	Eastbound Through	A	5.96	58.54
	Westbound Through	A	3.16	36.66
	All	**B**	**12.1**	**194.08**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	D	40.56	45.7
	Northbound Right-Turn	A	1.92	0
	Eastbound Left-Turn	C	21.42	54.94
	Eastbound Through	A	6.54	54.94
	Westbound Right-Turn	A	2.98	24.48
	Westbound Through	A	4.7	43.6
	All	**A**	**7.76**	**58.52**
Topsail Rd / Carlisle Dr	Northbound Through	C	32	53.06
	Northbound Left-Turn	D	35.58	53.24
	Northbound Right-Turn	A	5.34	52.96
	Southbound Through	D	39.4	56.54
	Southbound Right-Turn	A	7.64	56.5
	Southbound Left-Turn	D	42.9	55.36
	Eastbound Left-Turn	C	24.28	45.56
	Eastbound Right-Turn	A	4.52	43.84
	Eastbound Through	A	5.04	45.48
	Westbound Right-Turn	A	6.88	48.68
	Westbound Left-Turn	A	8.7	48.64
	Westbound Through	A	7.64	48.68
	All	**B**	**11.9**	**59.34**
Topsail Rd / Kenmount Rd Southbound Ramp	Westbound Through	A	3.28	0
	Westbound Right-Turn	C	15.24	0
	Eastbound Through	A	0.12	0
	Eastbound Right-Turn	A	1.12	0
	Southbound Right-Turn	A	0.1	4.5
	Southbound Left-Turn	A	0.32	4.16
	All	**A**	**0.68**	**4.5**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.34	0
	Westbound Through	A	0.06	0
	Eastbound Left-Turn	A	0.5	12.94
	Eastbound Through	A	0.06	12.94
	Northbound Right-Turn	A	2.14	0
	Northbound Left-Turn	B	11.12	0
	All	**A**	**0.34**	**12.94**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	C	33.02	194.44
	Northbound Right-Turn	B	10.98	15.76
	Northbound Left-Turn	D	47.42	193.38
	Eastbound Left-Turn	C	22.6	78.98
	Eastbound Right-Turn	B	13.2	0
	Eastbound Through	C	30.82	78.98
	Westbound Left-Turn	A	2.56	0
	Westbound Right-Turn	C	22.32	35.52
	Westbound Through	C	23.9	35.52
	All	**C**	**27.84**	**194.44**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	49.06	45.72
	Southbound Right-Turn	B	19.42	0
	Westbound Right-Turn	A	2.78	107.18
	Westbound Through	B	13.74	261.04
	Eastbound Left-Turn	C	27.34	59.82
	Eastbound Through	A	2.44	59.66
	All	**B**	**10.12**	**261.04**
Karwood Dr Kenmount Road	Eastbound Through	A	2.54	20.32
	Eastbound Left-Turn	A	3.96	20.32
	Westbound Through	A	0.78	14.2
	Westbound Right-Turn	A	3.76	14.2
	Southbound Right-Turn	A	5.84	22.7
	Southbound Left-Turn	A	4.54	22.7
	All	**A**	**2.88**	**22.92**





APPENDIX B

2025 VISUM MODEL ASSUMPTIONS

Hatch Mott MacDonald

MEMO

To **Allen Nie**
From Radya Rifaat
Date November 8, 2013
Project # 325480
Page 1 of 6
CC Robin King
Michael MacDonald

Subject **Paradise Traffic Improvement Plan – VISUM Model – Zone Recommendations**

Further to our conversations last week, this memo is to document suggested changes to the zone and road network structure to update the St. John's VISUM model for the Paradise Traffic Improvement Plan (TIP).

Zone Adjustments

The below recommended changes are based on the current zoning map and road network, as well as our knowledge of future proposed road improvements. The zones impacted are as follows:

- Zone 281(shown in Figure 1) – The current connector for this road directs all traffic towards Mallow Road. Currently, about 15% of the residential dwelling units have access only to St. Thomas' Line.

- Zone 413 (shown in Figure 2)

    - Need to have separate connectors to Karwood Drive (approximately 0.6) and McNamara Drive (0.4)

    - Need to update the land uses to include 406 units in existing, 515 units in 2015, and 592 units in 2025.

- Zone 415 (shown in Figure 3)

    - Suggested instead of splitting zones to add another connector closer to Topsail Road with a weight of 0.3

    - Land uses need to be updated to 249 units in existing, 281 units in 2015 and 295 units in 2025.

- Zone 416 (shown in Figure 4)

    - This should be an industrial / commercial node – suggested to move all residential except for 13 dwelling units adjacent to Kenmount into Zone 289

  - Connector split should be changed to 0.9 to Topsail Road and 0.1 to Kenmount Road based on the relative trip generation of the two parts

- Zone 412 – one connector is fine but it is suggested to move it mid-block between Karwood Drive and McNamara Road, not at the end of the Karwood / Kenmount intersection which is being assessed as a T-intersection.

- Suggested to create a new Zone between 282 and 416 which would represent future Octagon Pond residential development (shown in Figure 5). The Town planning department will be sending us a concept plan for the Octagon Pond development and road network.

Otherwise, the zone structure should facilitate the existing and future conditions.

Transportation Network

The future road network changes are shown in Figure 6. The main improvements that need to be considered for this study are:

- **New interchange on TransCanada Highway** – the current alignment of this interchange is not yet determined but it is expected to accommodate traffic from north of Topsail Road and possibly tie into Paradise Road or Milton Road.

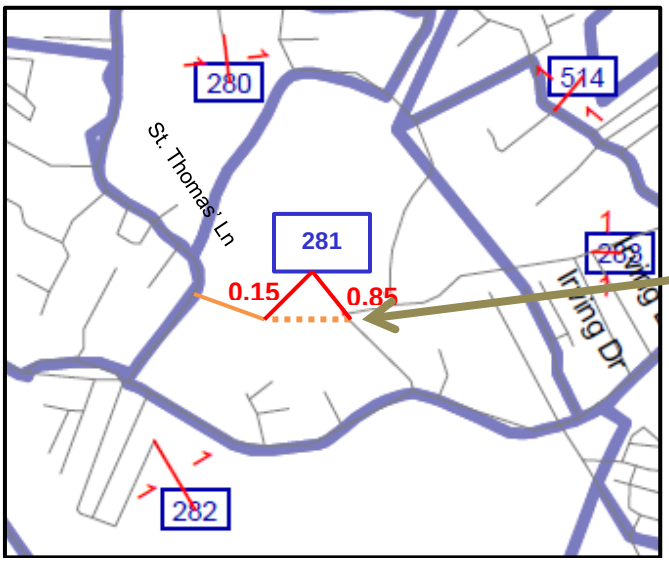
- **New interchange on Pitts Memorial** – Currently, this is foreseen as a continuation of Kenmount Road to an interchange on Pitts Memorial. This would divert some traffic from Kenmount Road and also serve the new Octagon Pond development and commercial/industrial development in the south. Also, the development south of Pitts Memorial (Oceanex) has retained us to do some conceptual planning and pre-design for the interchange.

- **New road from McNamara Road to Kenmount Road** – This is not expected to impact the bottlenecks but the Town has planned to have this road so it would be good to have forecast traffic on the road and at the intersection with Kenmount Road.

Zone Land Use

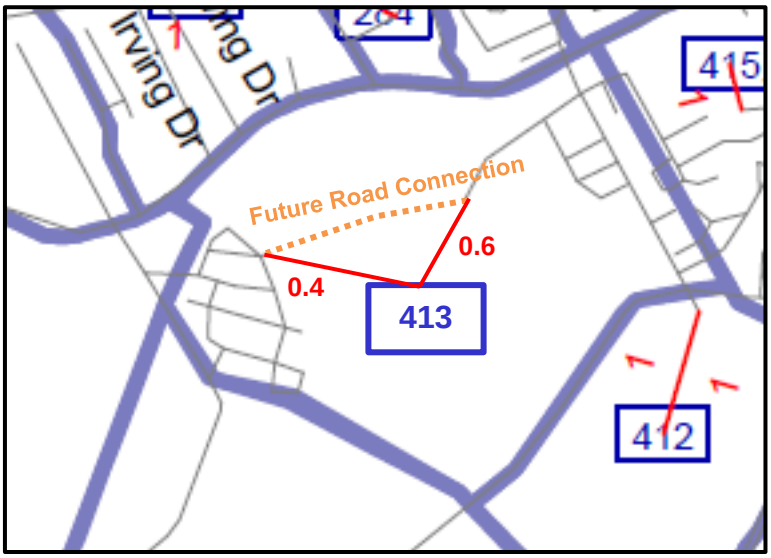
Land use data was also reviewed for Paradise and is detailed in Table 1 for the existing, 2015 and 2025 horizons. This is based on the current zoning map, the 2010 Paradise Transportation Study (by HMM), and applying a land use coverage of 0.1 for commercial and industrial. To convert to jobs, the rates of 1 retail job / 945 s.f. and 1 industrial job / 300 s.f. were applied as per previous St. John's VISUM zone adjustments.

Figure 1: Zone 281 Changes



In 2015 and 2025 model, the dashed link would be connected. In the future scenarios, the split between the connectors would be more like 0.4 to St. Thomas' Line based on the number of units in the development area.

Figure 2: Zone 413 Changes



Hatch Mott MacDonald

MEMO

To Allen Nie
Date November 8, 2013

Figure 3 – Zone 415 Changes

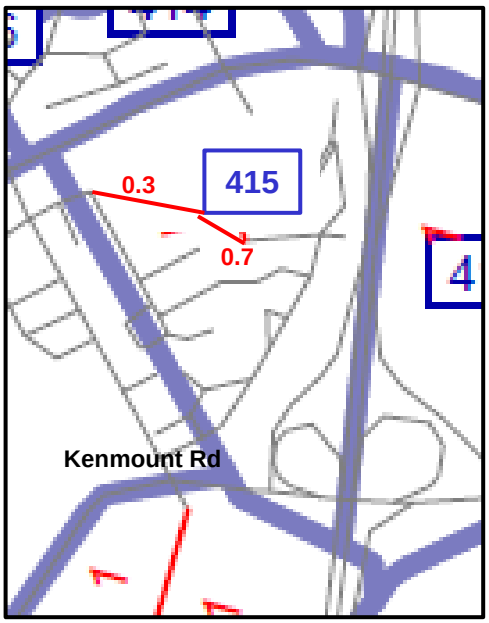


Figure 4 – Zone 416 Changes

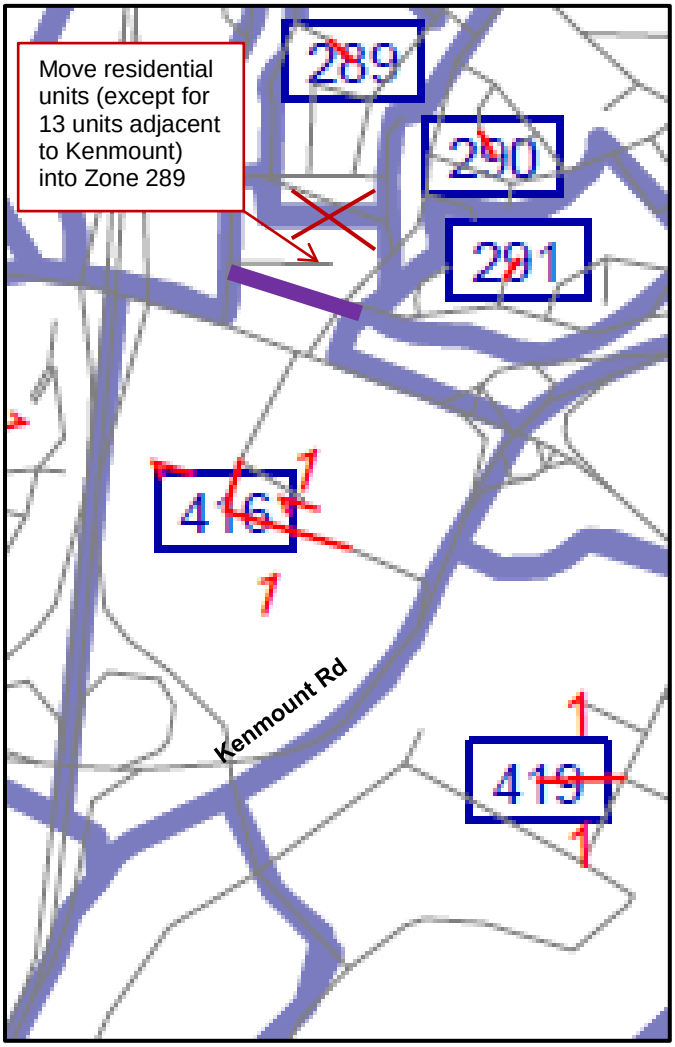


Figure 5 – New Zone from 426 and 282

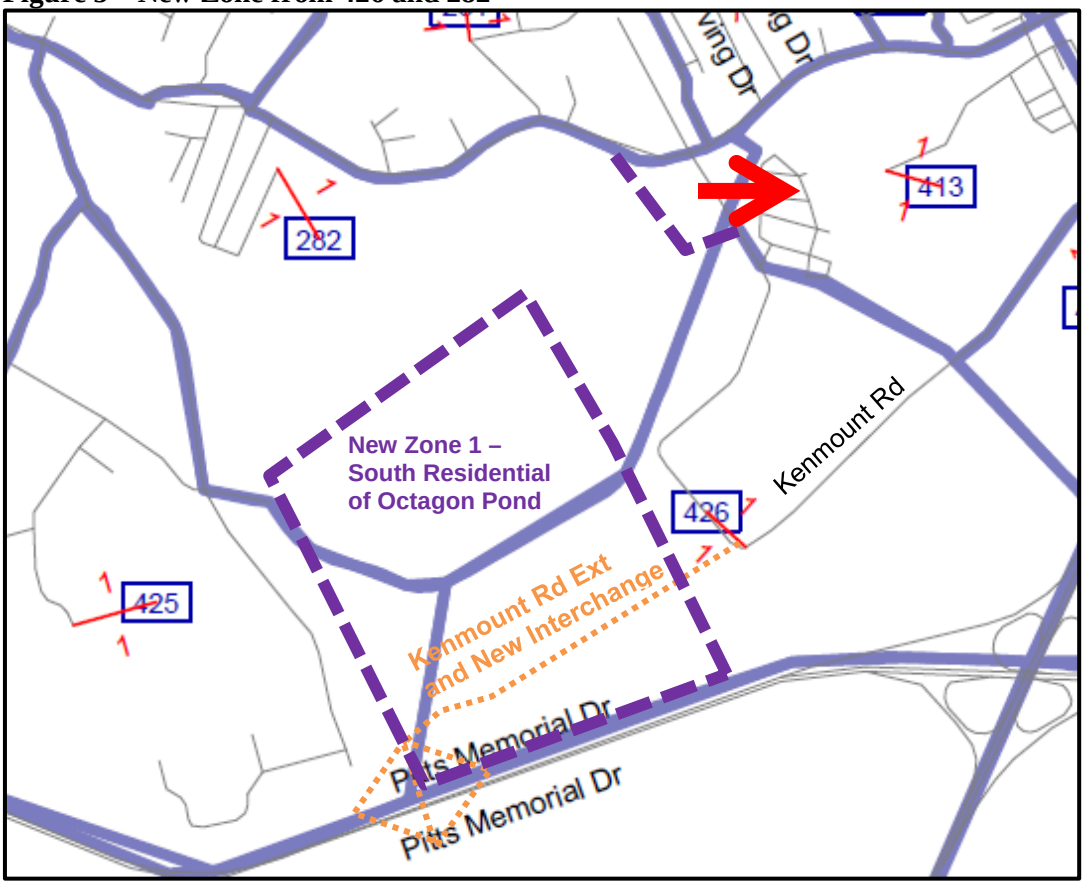
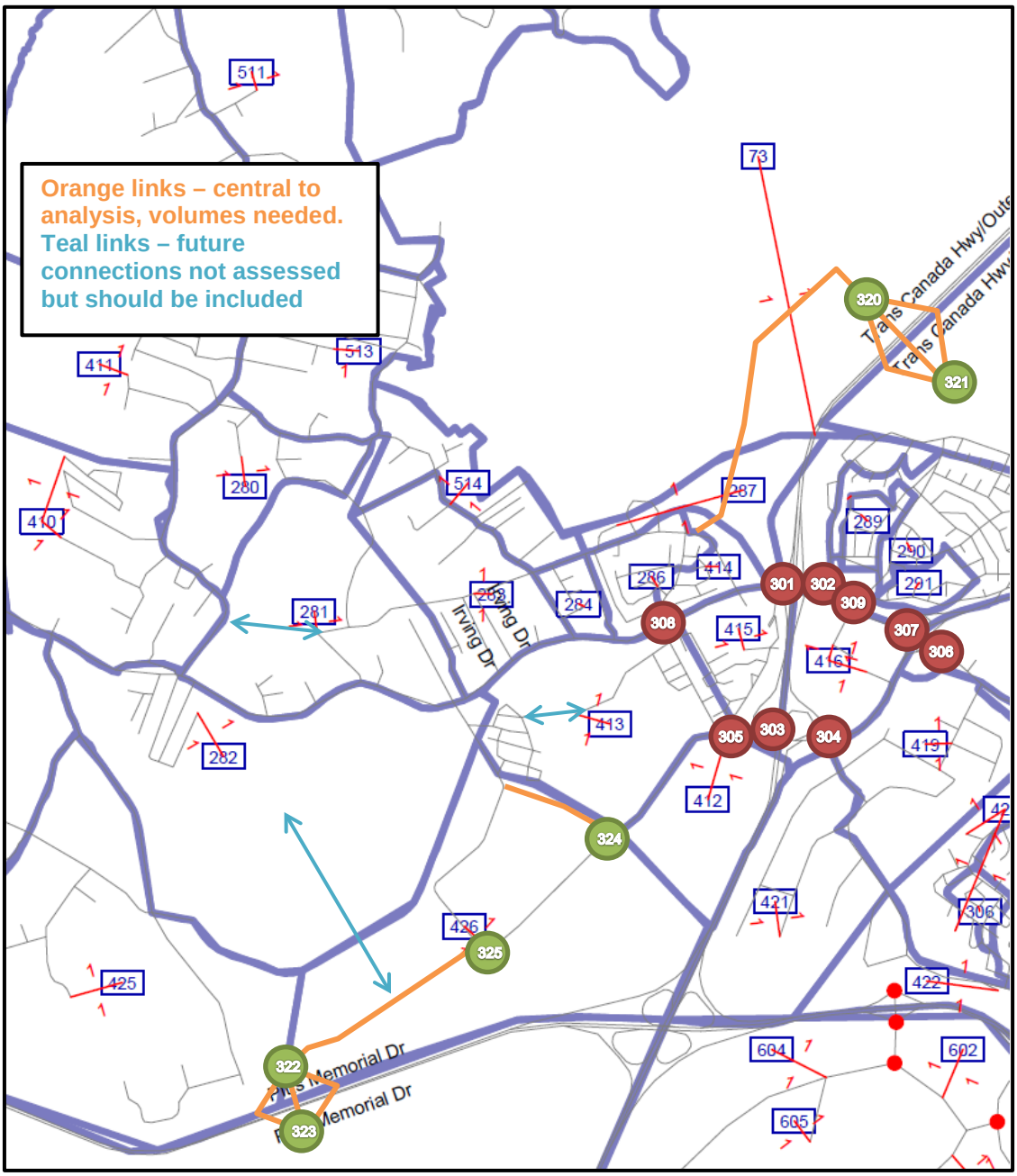


Figure 6 – Future Road Network



APPENDIX C

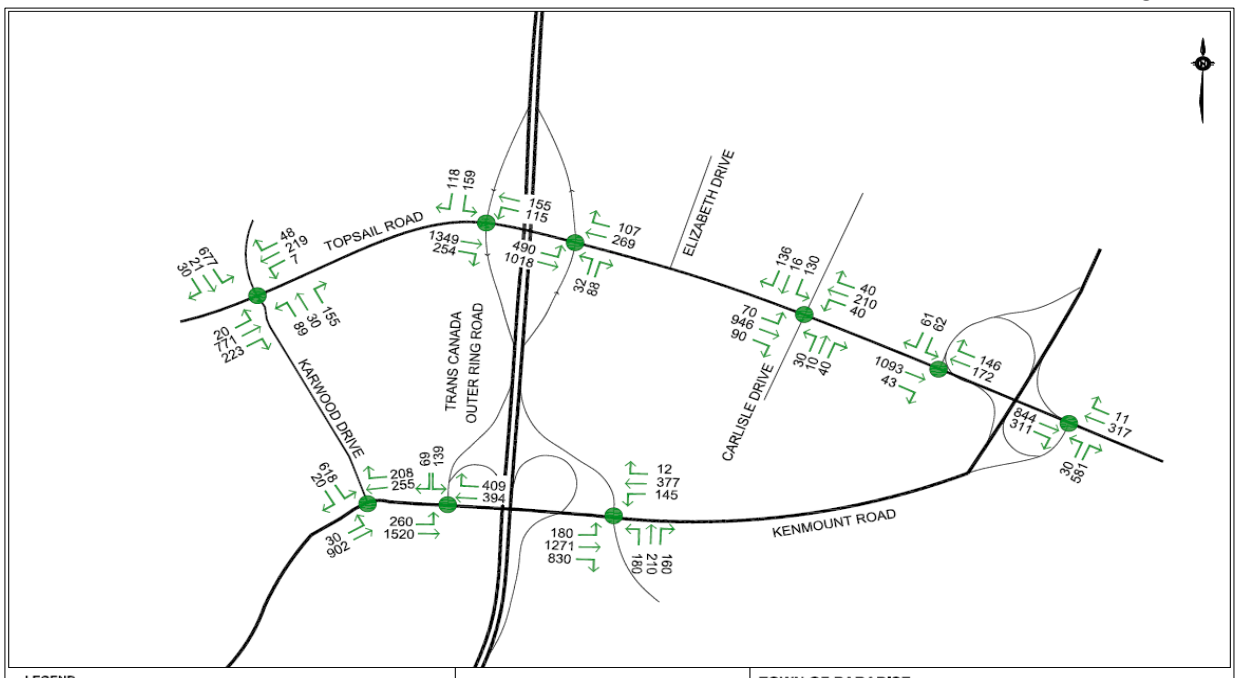
2025 FORECAST (NO ADDITIONAL INTERCHANGES) TRAFFIC VISSIM OUTPUT SUMMARIES

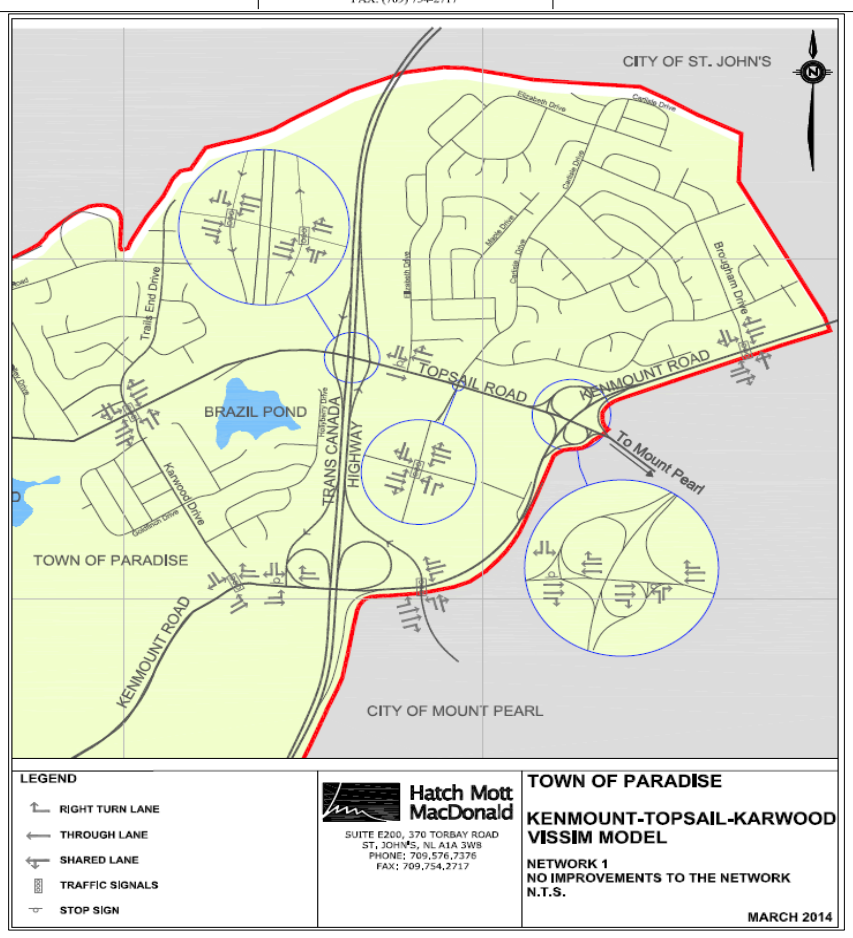
Scenario 1 - Network 1 AM

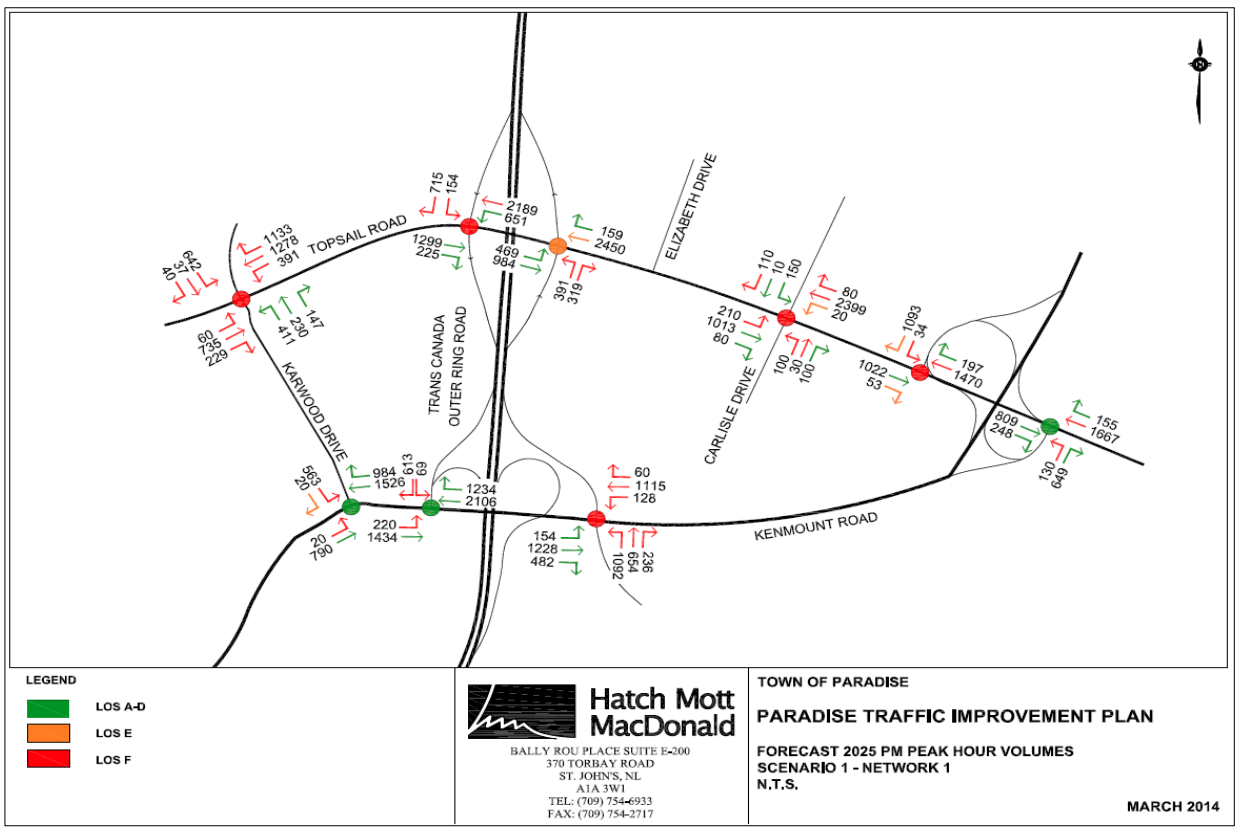
Intersection	Movement	LOS	Delay(All)	aveQueue	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	16.04	29.24	185.92
	Southbound Left-Turn	C	24.3	29.5	186.2
	Southbound Through	C	26.56	29.3	186.02
	Eastbound Left-Turn	C	25.74	27.36	128.8
	Eastbound Through	C	30.82	27.36	128.8
	Eastbound Right-Turn	C	28.04	27.36	128.8
	Westbound Right-Turn	B	10.3	5.48	40.36
	Westbound Through	B	18.12	5.58	40.32
	Westbound Left-Turn	D	54.4	4.84	40.32
	Northbound Through	D	36.3	5.36	46.56
	Northbound Left-Turn	B	18.26	5.36	46.58
	Northbound Right-Turn	B	12.76	5.46	46.7
	All	**C**	**25.08**	**16.84**	**186.72**
Topsail Rd / TransCanada Hwy	Southbound Right-Turn	A	2.44	0	0
	Southbound Left-Turn	D	43.44	11.4	63.86
	Eastbound Right-Turn	A	4.64	7.94	77.36
	Eastbound Through	B	10.3	7.9	76.86
	Westbound Left-Turn	C	24.24	6.1	51.76
	Westbound Through	A	5.76	6.44	53.34
	All	**B**	**12.02**	**7.16**	**77.36**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	D	41.56	1.84	19.66
	Northbound Right-Turn	A	2.64	0	0
	Eastbound Left-Turn	B	10.62	8.16	62.98
	Eastbound Through	A	5.28	8.16	62.98
	Westbound Right-Turn	A	5.88	4.04	39.38
	Westbound Through	B	10.64	4.04	39.36
	All	**A**	**7.76**	**4.84**	**62.98**
Topsail Rd / Carlisle Dr	Northbound Through	C	33.44	2.48	27.82
	Northbound Left-Turn	D	36.26	2.56	28.08
	Northbound Right-Turn	A	3.92	2.58	28.14
	Southbound Through	C	29.5	7.38	52.74
	Southbound Right-Turn	A	8.28	7.48	52.94
	Southbound Left-Turn	C	34.06	7.6	52.18
	Eastbound Left-Turn	A	4.94	2.26	50.44
	Eastbound Right-Turn	A	3.56	2.66	50.54
	Eastbound Through	A	4.12	2.72	50.5
	Westbound Right-Turn	A	3.92	1.14	21.68
	Westbound Left-Turn	B	10.18	0.8	20.4
	Westbound Through	A	6.74	1.24	21.7
	All	**A**	**8.96**	**3.4**	**56.06**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Right-Turn	A	0.92	0	0
	Southbound Left-Turn	B	10.46	0	0
	Eastbound Through	A	0.2	0	0
	Eastbound Right-Turn	A	0.86	0	0
	Westbound Through	A	0	0	4.54
	Westbound Right-Turn	A	0.64	0	4.22
	All	**A**	**0.58**	**0**	**4.54**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.22	0	0
	Westbound Through	A	0	0	0
	Eastbound Right-Turn	A	1.48	0.04	18.28
	Eastbound Through	A	0.1	0.04	18.28
	Northbound Right-Turn	A	4.26	0	0
	Northbound Left-Turn	A	9.72	0	0
	All	**A**	**1.16**	**0**	**18.28**
Kenmount Rd Bruce Street TransCanada Hwy	Northbound Through	D	41.3	22.6	107.4
	Northbound Right-Turn	B	13	0	1.54
	Northbound Left-Turn	D	35.98	21.96	106.7
	Westbound Left-Turn	B	14.42	6.3	64.38
	Westbound Right-Turn	A	1.58	0	0
	Westbound Through	B	12.76	6.3	64.38
	Eastbound Right-Turn	B	16.12	5.26	122.06
	Eastbound Left-Turn	B	16.12	29.36	375.72
	Eastbound Through	C	20.96	29.36	375.72
	All	**B**	**18.06**	**13.84**	**375.72**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	C	24.24	0	0
	Southbound Right-Turn	B	13.02	0	0
	Westbound Right-Turn	A	0.84	0	0
	Westbound Through	A	2.12	0	0
	Eastbound Left-Turn	A	3.3	0.04	12.6
	Eastbound Through	A	3.16	0.04	12.6
	All	**A**	**3.66**	**0.02**	**12.6**
Kenmount Rd Karwood Dr	Eastbound Through	C	26.1	47.56	291.36
	Eastbound Left-Turn	C	28.76	47.56	291.36
	Westbound Through	B	12.2	6.12	64.58
	Westbound Right-Turn	B	15.56	6.12	64.58
	Southbound Right-Turn	B	17.5	55.28	194.3
	Southbound Left-Turn	C	31.64	55.28	194.3
	All	**C**	**25.3**	**36.3**	**291.36**

Scenario 1 - Network 1 PM

Intersection	Movement	LOS	Delay(All)	aveQueue	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	F	215.66	253.16	291.64
	Southbound Left-Turn	F	208.38	253.44	291.9
	Southbound Through	F	322.4	253.26	291.72
	Eastbound Left-Turn	F	90.98	243	500.58
	Eastbound Through	F	124.76	243	500.58
	Eastbound Right-Turn	F	269.74	243	500.58
	Westbound Right-Turn	F	137.74	450.92	507.96
	Westbound Through	F	162.76	450.86	507.96
	Westbound Left-Turn	F	509.26	450.8	507.94
	Northbound Through	D	45.88	10.76	67.78
	Northbound Left-Turn	C	30.96	10.78	67.8
	Northbound Right-Turn	C	33.48	10.84	67.9
	All	**F**	**163.32**	**239.48**	**508.02**
Topsail Rd / TransCanada Hwy	Southbound Right-Turn	F	342.06	8.96	21.68
	Southbound Left-Turn	F	263.34	218.42	259.98
	Eastbound Right-Turn	B	13.66	4.88	106.96
	Eastbound Through	D	38.32	31.3	289.62
	Westbound Left-Turn	C	29.66	95.72	152.56
	Westbound Through	F	197.92	97.3	154.16
	All	**F**	**120.02**	**89.92**	**325.04**
Topsail Rd / Northbound Ramp	Northbound Left-Turn	F	250.52	148.98	180.72
	Northbound Right-Turn	F	148.3	0.42	9.38
	Eastbound Left-Turn	D	49.98	64.12	292.18
	Eastbound Through	B	16.36	64.12	292.18
	Westbound Right-Turn	C	23.66	63.44	91.38
	Westbound Through	E	56.74	63.44	91.3
	All	**E**	**71.28**	**74.5**	**292.18**
Topsail Rd / Carlisle Dr	Northbound Through	F	108.04	44.88	203.68
	Northbound Left-Turn	F	156.24	44.8	203.56
	Northbound Right-Turn	C	24.74	44.88	203.6
	Southbound Through	D	52.08	24.4	109.36
	Southbound Right-Turn	F	129.04	24.46	109.38
	Southbound Left-Turn	D	51.86	24.1	108.98
	Eastbound Left-Turn	F	424.36	76.04	130.5
	Eastbound Right-Turn	B	19.42	75.94	130.5
	Eastbound Through	C	21.28	76.16	130.5
	Westbound Right-Turn	F	103.98	328.14	505.76
	Westbound Left-Turn	E	63.56	328.3	505.74
	Westbound Through	F	145.58	328.16	505.74
	All	**F**	**107.76**	**118.36**	**505.76**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Right-Turn	E	47.66	129.6	509.1
	Southbound Left-Turn	F	74.22	129.6	509.1
	Eastbound Through	A	2.22	0	0
	Eastbound Right-Turn	E	49.08	0	0
	Westbound Through	F	103.68	138.94	268.76
	Westbound Right-Turn	D	32	138.46	267.88
	All	**F**	**57.22**	**89.44**	**509.1**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	1.8	164.64	336.64
	Westbound Through	F	53.36	164.64	336.64
	Eastbound Right-Turn	A	1.14	7.26	94.82
	Eastbound Through	A	2.64	7.26	94.82
	Northbound Right-Turn	A	5.44	145.18	420.06
	Northbound Left-Turn	F	69.86	145.18	420.06
	All	**D**	**30.1**	**105.7**	**420.06**
Kenmount Rd Bruce Street TransCanada Hwy	Northbound Through	F	97.36	157.94	200.8
	Northbound Right-Turn	F	80.68	6.54	19.46
	Northbound Left-Turn	F	184.86	157.2	200.02
	Westbound Left-Turn	F	353.16	403.46	451.76
	Westbound Right-Turn	F	328.66	62.88	101.7
	Westbound Through	F	436.28	403.46	451.76
	Eastbound Right-Turn	B	10.58	79.34	495.8
	Eastbound Left-Turn	D	37.98	111.66	505.34
	Eastbound Through	C	21.78	111.66	505.34
	All	**F**	**121.4**	**143.74**	**505.34**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	F	1542.74	2.12	13.8
	Southbound Right-Turn	F	2007.62	2.12	13.8
	Westbound Right-Turn	A	5.38	135	346.66
	Westbound Through	D	28.52	135	346.66
	Eastbound Left-Turn	F	61.92	14.06	102.94
	Eastbound Through	A	2.02	14.06	102.94
	All	**D**	**34.3**	**43.18**	**346.66**
Kenmount Rd Karwood Dr	Eastbound Through	B	16.88	47.8	273.42
	Eastbound Left-Turn	F	80.52	47.8	273.42
	Westbound Through	A	9.7	433.66	450.96
	Westbound Right-Turn	C	29.62	433.66	450.96
	Southbound Right-Turn	E	69.18	161.42	195.52
	Southbound Left-Turn	F	83.82	161.42	195.52
	All	**C**	**30.5**	**214.3**	**450.96**

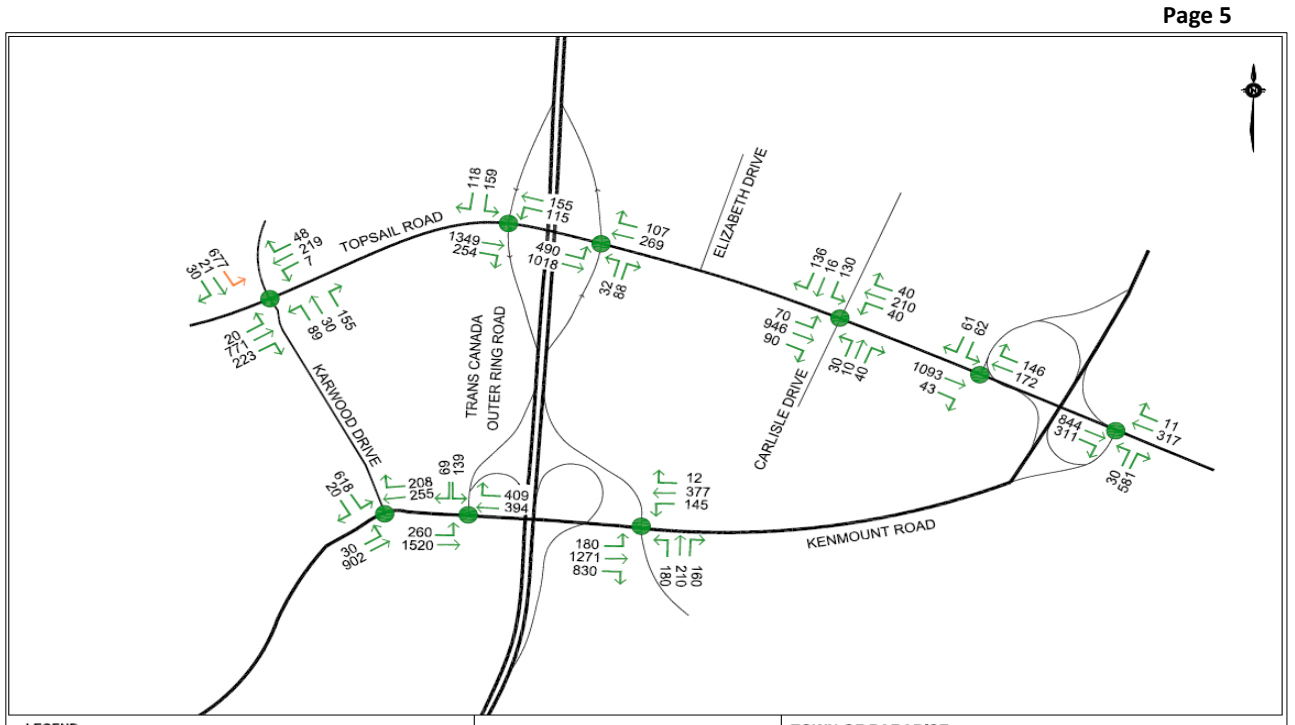






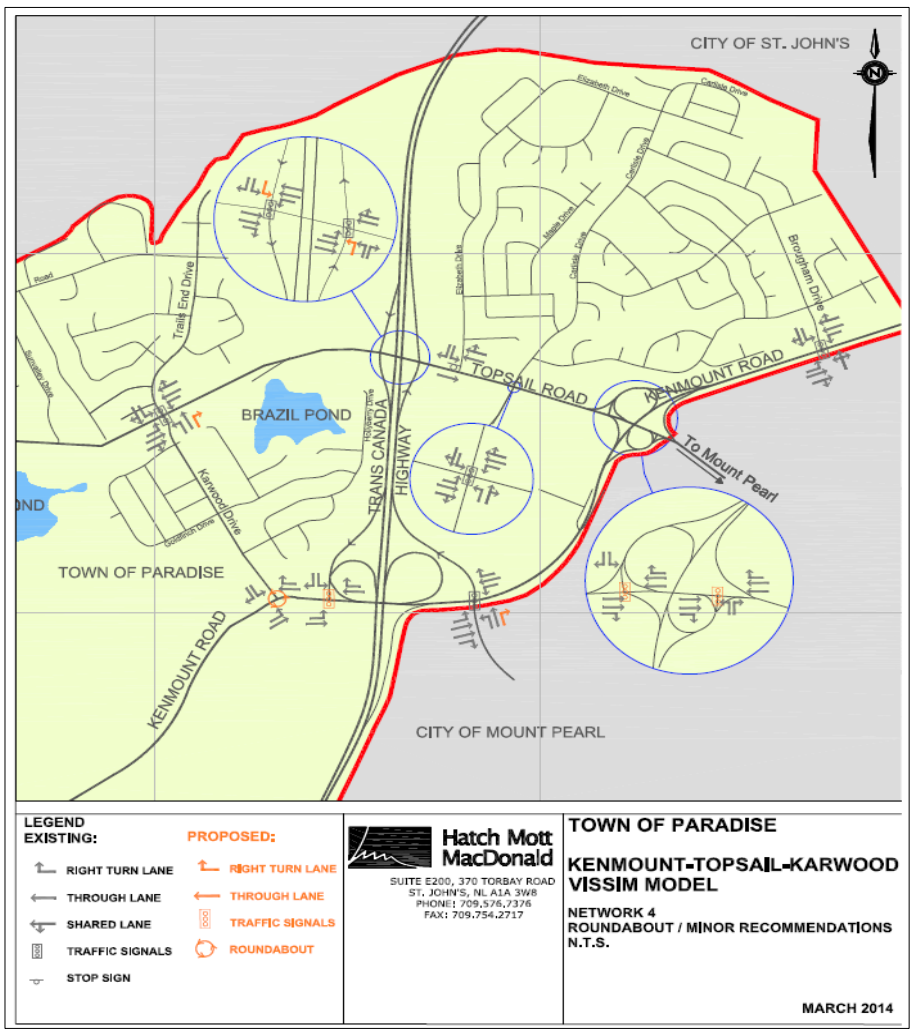
Scenario 1 - Network 4 AM

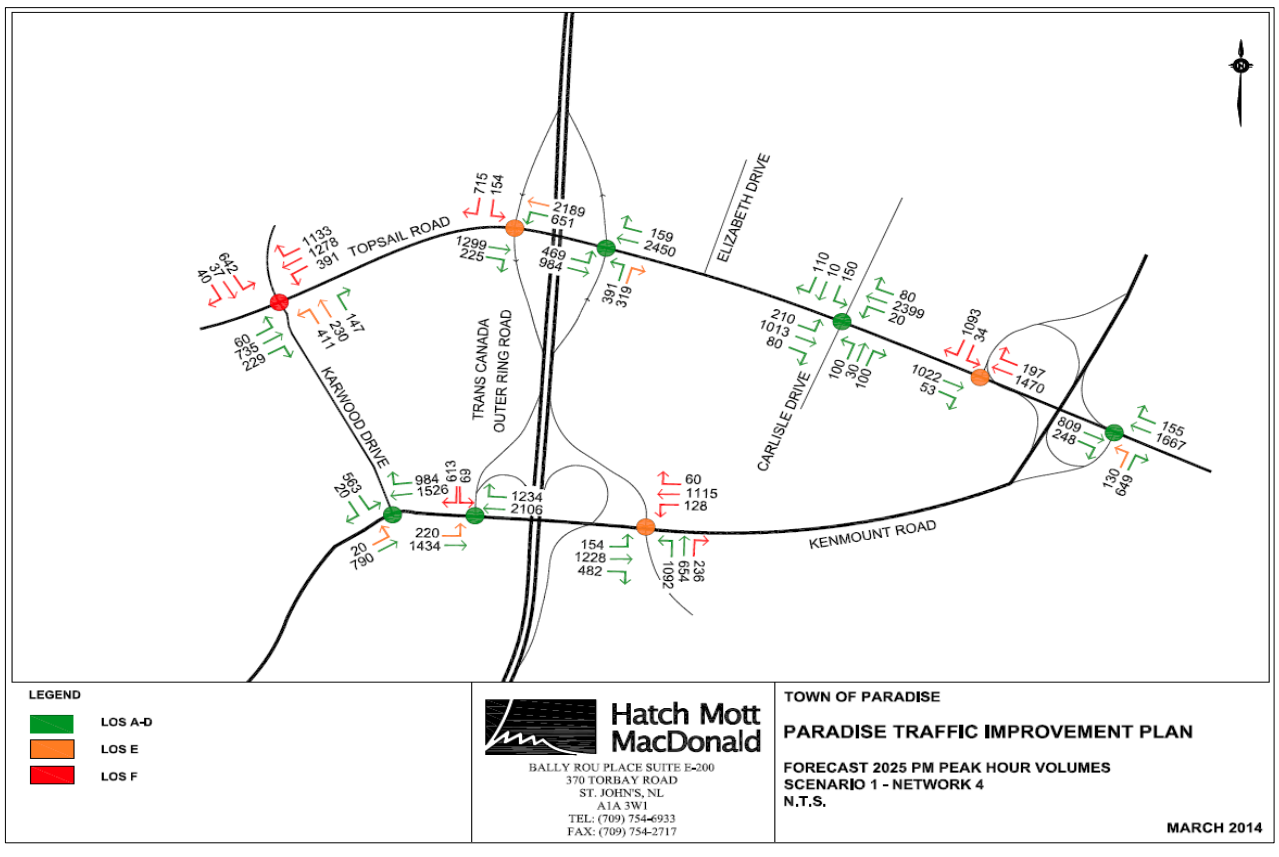
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	D	45.12	280.46
	Southbound Left-Turn	E	56.86	280.72
	Southbound Through	D	50.5	280.54
	Eastbound Left-Turn	B	18.06	97.54
	Eastbound Through	C	21.12	97.54
	Eastbound Right-Turn	B	18.74	97.54
	Westbound Right-Turn	B	10.36	35.92
	Westbound Through	B	14.12	35.84
	Westbound Left-Turn	C	27.48	35.84
	Northbound Through	D	35.44	26.9
	Northbound Left-Turn	B	18.48	27.52
	Northbound Right-Turn	A	8.8	27.54
	All	**C**	**30.64**	**280.72**
Topsail Rd / TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	2.18	0
	Southbound Left-Turn	D	42.62	34.74
	Eastbound Right-Turn	A	3.26	0
	Eastbound Through	A	7.6	79.7
	Westbound Left-Turn	B	14.86	25.88
	Westbound Through	A	4.38	27.42
	All	**A**	**9.42**	**79.7**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Lefft-Turn	D	46.88	13.12
	Northbound Right-Turn	A	0.76	0
	Eastbound Left-Turn	A	8.12	86.12
	Eastbound Through	A	2.02	86.12
	Westbound Right-Turn	A	3.48	0
	Westbound Through	A	6.02	31.56
	All	**A**	**4.78**	**86.12**
Topsail Rd / Carlisle Dr	Northbound Through	D	35.3	24.54
	Northbound Left-Turn	C	34.92	24.66
	Northbound Right-Turn	A	5.98	24.7
	Southbound Through	C	33.94	57.9
	Southbound Right-Turn	A	9.18	57.62
	Southbound Left-Turn	D	36.42	56.68
	Eastbound Left-Turn	A	6.36	34.72
	Eastbound Right-Turn	A	2.5	34.8
	Eastbound Through	A	3.16	34.8
	Westbound Right-Turn	A	2.86	17.7
	Westbound Through	B	11.34	17.58
	Westbound Left-Turn	A	3.96	17.74
	All	**A**	**8.3**	**57.9**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	2.94	34.9
	Eastbound Right-Turn	A	3.9	34.9
	Westbound Through	A	1.32	13.16
	Westbound Left-Turn	A	1.94	13.16
	Southbound Right-Turn	A	0.28	0
	Southbound Left-Turn	A	1	0
	Southbound Right-Turn	A	0.96	0
	Southbound Left-Turn	D	47.1	29.4
	All	**A**	**3.82**	**36.24**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	1.42	14.6
	Westbound Right-Turn	A	0.3	0
	Eastbound Through	A	2.14	33.36
	Eastbound Right-Turn	A	0.9	38.52
	Northbound Right-Turn	A	3.92	0
	Northbound Left-Turn	D	45.04	16.64
	All	**A**	**2.5**	**42.02**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Left-Turn	C	29.68	84.56
	Northbound Through	A	1.52	62.04
	Northbound Right-Turn	C	31.7	85.36
	Westbound Left-Turn	B	13.52	55.8
	Westbound Right-Turn	A	2.26	0
	Westbound Through	A	9.22	55.8
	Eastbound Left-Turn	B	12.14	260.82
	Eastbound Right-Turn	B	11.84	133.82
	Eastbound Through	B	15.5	260.82
	All	**B**	**13.56**	**260.82**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	43.5	63.68
	Southbound Right-Turn	A	6.76	0
	Westbound Right-Turn	A	1.08	0
	Westbound Through	A	9.68	55.22
	Eastbound Left-Turn	A	10	123.2
	Eastbound Through	B	10.26	123.52
	All	**B**	**10.44**	**123.52**
Karwood Dr Kenmount Road	Westbound Through	A	1.04	14.64
	Westbound Right-Turn	A	2.36	14.64
	Eastbound Through	A	8.38	160.96
	Eastbound Left-Turn	A	8.84	160.96
	Southbound Right-Turn	A	0.56	18.74
	Southbound Left-Turn	A	2.7	18.74
	All	**A**	**5.32**	**160.96**



Scenario 1 - Network 4 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	F	269.38	290.4
	Southbound Left-Turn	F	313.96	290.66
	Southbound Through	F	276.16	290.5
	Eastbound Left-Turn	C	32.58	126.14
	Eastbound Through	C	33.76	126.14
	Eastbound Right-Turn	C	32.12	126.14
	Westbound Right-Turn	F	157.62	507.66
	Westbound Through	F	142.9	507.62
	Westbound Left-Turn	F	148.2	507.62
	Northbound Through	E	70.66	147.32
	Northbound Left-Turn	E	55.84	147.2
	Northbound Right-Turn	B	17.82	147.22
	All	**F**	**109.56**	**507.66**
Topsail Rd / TransCanada Hwy Southbound Ramp	Southbound Right-Turn	F	261.14	18.7
	Southbound Left-Turn	F	220.22	259.92
	Eastbound Right-Turn	B	13.94	48.42
	Eastbound Through	C	33	235.24
	Westbound Left-Turn	B	18.68	149.96
	Westbound Through	E	66.92	151.54
	All	**E**	**75.7**	**271.42**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Right-Turn	E	61.68	152.5
	Northbound Left-Turn	B	18.62	20.72
	Eastbound Left-Turn	D	42.52	300.04
	Eastbound Through	A	4.66	300.04
	Westbound Right-Turn	B	10.16	58.08
	Westbound Through	B	16.48	91.26
	All	**C**	**22.22**	**303.1**
Topsail Rd / Carlisle Dr	Northbound Through	D	46.52	57.94
	Northbound Left-Turn	D	52.8	58.08
	Northbound Right-Turn	B	16.68	58.1
	Southbound Through	D	37.7	60.5
	Southbound Right-Turn	B	14.26	60.2
	Southbound Left-Turn	D	50.3	59.3
	Eastbound Left-Turn	D	46.18	110.2
	Eastbound Right-Turn	B	12.7	110.16
	Eastbound Through	B	13.6	110.18
	Westbound Right-Turn	C	31.62	425.34
	Westbound Left-Turn	C	24.52	425.34
	Westbound Through	C	33.28	425.34
	All	**C**	**29.42**	**425.34**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	0.9	30.16
	Eastbound Right-Turn	D	45.16	30.16
	Westbound Through	F	91.96	169.8
	Westbound Left-Turn	F	85.18	169.8
	Southbound Left-Turn	F	112.8	93.46
	Southbound Right-Turn	F	350.62	276
	All	**E**	**73.34**	**304.16**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	B	14.08	322.5
	Westbound Right-Turn	A	1.02	249.42
	Eastbound Through	A	1.38	34.22
	Eastbound Right-Turn	A	1	42.66
	Northbound Right-Turn	A	4.68	0
	Northbound Left-Turn	E	60	42.6
	All	**A**	**9.52**	**322.5**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	D	35.22	357.6
	Northbound Left-Turn	A	0	418
	Northbound Right-Turn	F	114.22	202
	Westbound Through	F	183.54	451.8
	Westbound Left-Turn	F	110.14	307.8
	Westbound Right-Turn	F	299.46	451.8
	Eastbound Left-Turn	C	24.36	418
	Eastbound Right-Turn	B	14.42	211.44
	Eastbound Through	C	26.3	418
	All	**E**	**67.6**	**472.96**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	F	267.48	323.28
	Southbound Right-Turn	F	234.38	83.76
	Westbound Right-Turn	A	1.86	0
	Westbound Through	A	5.8	63.16
	Eastbound Left-Turn	E	75.58	195.42
	Eastbound Through	A	9.98	195.74
	All	**D**	**38.14**	**323.28**
Karwood Dr Kenmount Rd	Westbound Through	A	0.82	14.34
	Westbound Right-Turn	A	0.74	14.34
	Eastbound Through	D	30.52	288.82
	Eastbound Left-Turn	E	37.4	288.82
	Southbound Right-Turn	A	9.76	88.38
	Southbound Left-Turn	C	24	88.38
	All	**B**	**14.42**	**288.82**



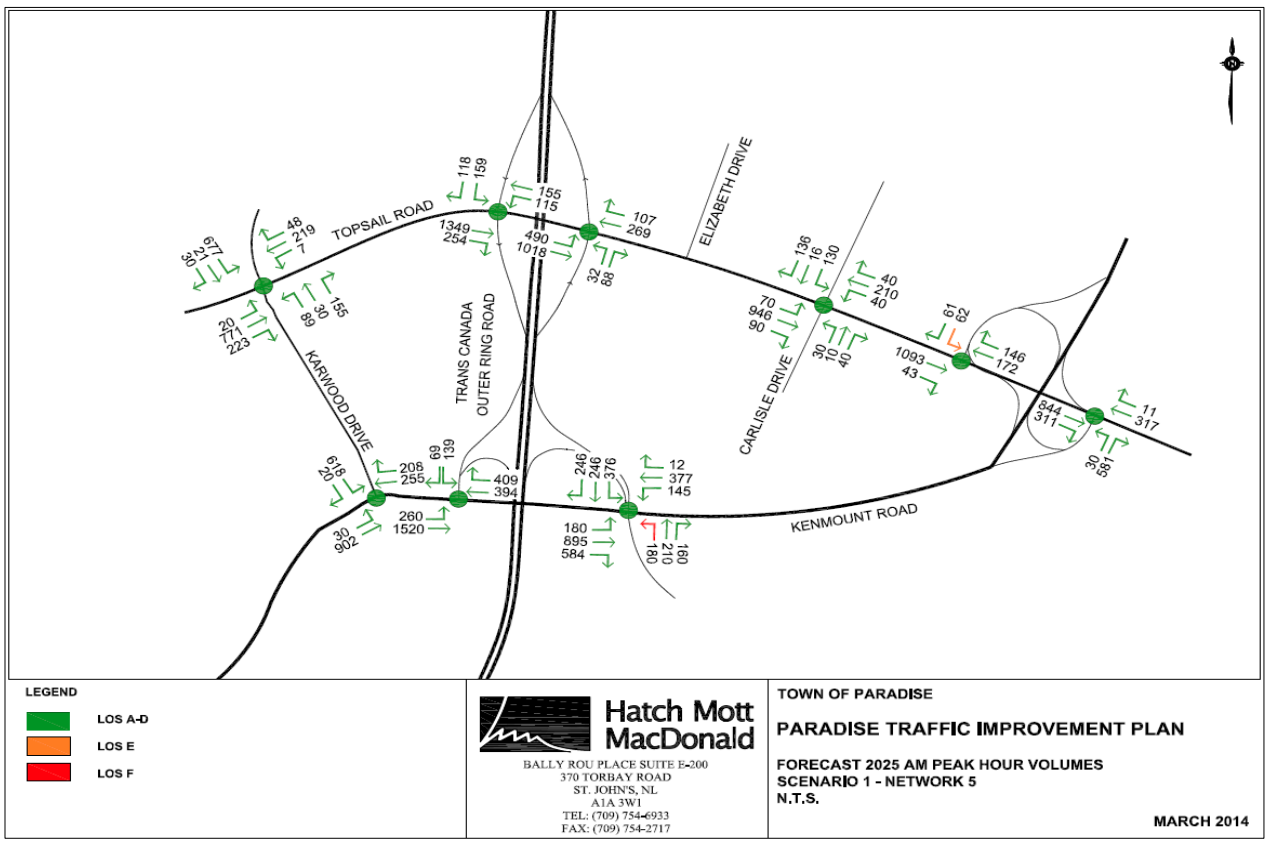


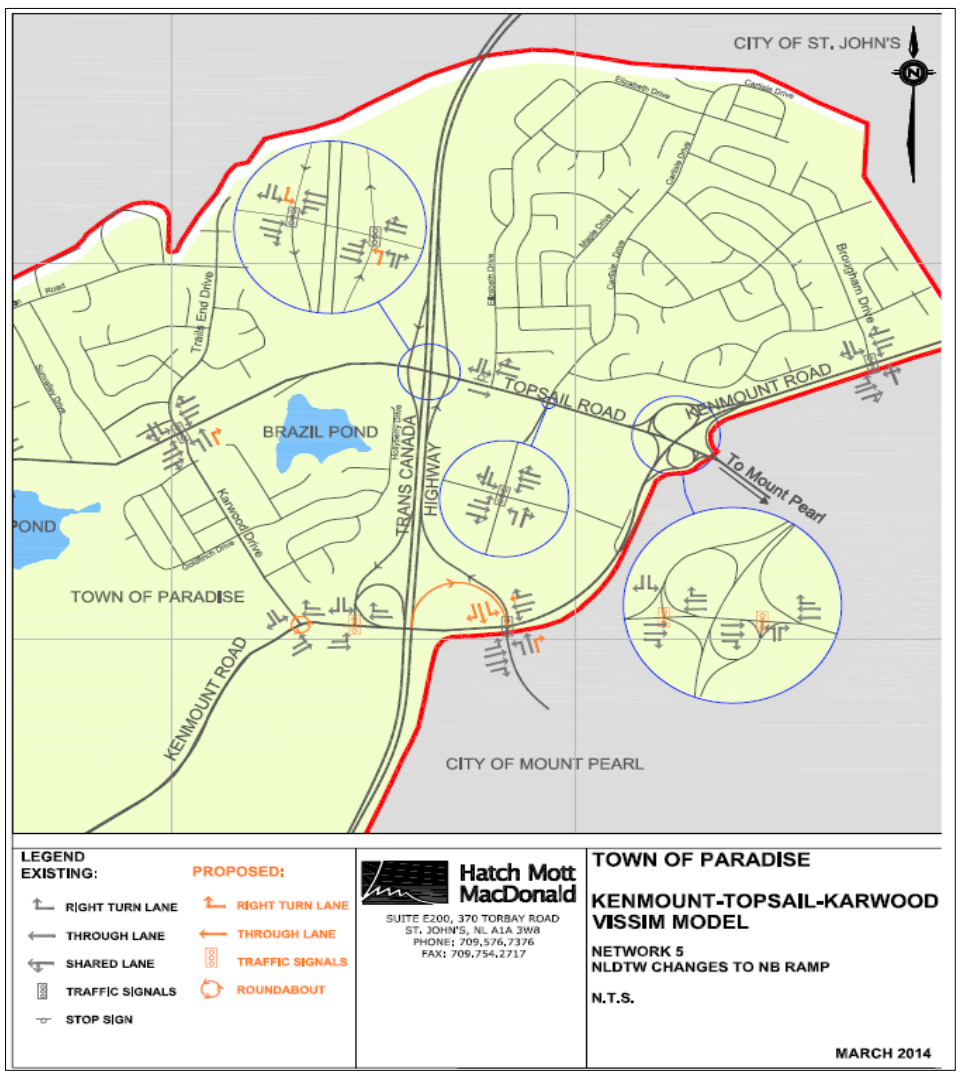
Scenario 1 - Network 5 AM

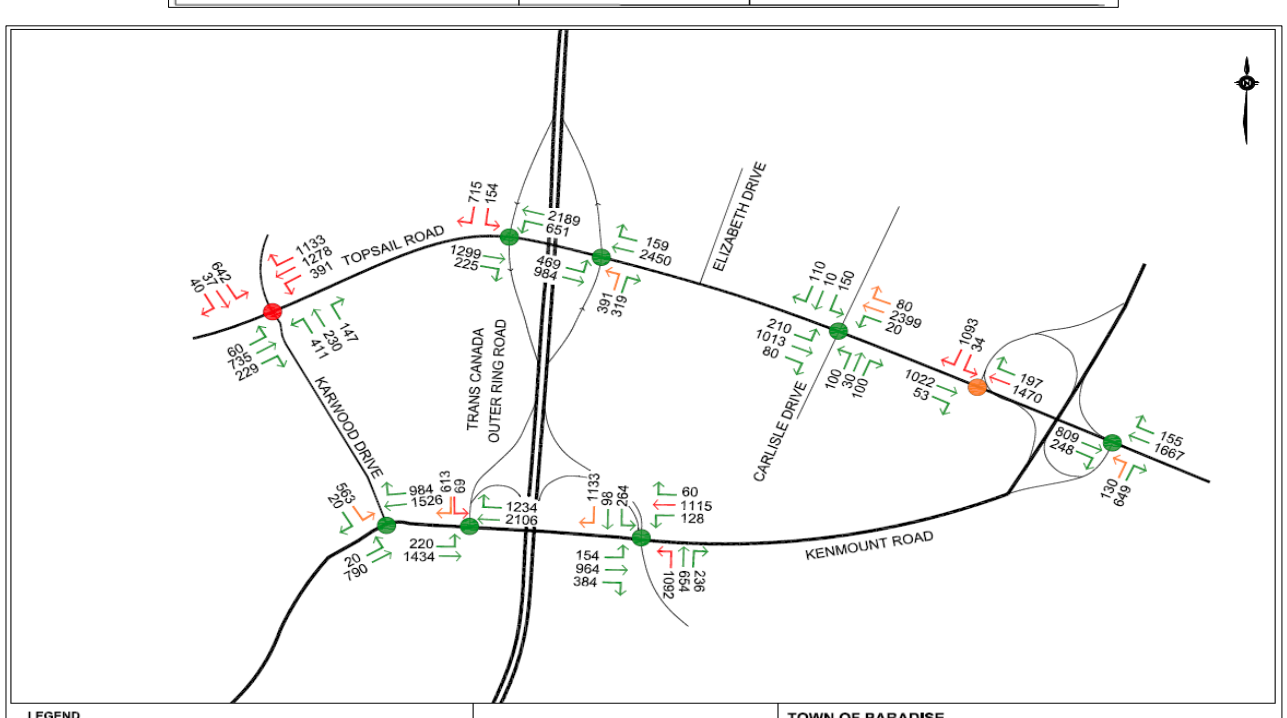
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	C	30.22	285.82
	Southbound Left-Turn	D	44.76	286.1
	Southbound Through	D	40.84	285.92
	Eastbound Left-Turn	B	17.74	101.96
	Eastbound Through	C	20.46	101.96
	Eastbound Right-Turn	B	17.9	101.96
	Westbound Right-Turn	A	8.2	36.12
	Westbound Through	B	12.12	36.04
	Westbound Left-Turn	C	21.66	36.04
	Northbound Through	D	35.92	29.58
	Northbound Right-Turn	C	21.3	29.54
	Northbound Left-Turn	A	4.66	24.66
	All	**C**	**25.64**	**286.1**
Topsail Rd / TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	1.42	0
	Southbound Left-Turn	D	44.18	33.84
	Eastbound Right-Turn	A	2.54	0
	Eastbound Through	A	6.34	79.8
	Westbound Left-Turn	C	23.96	48
	Westbound Through	A	4.5	49.58
	All	**A**	**9.72**	**81.22**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	D	47.62	14.68
	Northbound Right-Turn	A	0.72	0
	Eastbound Left-Turn	A	7.52	66.66
	Eastbound Through	A	4.38	66.66
	Westbound Right-Turn	A	3.94	4.88
	Westbound Through	A	7.3	37.56
	All	**A**	**6.04**	**66.66**
Topsail Rd / Carlisle Dr	Northbound Through	D	37.08	28.82
	Northbound Left-Turn	D	37.5	28.92
	Northbound Right-Turn	A	7.2	29.02
	Southbound Through	C	33.98	53.1
	Southbound Right-Turn	B	10.96	52.94
	Southbound Left-Turn	D	35.38	52.28
	Eastbound Left-Turn	A	4.96	39.32
	Eastbound Right-Turn	A	2.08	39.26
	Eastbound Through	A	2.02	39.28
	Westbound Right-Turn	A	2.82	18.74
	Westbound Left-Turn	A	8.62	18.22
	Westbound Through	A	4.5	18.76
	All	**A**	**8.04**	**53.84**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	1.88	29.54
	Eastbound Right-Turn	A	2.18	29.54
	Westbound Through	A	1.78	14.12
	Westbound Left-Turn	A	0.24	0
	Southbound Right-Turn	A	0.74	0
	Southbound Left-Turn	E	55.64	24.84
	All	**A**	**3.46**	**30**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.54	12.02
	Westbound Right-Turn	A	0.46	0
	Eastbound Through	A	0.6	17.14
	Eastbound Left-Turn	A	0.3	0
	Northbound Right-Turn	A	2.78	0
	Northbound Left-Turn	C	28.28	9.28
	All	**A**	**1.24**	**17.3**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	D	53.48	200.08
	Northbound Right-Turn	A	6.7	132.78
	Northbound Left-Turn	F	222.68	198.82
	Southbound Through	D	35.82	318.28
	Southbound Left-Turn	D	50.02	337.08
	Southbound Right-Turn	A	1.62	257.58
	Westbound Left-Turn	C	22.86	48
	Westbound Right-Turn	A	3.08	0
	Westbound Through	C	24.66	48
	Eastbound Right-Turn	B	11.56	4.48
	Eastbound Left-Turn	C	20.24	155.74
	Eastbound Through	C	26.44	155.74
	All	**C**	**32.78**	**356**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	43.18	62.58
	Southbound Right-Turn	A	4.02	5.74
	Westbound Left-Turn	A	0.7	0
	Westbound Through	A	9.64	60.52
	Eastbound Right-Turn	A	7.1	109.76
	Eastbound Through	A	5.28	109.64
	All	**A**	**7.46**	**109.76**
Karwood Dr Kenmount Road	Eastbound Through	B	11.38	115.74
	Eastbound Left-Turn	B	10.1	115.74
	Westbound Left-Turn	A	1.6	15.58
	Westbound Through	A	1.16	15.58
	Southbound Right-Turn	A	1.86	25.68
	Southbound Left-Turn	A	5.94	25.68
	All	**A**	**7.44**	**115.74**

Scenario 1 - Network 5 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	F	99.38	289.4
	Southbound Left-Turn	F	140.38	289.64
	Southbound Through	F	119.44	289.44
	Eastbound Left-Turn	C	30.4	127.06
	Eastbound Through	C	33.56	127.06
	Eastbound Right-Turn	C	29.66	127.06
	Westbound Right-Turn	F	129.46	509.22
	Westbound Through	F	115.22	509.18
	Westbound Left-Turn	F	115.8	509.2
	Northbound Through	A	0	90.94
	Northbound Left-Turn	C	34.9	90.86
	Northbound Right-Turn	A	6.78	90.82
	All	**F**	**80.6**	**509.26**
Topsail Rd / TransCanada Hwy Southbound Ramp	Southbound Right-Turn	F	88.06	200.12
	Southbound Left-Turn	F	87.36	257.22
	Eastbound Right-Turn	B	17.42	90.34
	Eastbound Through	D	42.54	233.4
	Westbound Left-Turn	C	22.88	149.24
	Westbound Through	D	54.06	150.8
	All	**D**	**51.16**	**277.4**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	E	61.54	163.28
	Northbound Right-Turn	C	20.08	78.5
	Eastbound Left-Turn	D	38.04	278.44
	Eastbound Through	A	6.2	278.44
	Westbound Right-Turn	B	13.14	58.26
	Westbound Through	C	20.98	91.3
	All	**C**	**24.32**	**278.44**
Topsail Rd / Carlisle Dr	Northbound Through	D	44.58	55.34
	Northbound Left-Turn	D	47.62	55.44
	Northbound Right-Turn	B	18.1	55.5
	Southbound Through	D	52.08	62.98
	Southbound Right-Turn	B	16.32	62.8
	Southbound Left-Turn	D	50.58	62.12
	Eastbound Left-Turn	D	50.78	82.48
	Eastbound Right-Turn	A	8.32	82.42
	Eastbound Through	A	9.54	82.42
	Westbound Right-Turn	E	60.02	370.2
	Westbound Left-Turn	D	43.3	370.2
	Westbound Through	E	62.8	370.2
	All	**D**	**43.84**	**370.2**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	0.52	30.3
	Eastbound Right-Turn	A	1.1	30.3
	Westbound Through	F	95.66	186.24
	Westbound Left-Turn	A	0.3	0
	Southbound Right-Turn	F	606.42	510.18
	Southbound Left-Turn	F	150.4	7.76
	All	**E**	**62.48**	**510.18**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	D	40.42	362.48
	Westbound Right-Turn	B	17.04	112
	Eastbound Through	A	2.86	56.34
	Eastbound Left-Turn	A	0.3	0
	Northbound Right-Turn	A	3.58	10.08
	Northbound Left-Turn	E	69.6	38.84
	All	**C**	**25.46**	**362.48**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	D	47.04	199.5
	Northbound Right-Turn	A	8.56	132.62
	Northbound Left-Turn	F	311.48	198.24
	Southbound Through	D	50.84	445.06
	Southbound Left-Turn	D	44.12	445.2
	Southbound Right-Turn	E	60.62	366.88
	Westbound Left-Turn	B	19.76	146.9
	Westbound Right-Turn	B	14.76	0
	Westbound Through	F	84.5	146.9
	Eastbound Right-Turn	A	8.6	77.16
	Eastbound Left-Turn	B	17.9	268.66
	Eastbound Through	C	22.34	268.66
	All	**D**	**53.24**	**449.56**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	F	101.54	324.54
	Southbound Right-Turn	E	70.42	265.12
	Westbound Left-Turn	A	0.84	255.4
	Westbound Through	A	9.16	359.1
	Eastbound Right-Turn	C	26.8	125.42
	Eastbound Through	A	2.94	125.3
	All	**B**	**14.52**	**399.3**
Karwood Dr Kenmount Rd	Eastbound Through	B	10.44	71.6
	Eastbound Left-Turn	A	8.4	71.6
	Westbound Through	A	3.1	144.18
	Westbound Right-Turn	A	1.36	144.18
	Southbound Right-Turn	D	32.1	200.78
	Southbound Left-Turn	E	35.14	200.78
	All	**B**	**13.16**	**200.78**





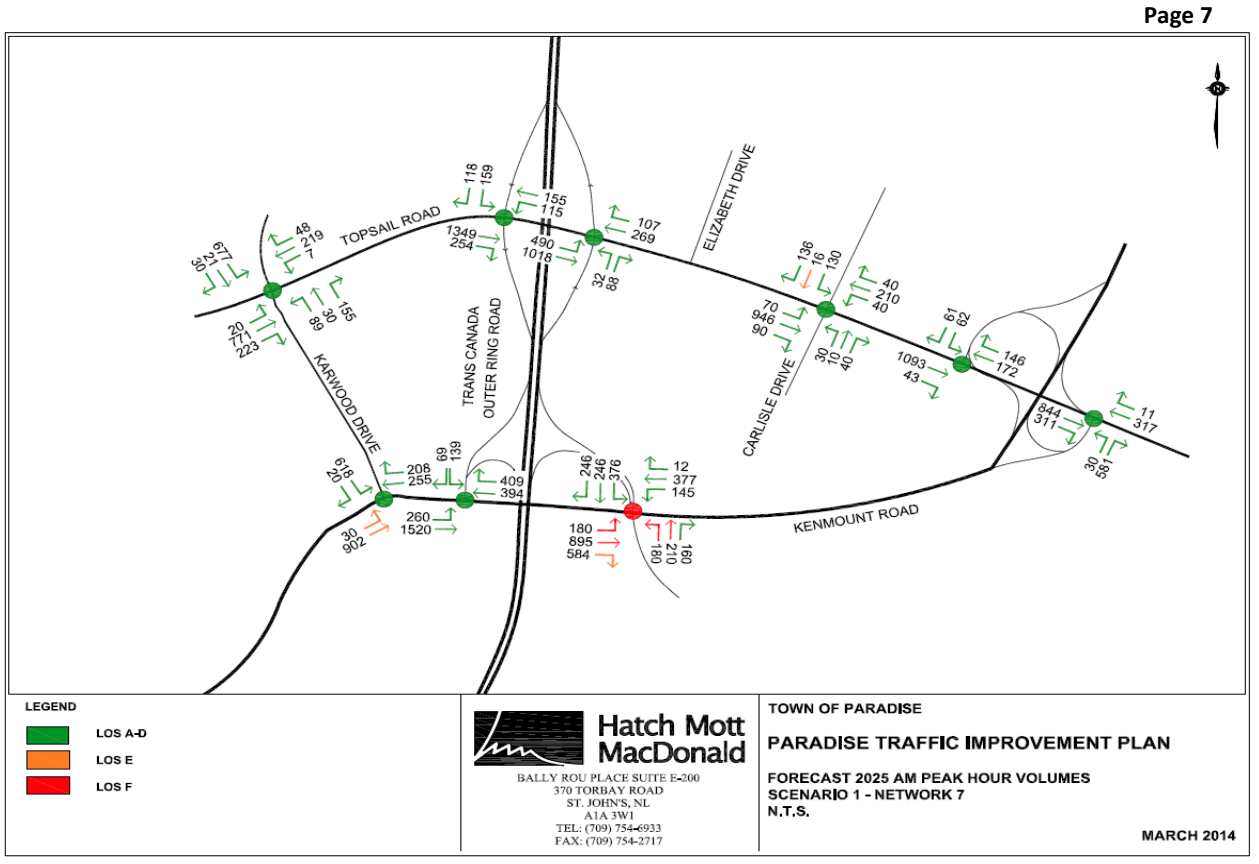


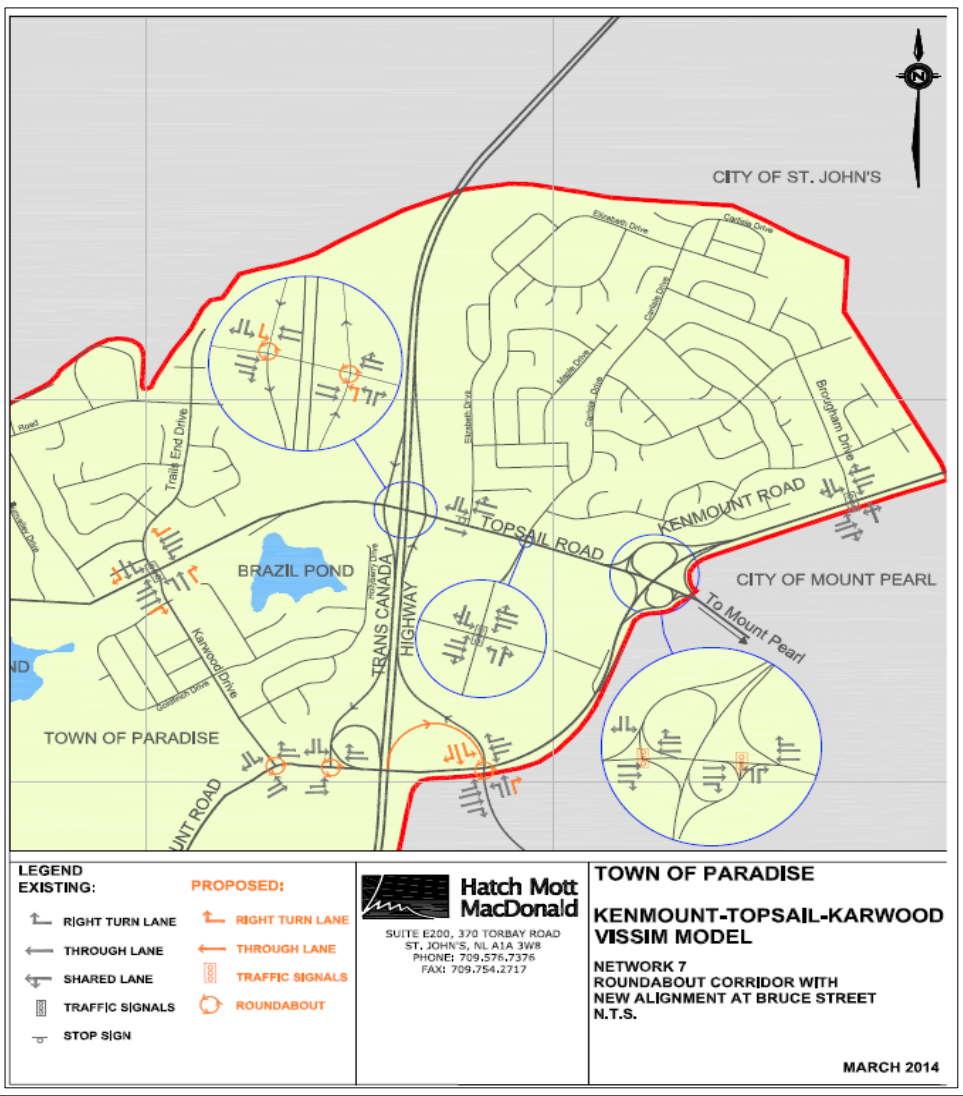
Scenario 1 - Network 7 AM

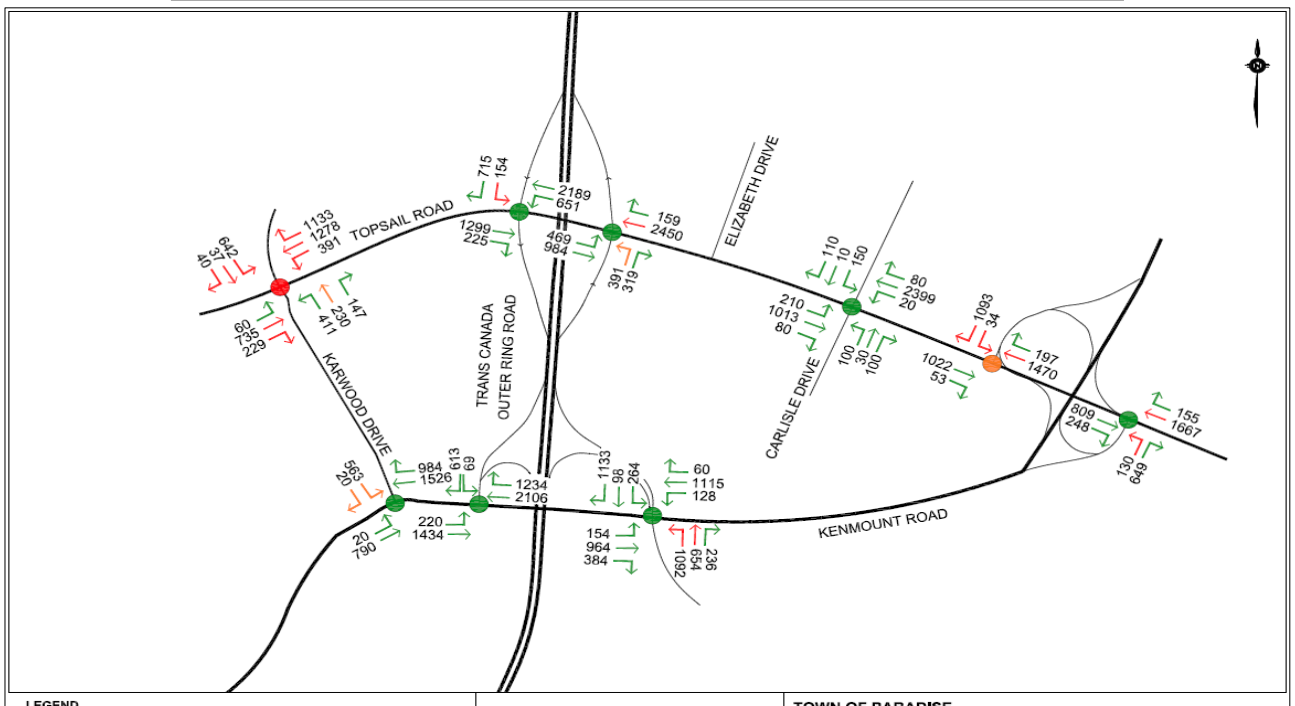
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	C	28.78	226.16
	Southbound Left-Turn	C	27.64	226.16
	Southbound Through	C	28	226.16
	Eastbound Left-Turn	C	25.66	134.6
	Eastbound Through	C	30.72	134.6
	Eastbound Right-Turn	C	34.08	134.6
	Westbound Right-Turn	B	14.48	42.74
	Westbound Through	C	23.88	42.84
	Westbound Left-Turn	C	26.5	42.84
	Northbound Through	D	43.78	27.66
	Northbound Left-Turn	C	22.1	27.66
	Northbound Right-Turn	A	5.5	27.66
	All	**C**	**27.44**	**226.16**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	0.7	26.8
	Southbound Left-Turn	A	4.86	26.8
	Eastbound Right-Turn	A	9.2	241.7
	Eastbound Through	C	15.52	241.7
	Westbound Left-Turn	A	2.76	0
	Westbound Through	A	0.7	0
	All	**B**	**10.98**	**241.7**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	D	32.42	2.94
	Northbound Right-Turn	C	15.98	2.94
	Eastbound Left-Turn	A	3.04	15.06
	Eastbound Through	A	4.02	15.06
	Westbound Right-Turn	A	0.34	0
	Westbound Through	A	7.2	28.76
	All	**A**	**5.08**	**28.76**
Topsail Rd / Carlisle Dr	Northbound Through	D	49.02	26.94
	Northbound Left-Turn	D	53.58	26.82
	Northbound Right-Turn	A	9.14	27.22
	Southbound Through	E	55.06	62.36
	Southbound Right-Turn	B	14.54	62.62
	Southbound Left-Turn	D	49.5	62.3
	Eastbound Left-Turn	A	8.74	58.82
	Eastbound Right-Turn	A	5.8	58.8
	Eastbound Through	A	6.98	58.8
	Westbound Right-Turn	A	3.6	20.38
	Westbound Left-Turn	A	8.32	20.4
	Westbound Through	A	7.62	20.34
	All	**B**	**13.58**	**64.04**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	1.58	38.74
	Eastbound Right-Turn	A	2.22	38.74
	Westbound Through	A	1.36	14.74
	Westbound Right-Turn	A	0.24	0
	Southbound Right-Turn	A	0.82	0
	Southbound Left-Turn	D	47.26	27.36
	All	**A**	**2.6**	**39.92**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.5	11.92
	Westbound Right-Turn	A	0.42	0
	Eastbound Through	A	0.68	29.66
	Eastbound Left-Turn	A	0.3	0
	Northbound Right-Turn	A	2.3	0
	Northbound Left-Turn	C	22.22	10.42
	All	**A**	**1**	**29.66**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	F	256.04	101.6
	Northbound Right-Turn	B	13.72	101.6
	Northbound Left-Turn	F	476.9	101.6
	Southbound Through	B	10.72	251.86
	Southbound Left-Turn	C	20.78	251.86
	Southbound Right-Turn	A	2.26	251.86
	Westbound Left-Turn	A	9.26	0
	Westbound Right-Turn	A	1.88	0
	Westbound Through	A	6.54	0
	Eastbound Right-Turn	E	46.24	307.78
	Eastbound Left-Turn	F	118.16	307.78
	Eastbound Through	F	102.88	307.78
	All	**F**	**65.86**	**316.88**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	D	28.94	30.2
	Southbound Right-Turn	A	0.84	30.2
	Westbound Right-Turn	A	2.1	0
	Westbound Through	A	3.06	0
	Eastbound Left-Turn	C	15.02	160.56
	Eastbound Through	D	30.26	160.56
	All	**C**	**21.26**	**160.56**
Kenmount Rd Karwood Dr	Eastbound Through	E	41.56	305.46
	Eastbound Left-Turn	E	49.62	305.46
	Westbound Through	A	0.8	9.26
	Westbound Right-Turn	A	0.58	9.26
	Southbound Right-Turn	A	1.74	34.36
	Southbound Left-Turn	D	27.68	34.36
	All	**D**	**28.94**	**305.46**

Scenario 1 - Network 7 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	F	175.52	287.14
	Southbound Left-Turn	F	170.94	287.14
	Southbound Through	F	140.6	287.14
	Eastbound Left-Turn	D	42.44	442.74
	Eastbound Through	F	91.78	442.74
	Eastbound Right-Turn	F	87.54	442.74
	Westbound Right-Turn	F	302.38	509.36
	Westbound Through	F	260.52	509.36
	Westbound Left-Turn	F	268.36	509.36
	Northbound Through	E	55.92	141.66
	Northbound Left-Turn	D	36.16	141.66
	Northbound Right-Turn	D	53.56	141.64
	All	**F**	**155.12**	**509.36**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	D	26.26	243.34
	Southbound Left-Turn	F	150	243.34
	Eastbound Right-Turn	C	16.94	252.26
	Eastbound Through	D	32.82	252.26
	Westbound Left-Turn	C	21.6	229.44
	Westbound Through	D	25.5	229.44
	All	**D**	**29.78**	**252.26**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	E	39.6	134.52
	Northbound Right-Turn	D	25.96	134.52
	Eastbound Left-Turn	C	22.14	243.74
	Eastbound Through	C	16.88	243.74
	Westbound Right-Turn	A	2.26	87.38
	Westbound Through	F	51	137.68
	All	**D**	**33.08**	**243.74**
Topsail Rd / Carlisle Dr	Northbound Through	D	46.36	269.06
	Northbound Left-Turn	D	40.58	269.06
	Northbound Right-Turn	D	51	269.06
	Southbound Through	D	36.44	146.88
	Southbound Right-Turn	C	23.38	146.54
	Southbound Left-Turn	D	38.44	146.54
	Eastbound Left-Turn	C	25.12	68.94
	Eastbound Right-Turn	A	4.04	68.92
	Eastbound Through	A	7.22	68.92
	Westbound Right-Turn	D	40.4	374.6
	Westbound Left-Turn	B	11.56	374.7
	Westbound Through	D	36.3	374.6
	All	**C**	**29.44**	**393.28**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	0.68	34.12
	Eastbound Right-Turn	A	1.18	34.12
	Westbound Through	F	138.38	184.62
	Westbound Right-Turn	A	0.32	0
	Southbound Right-Turn	F	267.22	506.52
	Southbound Left-Turn	F	159.94	7.32
	All	**E**	**76.42**	**506.52**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	F	89.36	404.68
	Westbound Right-Turn	D	49.76	120.6
	Eastbound Through	A	4.16	42.88
	Eastbound Left-Turn	A	0.28	0
	Northbound Right-Turn	A	2.58	316.18
	Northbound Left-Turn	F	88.32	330.02
	All	**D**	**51.52**	**466.12**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	F	137.46	87.28
	Northbound Right-Turn	C	20.22	87.28
	Northbound Left-Turn	F	365.2	87.28
	Southbound Through	C	16.02	340.96
	Southbound Left-Turn	D	33.36	340.96
	Southbound Right-Turn	A	8.68	340.96
	Westbound Left-Turn	B	11.8	92.78
	Westbound Right-Turn	C	20.14	92.78
	Westbound Through	C	17.12	92.78
	Eastbound Right-Turn	B	14.58	126.5
	Eastbound Left-Turn	A	2.04	126.5
	Eastbound Through	B	12.48	126.5
	All	**D**	**27.58**	**362.52**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	C	23.74	304.26
	Southbound Right-Turn	C	24.5	304.26
	Westbound Right-Turn	A	2.68	258.42
	Westbound Through	A	8.38	258.42
	Eastbound Left-Turn	A	2.94	52.38
	Eastbound Through	A	2.98	52.38
	All	**A**	**8.26**	**373.92**
Kenmount Rd Karwood Dr	Eastbound Through	A	5.48	166.02
	Eastbound Left-Turn	A	7.08	166.02
	Westbound Through	A	3.76	161.62
	Westbound Right-Turn	A	2.5	161.62
	Southbound Right-Turn	E	36.54	208
	Southbound Left-Turn	E	48.16	208
	All	**B**	**12.64**	**235.68**







APPENDIX D

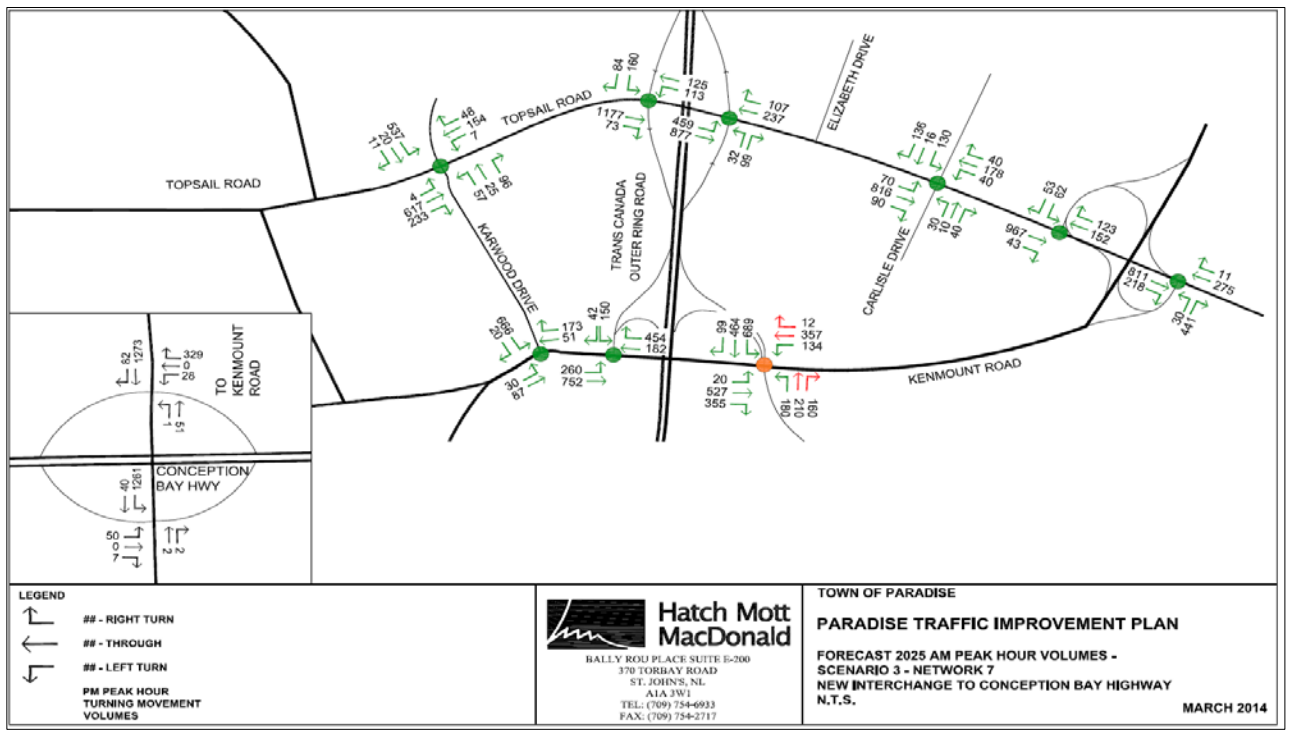
2025 FORECAST (WITH ADDITIONAL INTERCHANGES) TRAFFIC – VISSIM OUTPUT SUMMARIES

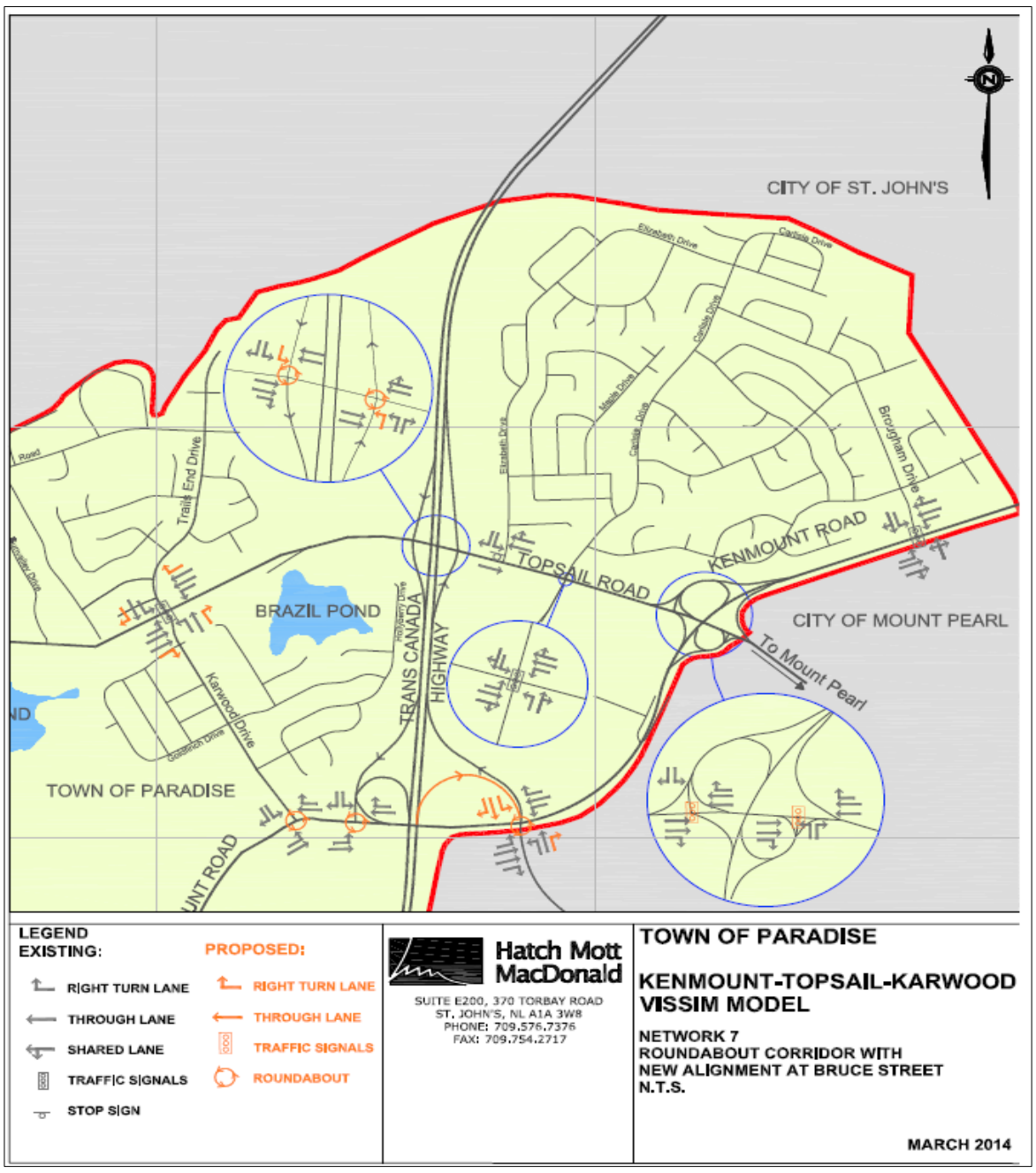
Scenario 3 - Network 7 AM

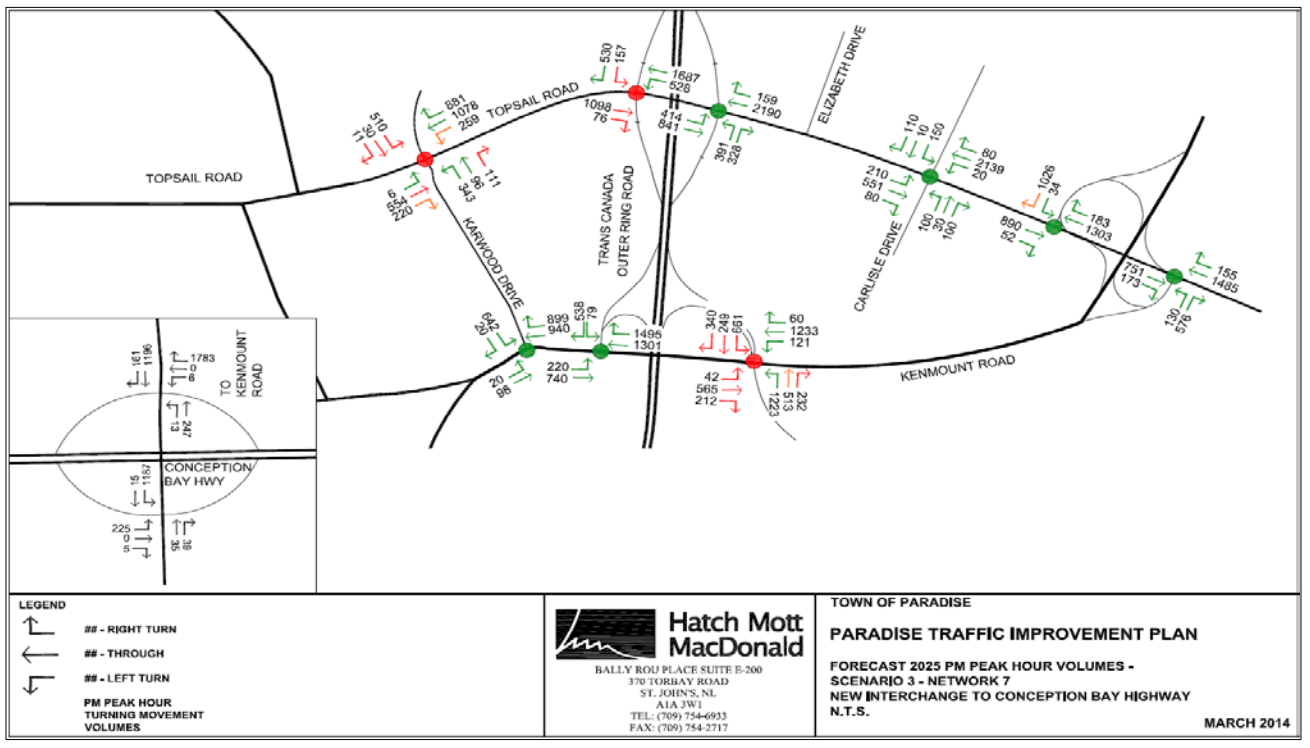
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	A	9.9	115.7
	Southbound Left-Turn	B	16.8	115.7
	Southbound Through	B	15.1	115.7
	Eastbound Left-Turn	B	15.4	99.0
	Eastbound Through	C	28.3	99.0
	Eastbound Right-Turn	C	24.0	99.0
	Westbound Right-Turn	B	10.2	31.4
	Westbound Through	C	22.6	31.3
	Westbound Left-Turn	C	31.3	31.3
	Northbound Through	C	33.0	24.1
	Northbound Left-Turn	B	16.5	24.3
	Northbound Right-Turn	A	4.5	24.1
	All	**C**	**21.3**	**115.9**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	0.7	25.0
	Southbound Left-Turn	A	4.7	25.0
	Eastbound Right-Turn	B	14.7	0.0
	Eastbound Through	C	18.8	0.0
	Westbound Left-Turn	A	2.4	0.0
	Westbound Through	A	0.8	0.0
	All	**B**	**13.6**	**25.0**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	D	26.8	0.0
	Northbound Right-Turn	B	12.2	0.0
	Eastbound Left-Turn	A	2.9	0.0
	Eastbound Through	A	3.5	0.0
	Westbound Right-Turn	A	0.2	1.5
	Westbound Through	A	6.9	25.1
	All	**A**	**4.5**	**25.1**
Topsail Rd / Carlisle Dr	Northbound Through	D	43.04	29.14
	Northbound Left-Turn	D	45.1	29.34
	Northbound Right-Turn	A	6.96	29.4
	Southbound Through	D	41.32	63.72
	Southbound Right-Turn	B	12.02	63.96
	Southbound Left-Turn	D	49.32	62.98
	Eastbound Left-Turn	A	7.7	65.12
	Eastbound Right-Turn	A	6.52	65.08
	Eastbound Through	A	8.16	65.1
	Westbound Right-Turn	A	4.16	23.36
	Westbound Left-Turn	B	10.94	22.4
	Westbound Through	A	8.6	23.34
	All	**B**	**13.74**	**68.3**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Left-Turn	A	1.0	0.0
	Southbound Right-Turn	D	49.2	30.4
	Westbound Through	A	3.2	72.8
	Westbound Left-Turn	A	3.8	72.8
	Eastbound Through	A	1.8	13.6
	Eastbound Right-Turn	A	0.3	2.2
	All	**A**	**4.3**	**72.8**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.3	0.0
	Westbound Through	A	0.7	12.0
	Eastbound Right-Turn	A	0.8	25.0
	Eastbound Through	A	0.6	16.0
	Northbound Right-Turn	A	2.8	0.0
	Northbound Left-Turn	C	29.0	13.0
	All	**A**	**1.4**	**27.2**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp Northbound Ramp	Northbound Through	F	649.56	125.86
	Northbound Right-Turn	F	370.16	125.86
	Eastbound Right-Turn	C	19.92	297.02
	Eastbound Left-Turn	C	20.96	297.02
	Eastbound Through	A	8.14	297.02
	Northbound Left-Turn	B	14.48	0
	Southbound Through	A	4.24	0
	Southbound Right-Turn	A	0.7	0
	Southbound Left-Turn	A	2.64	0
	Westbound Left-Turn	A	0	0
	Westbound Through	F	113.34	0
	Westbound Left-Turn	C	19.06	0
	Westbound Right-Turn	F	84.76	0
	All	**E**	**42.14**	**297.02**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	1.44	13.44
	Southbound Right-Turn	A	0.34	13.44
	Westbound Right-Turn	A	1.96	0
	Westbound Through	A	2.66	0
	Eastbound Left-Turn	A	0.74	1.64
	Eastbound Through	A	0.82	1.64
	All	**A**	**0**	**1.64**
Kenmount Rd Karwood Dr	Eastbound Through	A	2.0	19.9
	Eastbound Left-Turn	A	6.1	19.9
	Westbound Through	A	0.5	1.0
	Westbound Right-Turn	A	1.1	1.0
	Southbound Right-Turn	A	0.8	15.6
	Southbound Left-Turn	A	0.5	15.6
	All	**A**	**0.9**	**20.0**

Scenario 3 - Network 7 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	F	115.6	287.5
	Southbound Left-Turn	F	242.0	287.6
	Southbound Through	F	141.5	287.5
	Eastbound Left-Turn	C	31.7	265.6
	Eastbound Through	F	205.0	265.6
	Eastbound Right-Turn	E	77.5	265.6
	Westbound Right-Turn	D	39.9	238.1
	Westbound Through	C	34.7	238.1
	Westbound Left-Turn	E	62.5	238.1
	Northbound Through	D	48.6	99.2
	Northbound Left-Turn	C	29.1	99.3
	Northbound Right-Turn	F	110.1	99.1
	All	**F**	**93.8**	**327.7**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	C	19.3	242.8
	Southbound Left-Turn	F	151.5	242.8
	Eastbound Right-Turn	F	114.3	304.6
	Eastbound Through	F	150.8	304.6
	Westbound Left-Turn	A	5.0	18.1
	Westbound Through	A	3.3	18.1
	All	**F**	**55.6**	**304.6**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	C	18.4	10.0
	Northbound Right-Turn	B	12.1	10.0
	Eastbound Left-Turn	A	3.5	6.1
	Eastbound Through	A	4.0	6.1
	Westbound Right-Turn	A	0.9	90.3
	Westbound Through	C	19.0	137.7
	All	**B**	**12.5**	**137.7**
Topsail Rd / Carlisle Dr	Northbound Through	C	34.64	53.02
	Northbound Left-Turn	D	42.92	53.2
	Northbound Right-Turn	B	11.34	53.28
	Southbound Through	D	37.18	77.7
	Southbound Right-Turn	B	14.46	77.96
	Southbound Left-Turn	D	43.64	76.98
	Eastbound Left-Turn	D	36.06	59.78
	Eastbound Right-Turn	A	6.7	59.72
	Eastbound Through	A	9.3	59.98
	Westbound Right-Turn	C	28.1	324.92
	Westbound Left-Turn	B	17.22	325.02
	Westbound Through	C	33.06	324.92
	All	**C**	**28.36**	**325.02**
Topsail Rd / Kenmount Rd Southbound Ramp	Southbound Left-Turn	B	12.9	1.1
	Southbound Right-Turn	E	62.5	11.4
	Westbound Through	A	0.7	22.0
	Westbound Left-Turn	A	1.2	22.0
	Eastbound Through	A	4.1	73.5
	Eastbound Right-Turn	A	0.4	40.5
	All	**A**	**4.1**	**75.0**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Right-Turn	A	0.4	0.0
	Westbound Through	A	1.4	46.0
	Eastbound Right-Turn	A	0.6	10.7
	Eastbound Through	A	1.0	24.7
	Northbound Right-Turn	A	1.7	0.0
	Northbound Left-Turn	D	39.6	18.3
	All	**A**	**1.6**	**46.0**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp Northbound Ramp	Northbound Through	E	41.66	127.04
	Northbound Right-Turn	F	60.5	127.04
	Eastbound Right-Turn	F	256.4	297.68
	Eastbound Left-Turn	F	281.3	297.68
	Eastbound Through	F	100.94	297.68
	Northbound Left-Turn	A	3.52	0
	Southbound Through	F	84.76	43.96
	Southbound Right-Turn	F	68.06	43.96
	Southbound Left-Turn	F	81.64	43.96
	Westbound Through	A	7.96	0
	Westbound Left-Turn	A	1.14	0
	Westbound Right-Turn	A	6.06	0
	All	**F**	**65.74**	**297.68**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	8.94	63.62
	Southbound Right-Turn	A	5.66	63.62
	Westbound Right-Turn	A	4.04	0
	Westbound Through	A	6.2	0
	Eastbound Left-Turn	A	0.94	2.6
	Eastbound Through	A	0.92	2.6
	Eastbound Through	A	1.42	0
	All	**A**	**3.34**	**63.62**
Kenmount Rd Karwood Dr	Eastbound Through	A	4.2	17.8
	Eastbound Left-Turn	A	3.8	17.8
	Westbound Through	A	1.2	24.7
	Westbound Right-Turn	A	0.9	24.7
	Southbound Right-Turn	B	10.6	79.3
	Southbound Left-Turn	B	11.1	79.3
	All	**A**	**5.1**	**79.3**





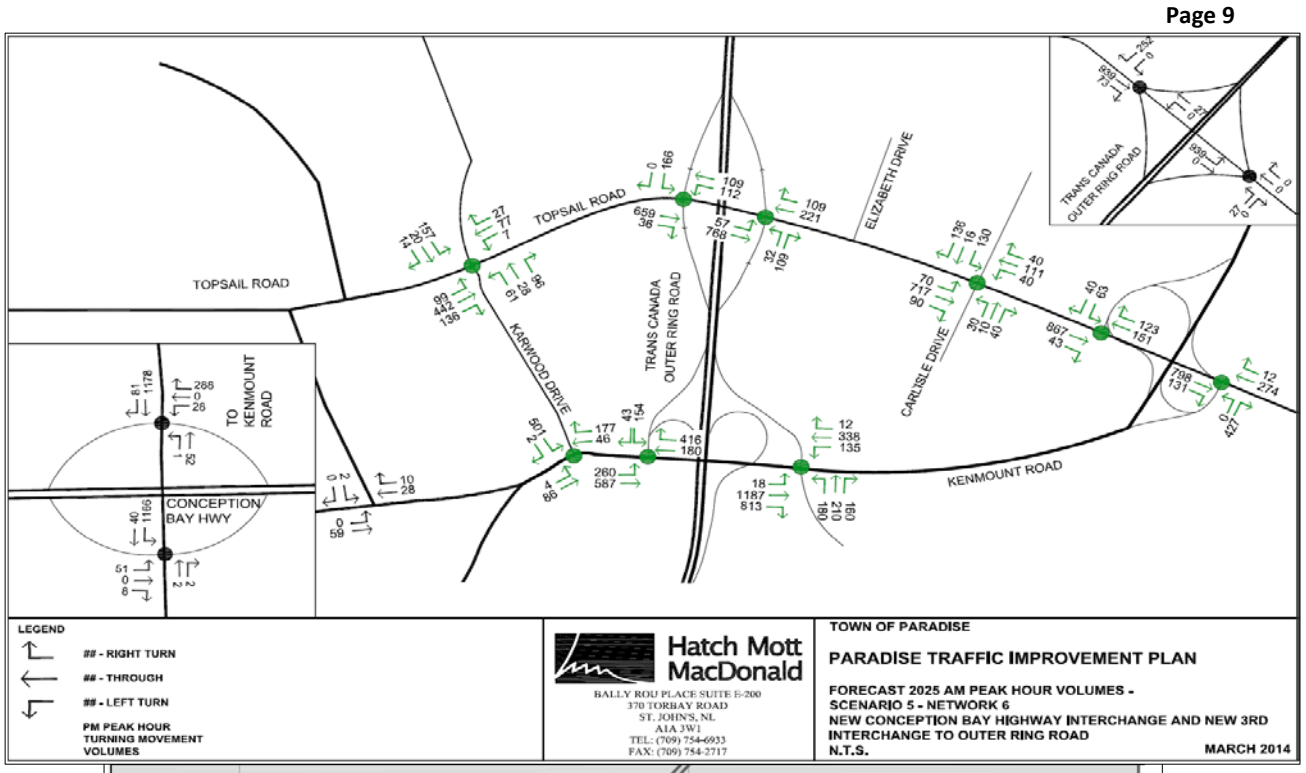


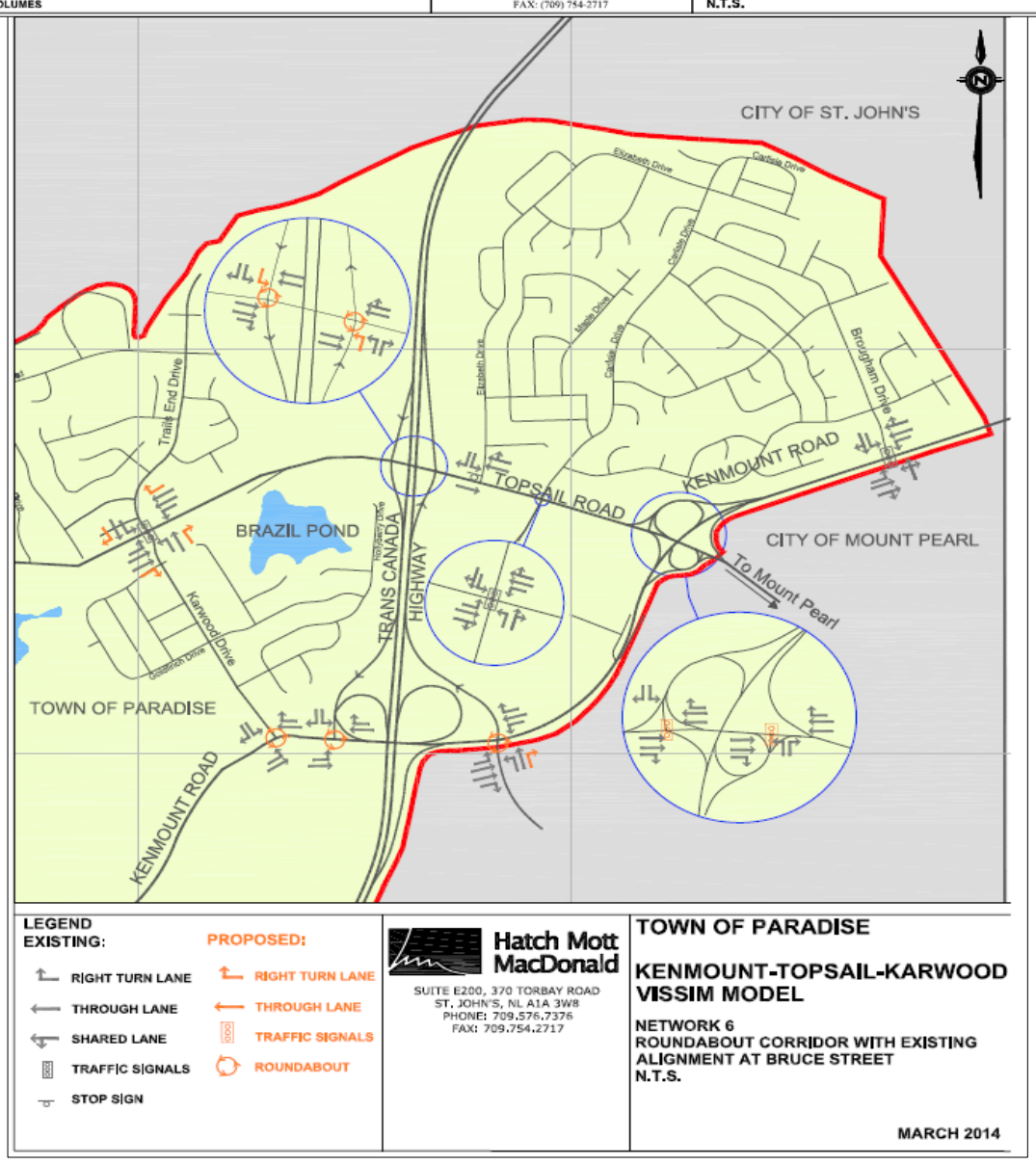
Scenario 5 - Network 6 AM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	A	6.28	48.12
	Southbound Left-Turn	C	25.68	48.36
	Southbound Through	C	34.04	48.22
	Eastbound Left-Turn	B	11.56	47.6
	Eastbound Through	B	11.92	47.38
	Eastbound Right-Turn	A	8.32	47.62
	Westbound Right-Turn	A	5.12	22.9
	Westbound Through	B	15.12	22.8
	Westbound Left-Turn	B	12.04	21.7
	Northbound Through	D	36.2	32
	Northbound Left-Turn	C	22.76	31.74
	Northbound Right-Turn	A	4.3	30.58
	All	**B**	**14.02**	**49.74**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	0	18.68
	Southbound Left-Turn	A	3.68	18.68
	Eastbound Right-Turn	A	5.3	0
	Eastbound Through	A	8.04	0
	Westbound Left-Turn	A	0.64	0
	Westbound Through	A	0.46	0
	All	**A**	**5.32**	**18.68**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	A	7.2	0
	Northbound Right-Turn	A	3.78	0
	Eastbound Left-Turn	A	1.1	0
	Eastbound Through	A	1.24	0
	Westbound Right-Turn	A	0.22	2.9
	Westbound Through	A	1.26	18.3
	All	**A**	**1.48**	**18.3**
Topsail Rd / Carlisle Dr	Northbound Through	D	51.42	24.92
	Northbound Left-Turn	D	41.34	24.9
	Northbound Right-Turn	A	7.7	25.1
	Southbound Through	D	42.48	71.08
	Southbound Right-Turn	B	11.46	71.28
	Southbound Left-Turn	D	50.08	70.08
	Eastbound Left-Turn	A	8.9	52.78
	Eastbound Right-Turn	A	5.5	52.76
	Eastbound Through	A	8.6	52.78
	Westbound Right-Turn	A	7.78	31.4
	Westbound Left-Turn	B	10.74	31.34
	Westbound Through	B	10.18	31.26
	All	**B**	**14.4**	**71.28**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	1.42	0
	Eastbound Right-Turn	D	50.06	33.44
	Westbound Through	A	1.78	31.62
	Westbound Right-Turn	A	2.38	31.62
	Southbound Right-Turn	A	1.76	17.02
	Southbound Left-Turn	A	0	0
	All	**A**	**3.9**	**36.62**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.28	0
	Westbound Right-Turn	A	0	0
	Eastbound Through	A	0.6	21.26
	Eastbound Left-Turn	A	0.1	0
	Northbound Right-Turn	A	2.18	0
	Northbound Left-Turn	A	0	0
	All	**A**	**0.36**	**21.26**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp Northbound Ramp	Northbound Through	D	31.28	74.3
	Northbound Left-Turn	D	26.48	74.3
	Northbound Right-Turn	A	0.68	0
	Eastbound Right-Turn	A	3.1	212.54
	Eastbound Through	A	6.34	212.54
	Eastbound Left-Turn	B	14.74	212.54
	Northbound Through	A	4.46	0
	Westbound Left-Turn	B	10.34	0
	Westbound Right-Turn	A	4.66	0
	Westbound Through	A	8.16	0
	All	**A**	**7.68**	**212.54**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	8.68	27.36
	Southbound Right-Turn	A	1.14	27.36
	Westbound Right-Turn	A	2.56	0
	Westbound Through	A	3.68	0
	Eastbound Left-Turn	A	2.06	0
	Eastbound Through	A	2.64	0
	All	**A**	**3.32**	**27.36**
Kenmount Rd Karwood Dr	Eastbound Through	A	2.34	16.02
	Eastbound Left-Turn	A	3.76	16.02
	Westbound Through	A	0.44	4.3
	Westbound Right-Turn	A	0.98	4.3
	Southbound Right-Turn	A	0.1	14.94
	All	**A**	**0.8**	**16.62**

Scenario 5 - Network 6 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	B	12.7	67.8
	Southbound Left-Turn	C	26.3	68.0
	Southbound Through	C	32.7	67.8
	Eastbound Left-Turn	B	17.8	65.6
	Eastbound Through	C	21.5	65.4
	Eastbound Right-Turn	B	16.5	65.6
	Westbound Right-Turn	B	15.7	69.2
	Westbound Through	B	19.8	69.1
	Westbound Left-Turn	B	17.6	69.1
	Northbound Through	D	36.9	70.1
	Northbound Left-Turn	C	24.7	69.9
	All	**C**	**20.9**	**81.4**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	E	42.2	73.1
	Southbound Left-Turn	F	63.9	73.1
	Eastbound Right-Turn	F	88.2	112.8
	Eastbound Through	F	123.3	112.8
	Westbound Left-Turn	A	3.4	5.0
	Westbound Through	A	2.4	5.0
	All	**E**	**45.8**	**137.9**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	B	11.2	0.0
	Northbound Right-Turn	A	7.7	0.0
	Eastbound Left-Turn	A	2.2	0.0
	Eastbound Through	A	2.6	0.0
	Westbound Right-Turn	A	0.4	27.4
	Westbound Through	A	4.4	67.8
	All	**A**	**4.3**	**67.8**
Topsail Rd / Carlisle Dr	Northbound Through	D	42.78	61.48
	Northbound Left-Turn	D	50.7	61.44
	Northbound Right-Turn	B	13.9	61.64
	Southbound Through	C	31.7	62.94
	Southbound Right-Turn	A	8.42	63.14
	Southbound Left-Turn	C	34.46	61.98
	Eastbound Left-Turn	D	46.12	100.46
	Eastbound Right-Turn	B	10.9	100.46
	Eastbound Through	B	14	100.46
	Westbound Right-Turn	E	61.98	386.52
	Westbound Left-Turn	D	44.68	386.52
	Westbound Through	E	62.18	386.42
	All	**D**	**43.54**	**386.52**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	F	125.3	234.8
	Eastbound Right-Turn	F	82.9	13.9
	Westbound Through	A	1.5	68.9
	Westbound Right-Turn	B	13.9	68.9
	Southbound Right-Turn	C	29.2	95.3
	Southbound Left-Turn	A	5.3	39.4
	All	**C**	**26.8**	**274.2**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.3	0.0
	Westbound Right-Turn	A	0.6	0.0
	Eastbound Through	A	0.7	23.1
	Eastbound Left-Turn	A	0.1	0.0
	Northbound Right-Turn	A	2.0	0.0
	Northbound Left-Turn	A	0.0	0.0
	All	**A**	**0.5**	**23.1**
Kenmount Rd Bruce Street Bruce Street Northbound Ramp	Northbound Through	F	75.2	263.1
	Northbound Right-Turn	B	13.14	263.08
	Northbound Left-Turn	F	69.18	263.08
	Eastbound Right-Turn	A	0.9	168.14
	Eastbound Through	A	2.3	168.14
	Eastbound Left-Turn	A	6.16	168.14
	Westbound Right-Turn	F	171.18	219.3
	Westbound Left-Turn	F	223.66	219.3
	Westbound Through	F	198.58	219.3
	All	**F**	**58.08**	**263.08**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	F	188.4	303.3
	Southbound Right-Turn	C	21.6	303.3
	Westbound Right-Turn	A	9.9	37.5
	Westbound Through	B	14.7	37.5
	Eastbound Left-Turn	A	3.6	2.0
	Eastbound Through	A	4.8	2.0
	All	**C**	**15.3**	**303.3**
Kenmount Rd Karwood Dr	Eastbound Through	A	3.4	18.5
	Eastbound Left-Turn	A	3.4	18.5
	Westbound Through	A	0.9	18.1
	Westbound Right-Turn	A	0.6	18.1
	Southbound Right-Turn	B	11.3	71.9
	Southbound Left-Turn	C	15.2	71.9
	All	**A**	**6.0**	**71.9**



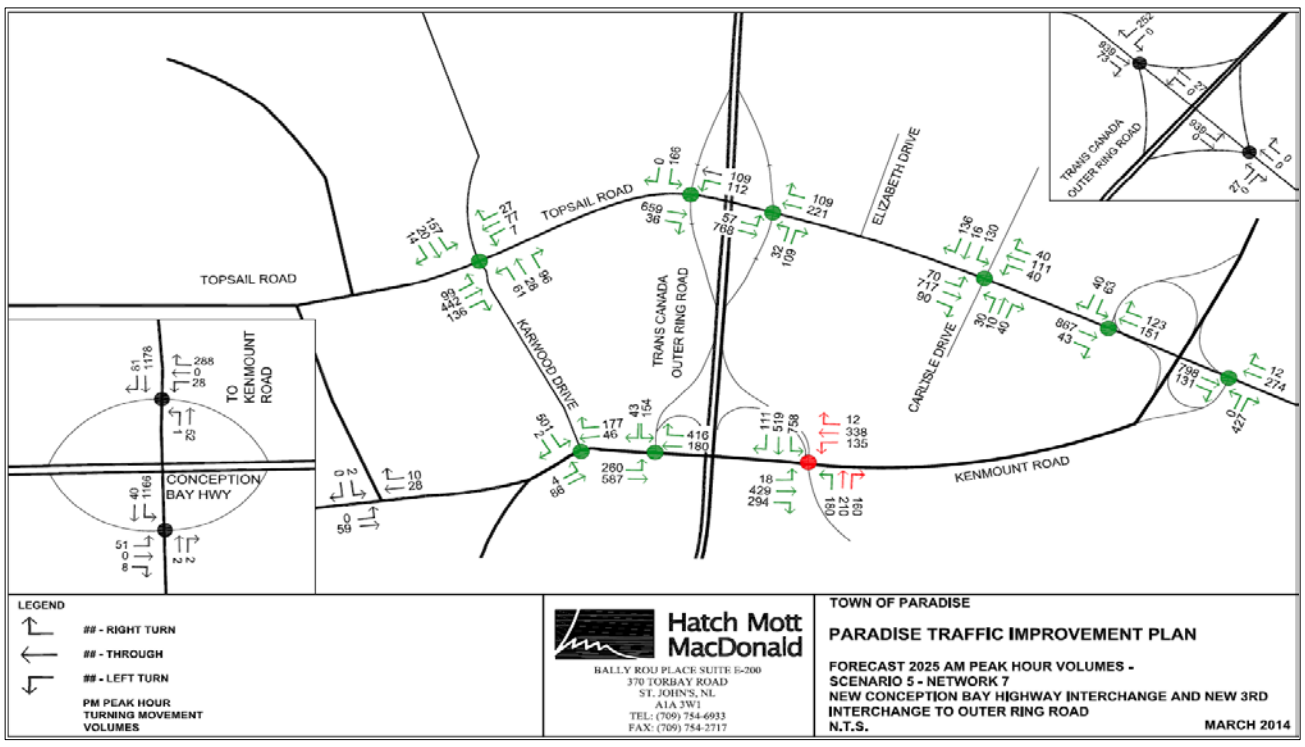


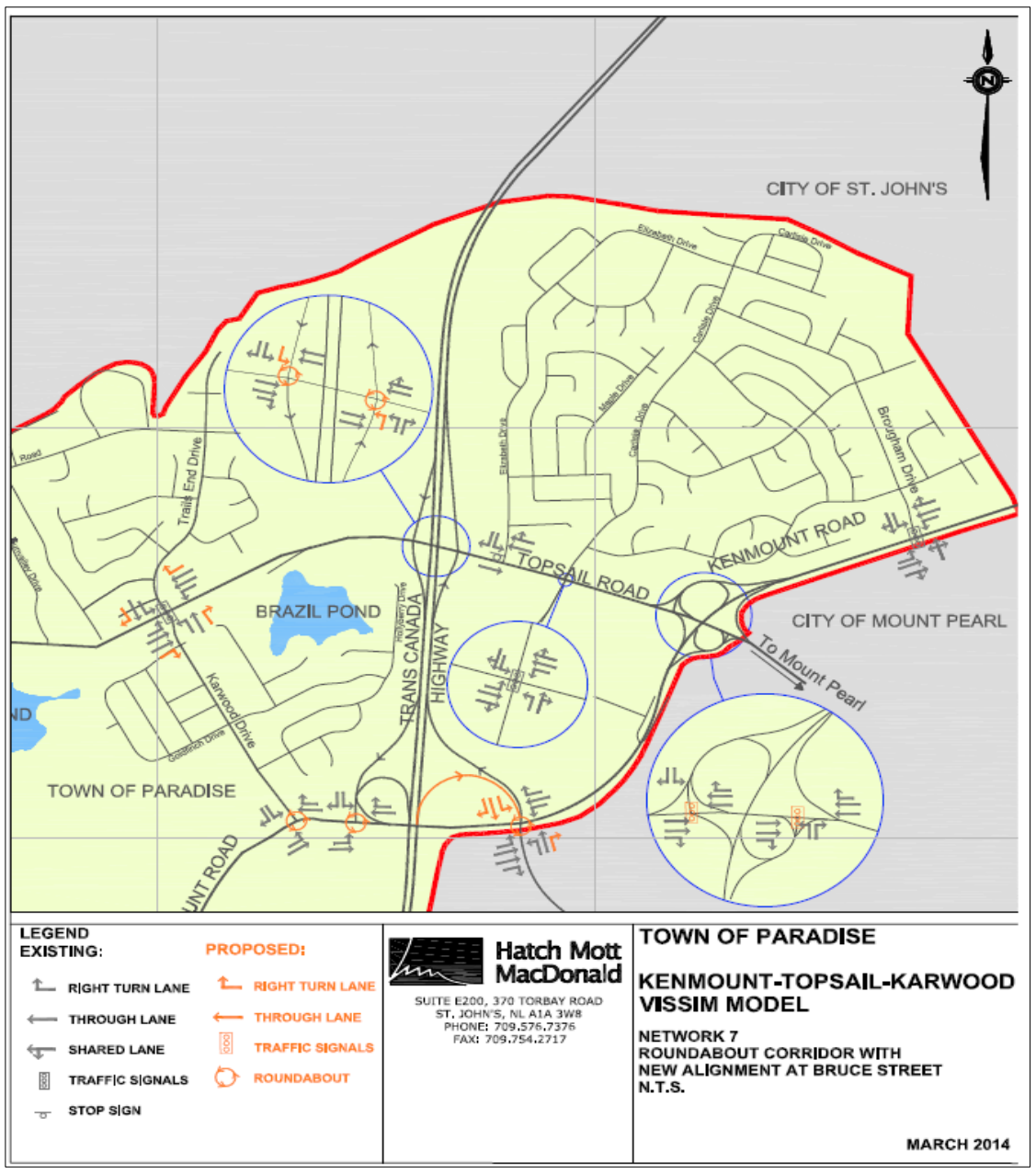
Scenario 5 - Network 7 AM

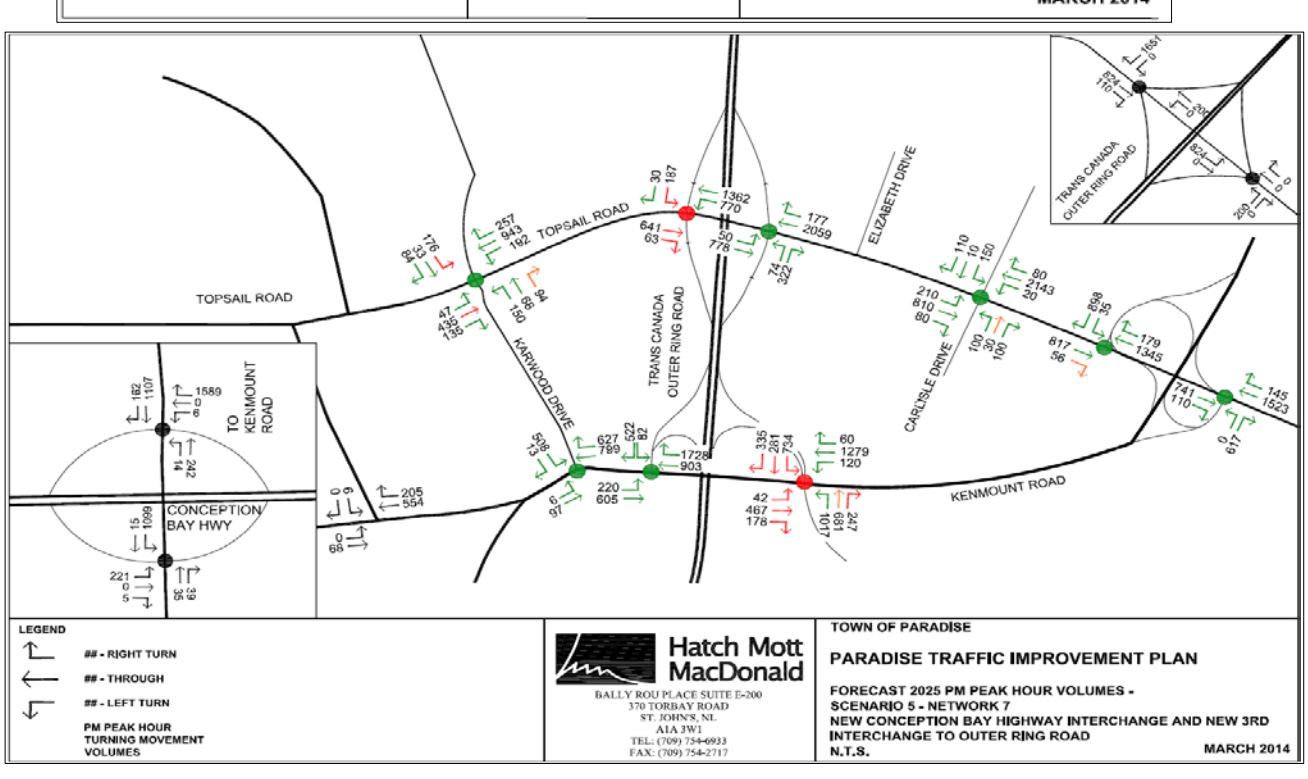
Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	A	6.2	45.8
	Southbound Left-Turn	C	25.0	46.0
	Southbound Through	C	32.2	45.9
	Eastbound Left-Turn	B	11.8	48.2
	Eastbound Through	B	12.3	48.2
	Eastbound Right-Turn	A	8.8	48.2
	Westbound Right-Turn	A	4.8	20.6
	Westbound Through	B	14.3	20.6
	Westbound Left-Turn	B	15.6	20.6
	Northbound Through	D	36.4	25.1
	Northbound Left-Turn	C	24.0	25.1
	Northbound Right-Turn	A	4.2	23.8
	All	**B**	**14.1**	**49.6**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	0.0	27.9
	Southbound Left-Turn	A	5.0	27.9
	Eastbound Right-Turn	A	4.8	0.0
	Eastbound Through	A	8.9	0.0
	Westbound Left-Turn	A	1.2	0.0
	Westbound Through	A	0.6	0.0
	All	**A**	**6.2**	**27.9**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	A	7.4	0.0
	Northbound Right-Turn	A	3.9	0.0
	Eastbound Left-Turn	A	1.3	0.0
	Eastbound Through	A	1.3	0.0
	Westbound Right-Turn	A	0.2	1.5
	Westbound Through	A	1.1	17.6
	All	**A**	**1.5**	**17.6**
Topsail Rd / Carlisle Dr	Northbound Through	D	51.34	24.96
	Northbound Left-Turn	D	42.02	24.96
	Northbound Right-Turn	A	7.66	24.96
	Southbound Through	D	43.58	71.04
	Southbound Right-Turn	B	11.54	71.34
	Southbound Left-Turn	D	46.98	70.2
	Eastbound Left-Turn	A	8.22	58.76
	Eastbound Right-Turn	A	6.28	58.72
	Eastbound Through	A	9.6	58.76
	Westbound Right-Turn	A	6.34	30.88
	Westbound Left-Turn	B	11.4	30.98
	Westbound Through	B	10.28	30.88
	All	**B**	**14.24**	**75.56**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	A	1.2	0.0
	Eastbound Right-Turn	D	51.3	30.6
	Westbound Through	A	2.2	40.0
	Westbound Right-Turn	A	2.4	40.0
	Southbound Right-Turn	A	1.7	15.6
	Southbound Left-Turn	A	0.0	0.0
	All	**A**	**4.1**	**40.4**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.3	0.0
	Westbound Right-Turn	A	0.0	0.0
	Eastbound Through	A	0.7	26.1
	Eastbound Left-Turn	A	0.1	0.0
	Northbound Right-Turn	A	2.7	0.0
	Northbound Left-Turn	A	0.0	0.0
	All	**A**	**0.6**	**26.1**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	F	255.14	127.04
	Northbound Right-Turn	F	194.86	127.04
	Eastbound Right-Turn	C	15.36	294.8
	Eastbound Left-Turn	C	16.54	294.8
	Eastbound Through	A	6.38	294.8
	Northbound Left-Turn	A	9.38	0
	Southbound Through	A	5.3	0
	Southbound Right-Turn	A	1.4	0
	Southbound Left-Turn	A	3.58	0
	Westbound Left-Turn	A	0	20.04
	Westbound Through	F	210.84	20.04
	Westbound Left-Turn	F	69.32	20.04
	Westbound Right-Turn	F	178.34	20.04
	All	**F**	**57.68**	**294.8**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	1.44	13.24
	Southbound Right-Turn	A	0.32	13.24
	Westbound Right-Turn	A	1.96	0
	Westbound Through	A	2.56	0
	Eastbound Left-Turn	A	0.6	0.96
	Eastbound Through	A	1.86	0.96
	All	**A**	**0**	**0.96**
Kenmount Rd Karwood Dr	Eastbound Through	A	2.3	16.2
	Eastbound Left-Turn	A	2.9	16.2
	Westbound Through	A	0.4	0.0
	Westbound Right-Turn	A	0.7	0.0
	Southbound Right-Turn	A	0.2	15.9
	Southbound Left-Turn	A	0.3	15.9
	All	**A**	**0.6**	**18.0**

Scenario 5 - Network 7 PM

Intersection	Movement	LOS	Delay(All)	maxQueue
Topsail Rd / Karwood Drive	Southbound Right-Turn	C	21.1	176.5
	Southbound Left-Turn	F	86.5	176.8
	Southbound Through	D	41.0	176.6
	Eastbound Left-Turn	B	18.5	127.8
	Eastbound Through	F	81.2	127.8
	Eastbound Right-Turn	C	21.9	127.8
	Westbound Right-Turn	B	17.8	81.2
	Westbound Through	B	19.3	81.1
	Westbound Left-Turn	C	23.5	81.1
	Northbound Through	D	37.8	69.2
	Northbound Left-Turn	C	26.4	69.2
	Northbound Right-Turn	E	66.4	69.1
	All	**D**	**40.8**	**198.4**
TransCanada Hwy Southbound Ramp	Southbound Right-Turn	A	7.2	241.0
	Southbound Left-Turn	F	100.8	241.0
	Eastbound Right-Turn	F	196.6	303.5
	Eastbound Through	F	265.8	303.5
	Westbound Left-Turn	A	4.4	17.0
	Westbound Through	A	3.1	17.0
	All	**F**	**78.9**	**303.5**
Topsail Rd / TransCanada Hwy Northbound Ramp	Northbound Left-Turn	A	8.8	0.0
	Northbound Right-Turn	A	5.7	0.0
	Eastbound Left-Turn	A	2.0	0.0
	Eastbound Through	A	2.2	0.0
	Westbound Right-Turn	A	0.4	51.4
	Westbound Through	A	4.5	85.0
	All	**A**	**4.0**	**85.0**
Topsail Rd / Carlisle Dr	Northbound Through	E	56.04	59.02
	Northbound Left-Turn	D	45.12	59.06
	Northbound Right-Turn	B	17.66	59.04
	Southbound Through	D	51.32	69.68
	Southbound Right-Turn	B	12.38	69.94
	Southbound Left-Turn	D	40.4	68.8
	Eastbound Left-Turn	D	42.56	79.12
	Eastbound Right-Turn	B	11.56	79.1
	Eastbound Through	B	12.6	79.1
	Westbound Right-Turn	D	43.56	329.42
	Westbound Left-Turn	D	37.12	329.52
	Westbound Through	D	46.38	329.42
	All	**D**	**36.28**	**329.52**
Topsail Rd / Kenmount Rd Southbound Ramp	Eastbound Through	C	29.2	13.5
	Eastbound Right-Turn	E	68.2	13.2
	Westbound Through	A	0.9	32.6
	Westbound Right-Turn	A	1.2	32.6
	Southbound Right-Turn	B	10.5	71.7
	Southbound Left-Turn	A	0.4	34.9
	All	**A**	**9.2**	**80.9**
Topsail Rd / Kenmount Rd Northbound Ramp	Westbound Through	A	0.3	0.0
	Westbound Right-Turn	A	0.3	0.0
	Eastbound Through	A	0.7	20.9
	Eastbound Left-Turn	A	0.1	0.0
	Northbound Right-Turn	A	2.5	0.0
	Northbound Left-Turn	A	0.0	0.0
	All	**A**	**0.4**	**20.9**
Kenmount Rd Bruce Street TransCanada Hwy Northbound Ramp	Northbound Through	E	41.5	127.1
	Northbound Right-Turn	F	52.9	127.1
	Eastbound Right-Turn	F	251.86	298.24
	Eastbound Left-Turn	F	278.62	298.24
	Eastbound Through	F	90.08	298.24
	Northbound Left-Turn	A	3.54	0
	Southbound Through	F	146.34	80.36
	Southbound Right-Turn	F	131.62	80.36
	Southbound Left-Turn	F	141.62	80.36
	Westbound Through	A	7.24	0
	Westbound Left-Turn	A	1	0
	Westbound Right-Turn	A	5.2	0
	All	**F**	**88.3**	**298.24**
Kenmount Rd TransCanada Hwy Southbound Ramp	Southbound Left-Turn	A	6.48	41.42
	Southbound Right-Turn	A	4.24	41.42
	Westbound Right-Turn	A	5.2	1.04
	Westbound Through	A	5.86	1.04
	Eastbound Left-Turn	A	0.86	0
	Eastbound Through	A	0.82	0
	All	**A**	**0**	**0**
Kenmount Rd Karwood Dr	Eastbound Through	A	3.7	17.7
	Eastbound Left-Turn	A	3.1	17.7
	Westbound Through	A	0.9	16.3
	Westbound Right-Turn	A	0.6	16.3
	Southbound Right-Turn	A	7.8	45.0
	Southbound Left-Turn	A	7.8	45.0
	All	**A**	**3.6**	**45.0**







APPENDIX E

PRELIMINARY DESIGN/CONCEPT DRAWINGS

1- ROUTE 2 INTERCHANGE AND CONNECTIONS TO TOPSAIL ROAD AND KENMOUNT ROAD
2- ROUTE 1 INTERCHANGE AND CONNECTIONS TO PARADISE ROAD AND TO TRAILS END DRIVE

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH.	BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: - DATE: -	DRAWN BY: - DATE: -
CHECKED BY: - DATE: -	PROJECT MANAGER: - DATE:
BAR SCALE:	

TOPSAIL/KENMOUNT CONNECTOR
(PRELIMINARY) GENERAL ARRANGEMENT

HMM PROJECT No:	DWG SCALE(FULL SIZE):	DWG No:	SHT No	REV No
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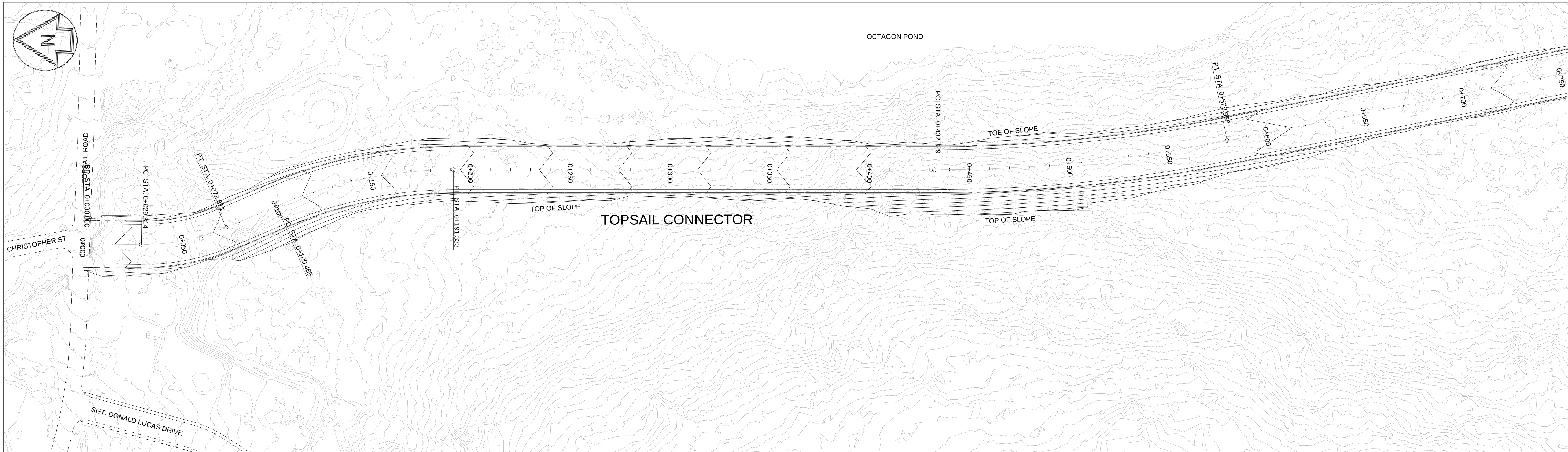

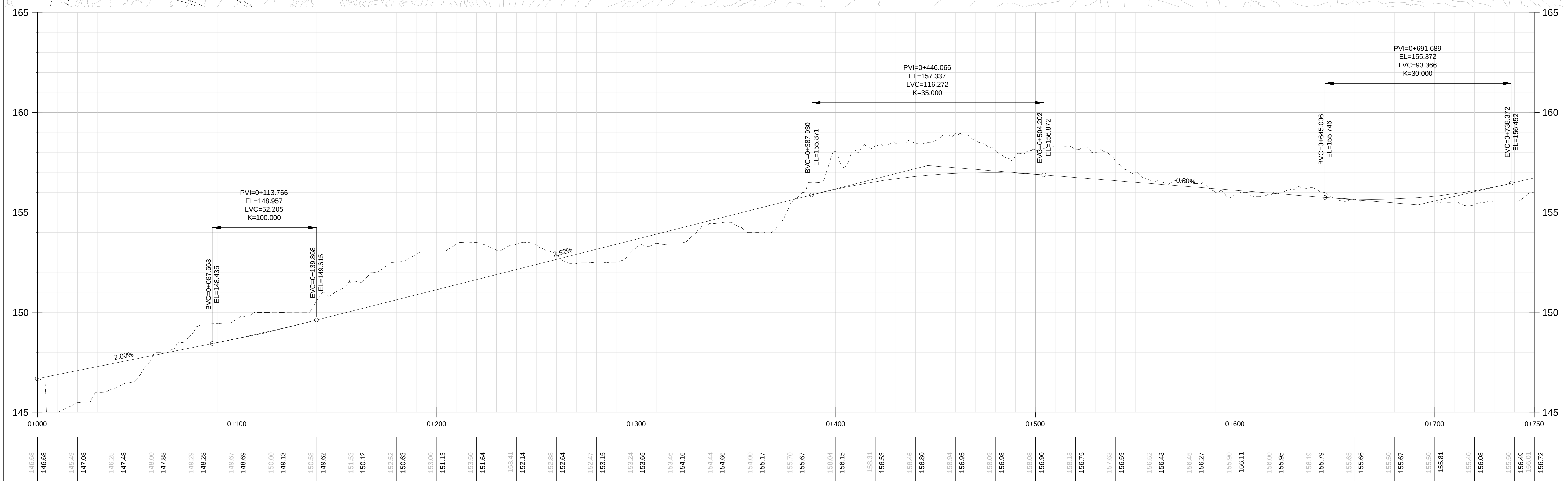

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: -
DATE: -
DRAWN BY: -
DATE: -
CHECKED BY: -
DATE: -
PROJECT MANAGER: -
DATE:
BAR SCALE:

TOPSAIL CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+000 TO STA. 0+750

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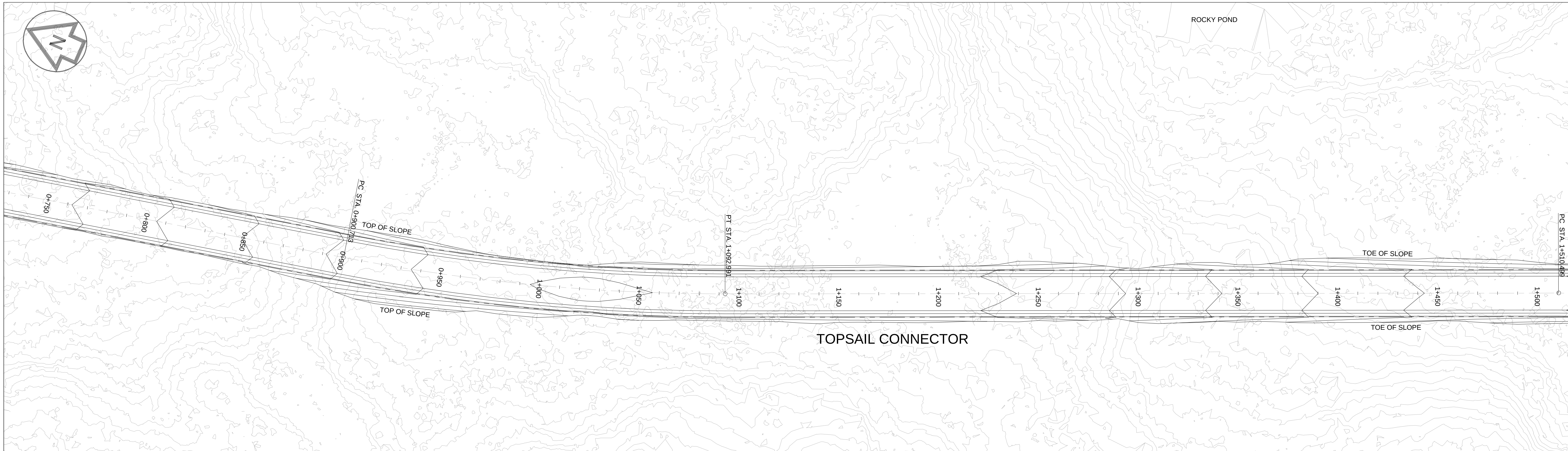

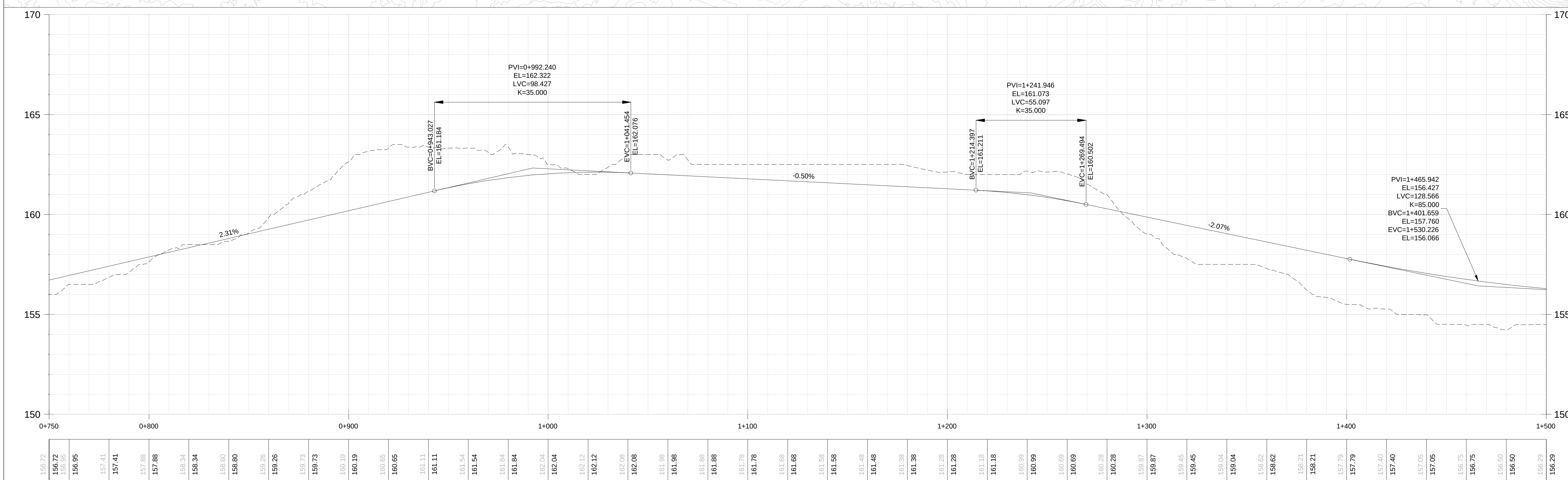

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REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: -
DATE: -

DRAWN BY: -
DATE: -

CHECKED BY: -
DATE: -

PROJECT MANAGER: -
DATE:

BAR SCALE:

TOPSAIL CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+750 TO STA. 1+500

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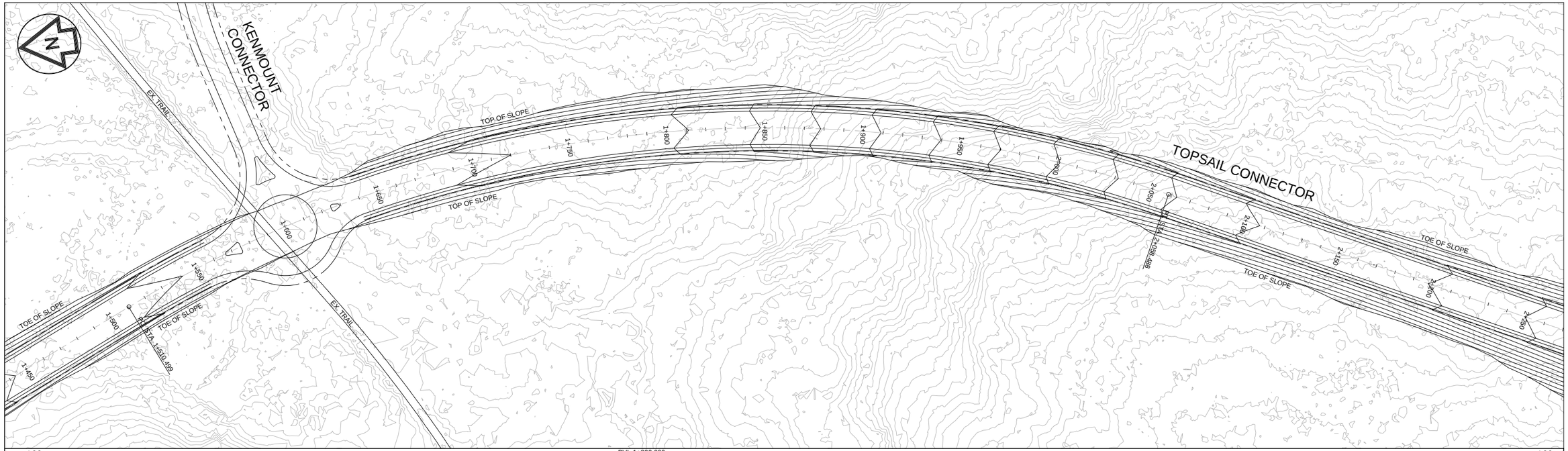

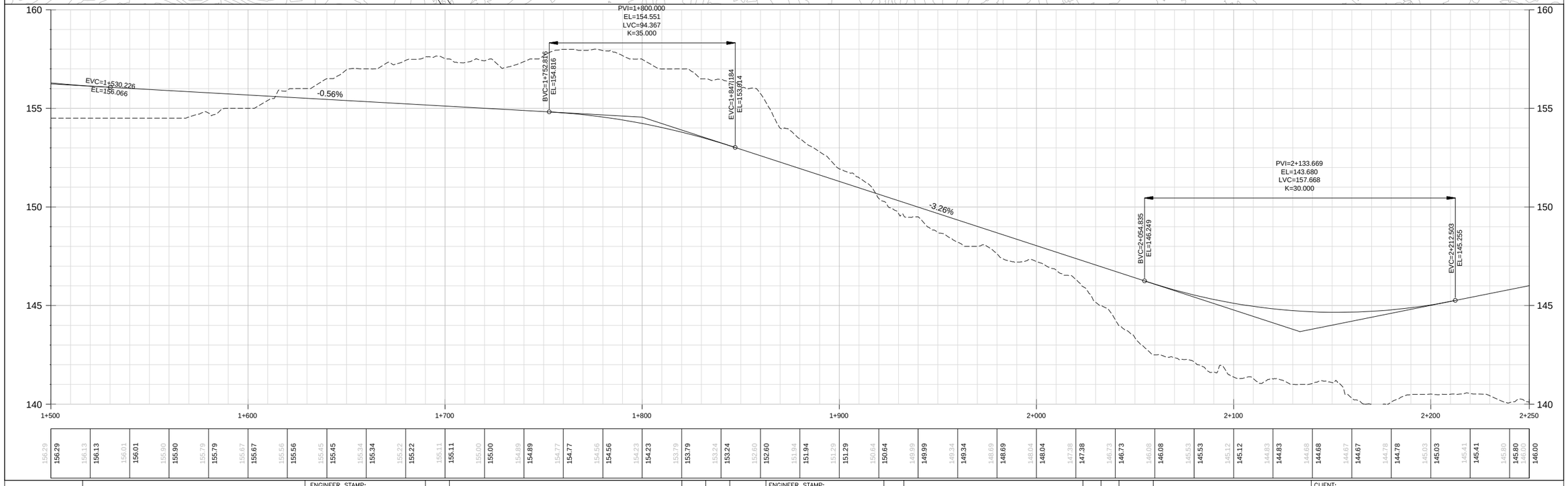

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156.29	156.13	156.01	155.90	155.79	155.67	155.56	155.45	155.34	155.22	155.11	155.00	154.89	154.77	154.56	154.23	153.79	153.24	152.60	151.94	151.29	150.64	149.99	149.34	148.69	148.04	147.38	146.73	146.08	145.53	145.12	144.83	144.68	144.67	144.78	145.03	145.41	145.80	146.00

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY:	DRAWN BY:
-	-
DATE: -	DATE: -
CHECKED BY:	PROJECT MANAGER:
-	-
DATE: -	DATE:

BAR SCALE:

TOPSAIL CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 1+500 TO STA. 2+250

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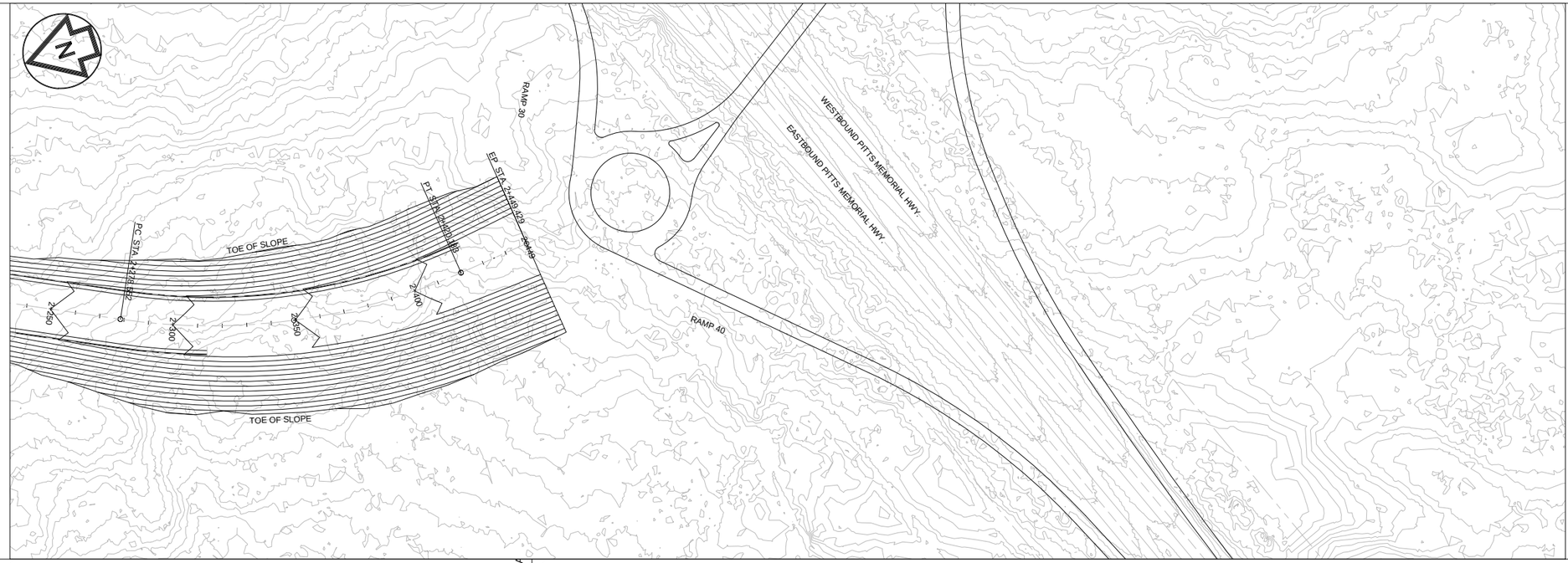

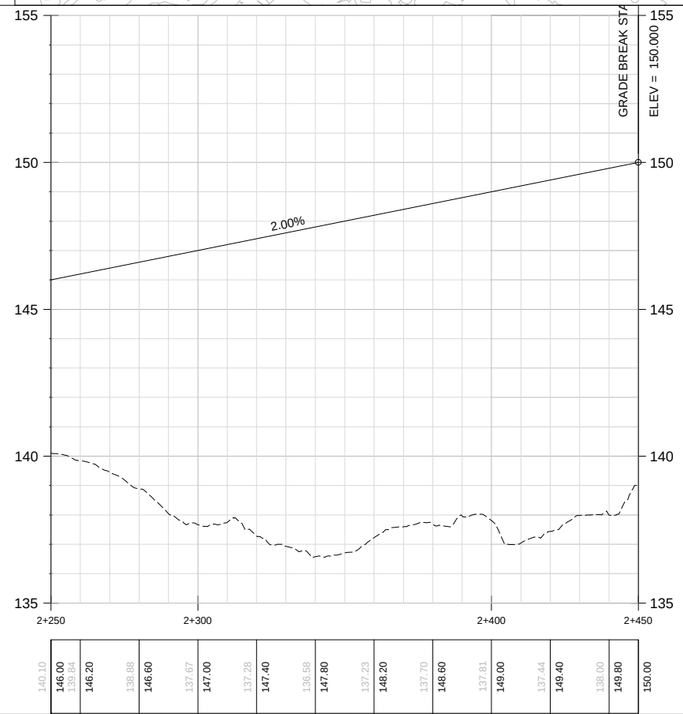

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ENGINEER STAMP:

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: -	DRAWN BY: -
DATE: -	DATE: -
CHECKED BY: -	PROJECT MANAGER: -
DATE: -	DATE:
BAR SCALE:	

TOPSAIL CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 2+250 TO STA. 2+450

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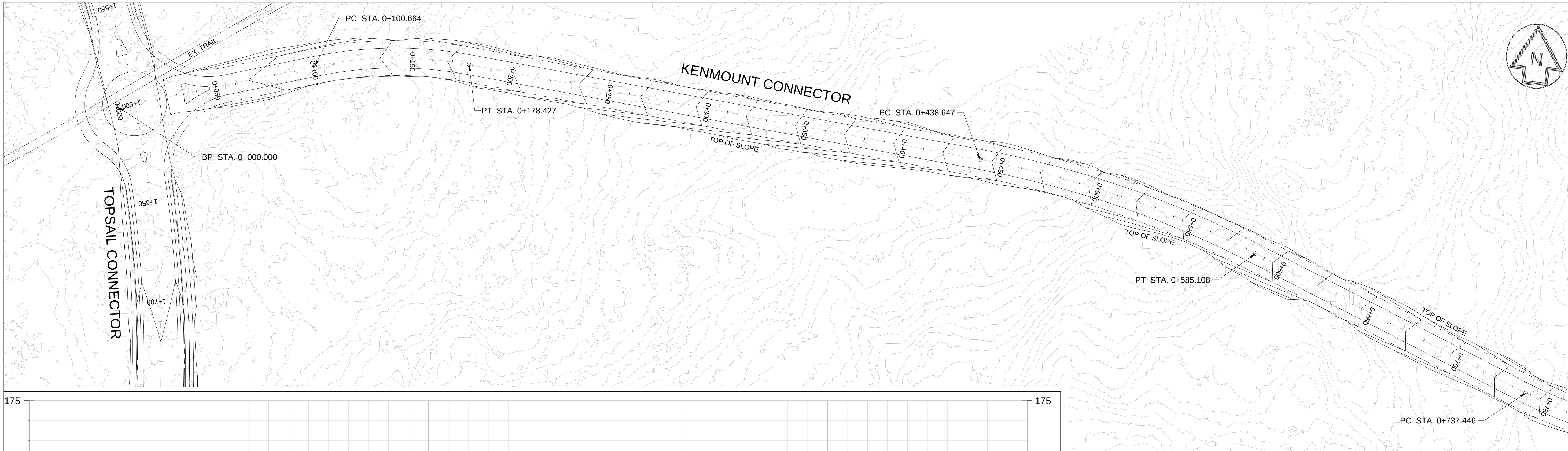

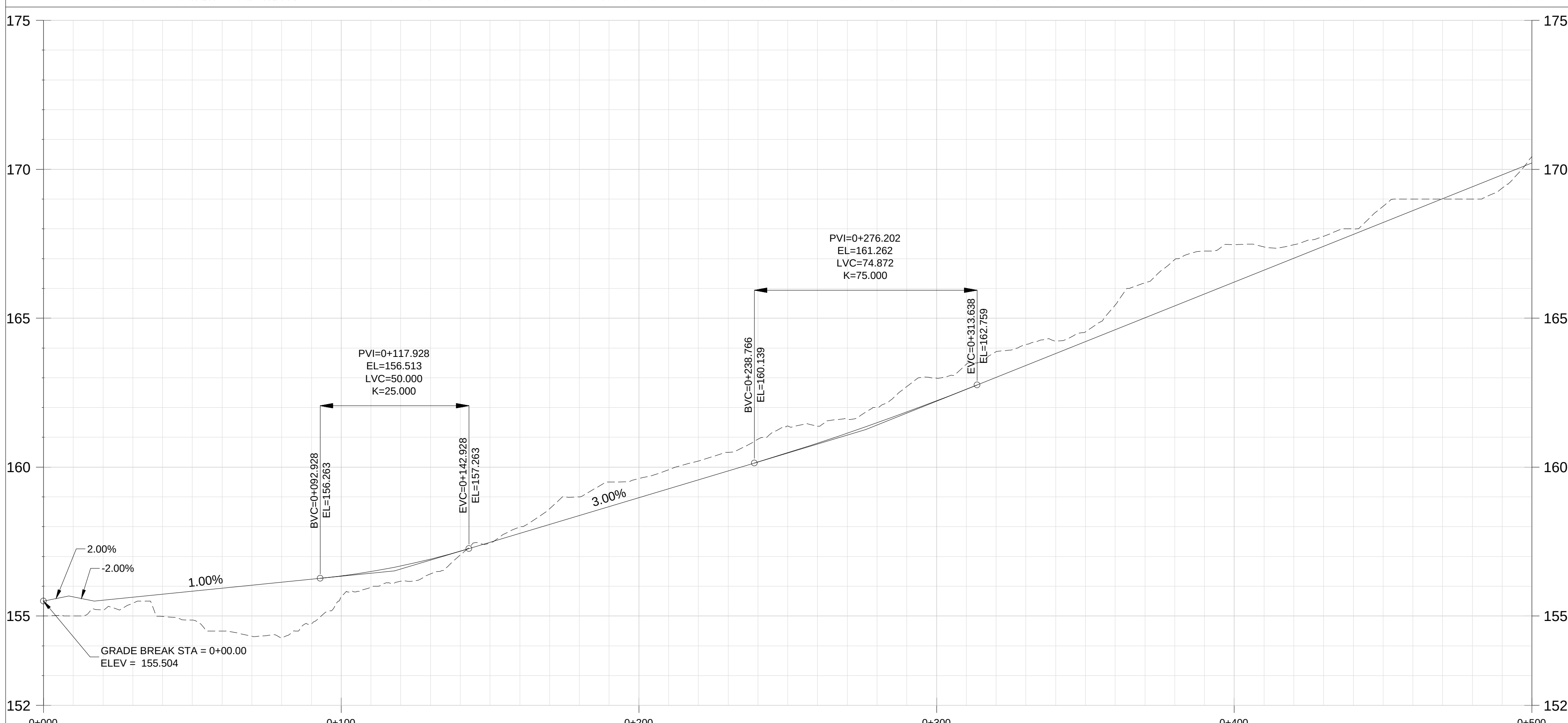

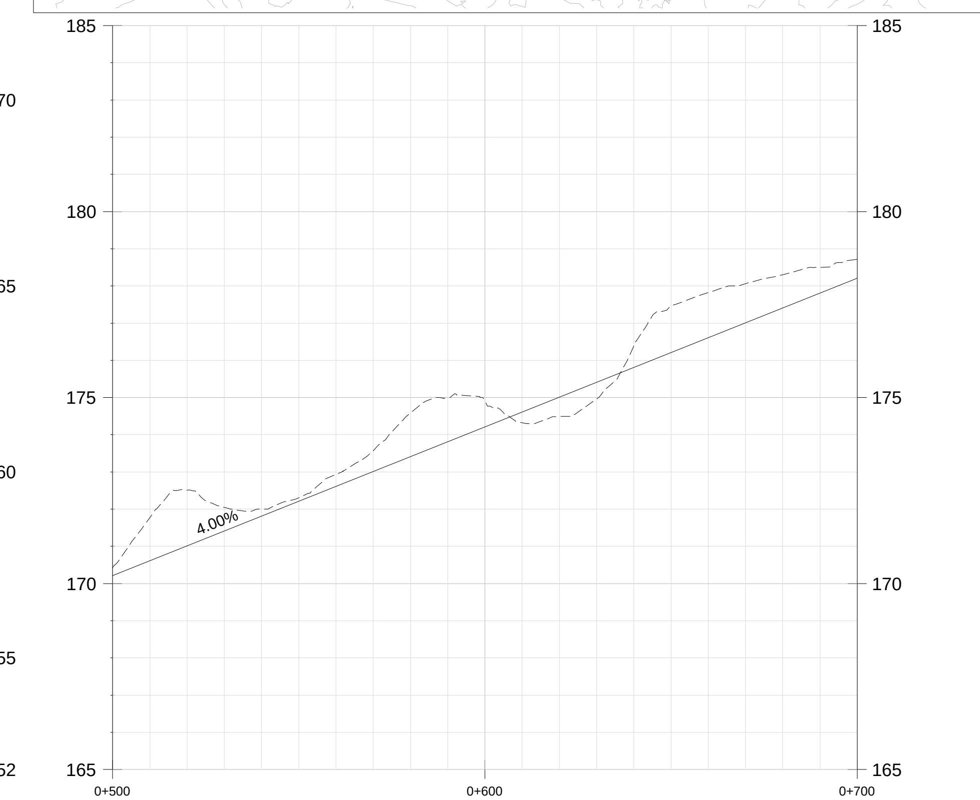

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157.05	157.18
158.00	157.78
159.00	158.38
159.62	158.98
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160.93	160.18
161.37	160.81
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170.43	170.21
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178.72	178.21

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	18/11/13

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: - DATE: -
DRAWN BY: - DATE: -
CHECKED BY: - DATE: -
PROJECT MANAGER: - DATE:
BAR SCALE:

KENMOUNT CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+000 TO STA. 0+700

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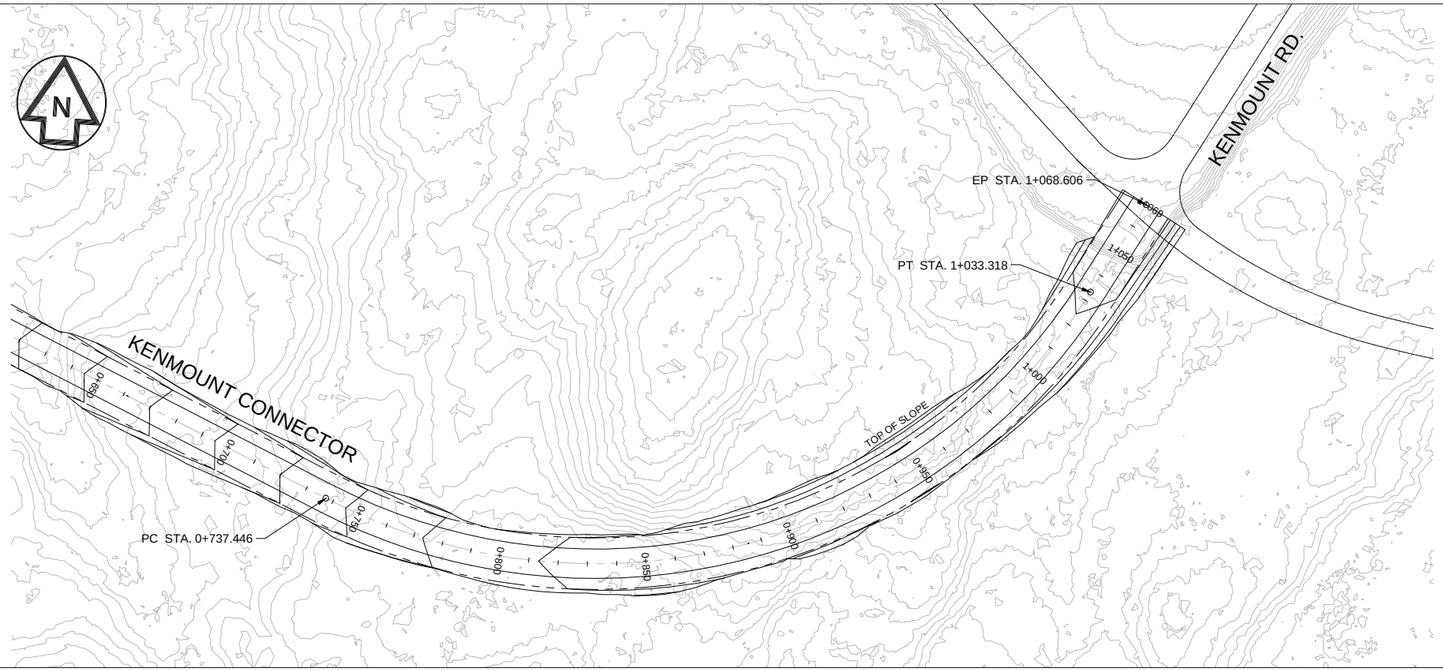

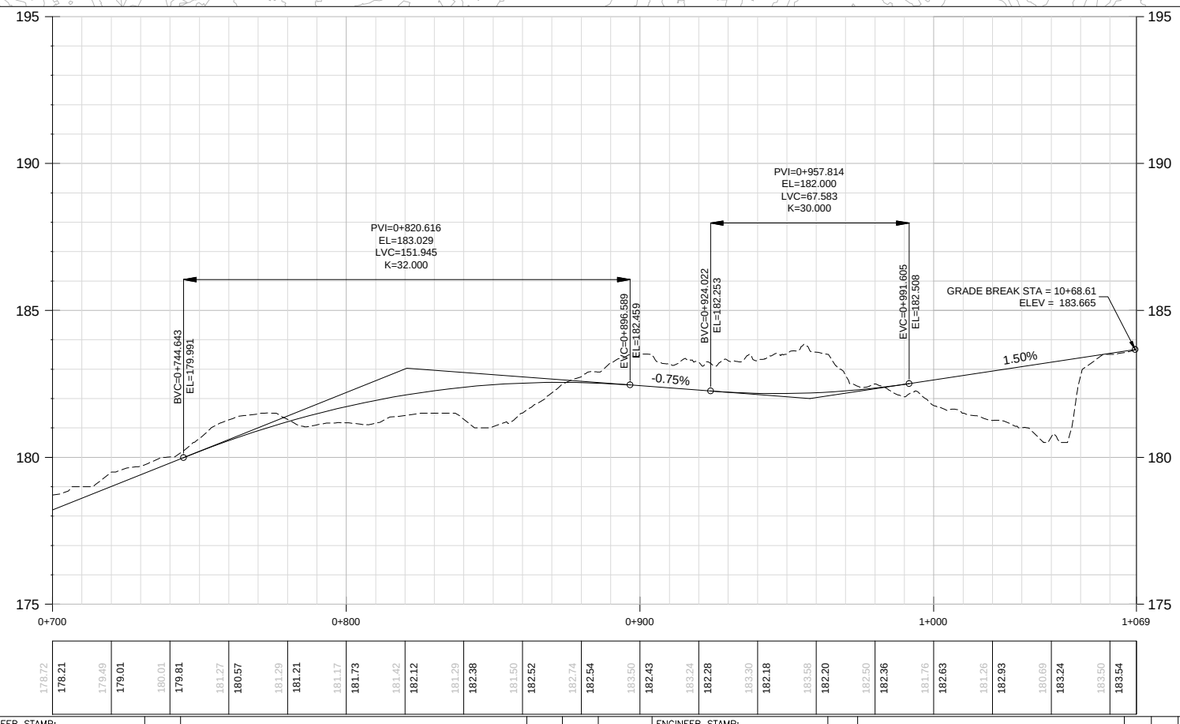

		ENGINEER STAMP:
DRAWING NUMBER	DRAWING TITLE	
REFERENCE DRAWINGS		

A	DRAFT	–	–	18/11/13	
NO.	DESCRIPTION	CHK'D	APP'D	DATE	
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ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE
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Hatch Mott MacDonald

CLIENT:

DESIGNED BY: - DATE: -	DRAWN BY: - DATE: -
CHECKED BY: - DATE: -	PROJECT MANAGER: - DATE:
BAR SCALE:	

KENMOUNT CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+700 TO STA. 1+069

HMM PROJECT No:	DWG SCALE(FULL SIZE):	DWG No:	SHT No	REV No
331087	1:1000	HMM-331087-C-006	6	A

FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

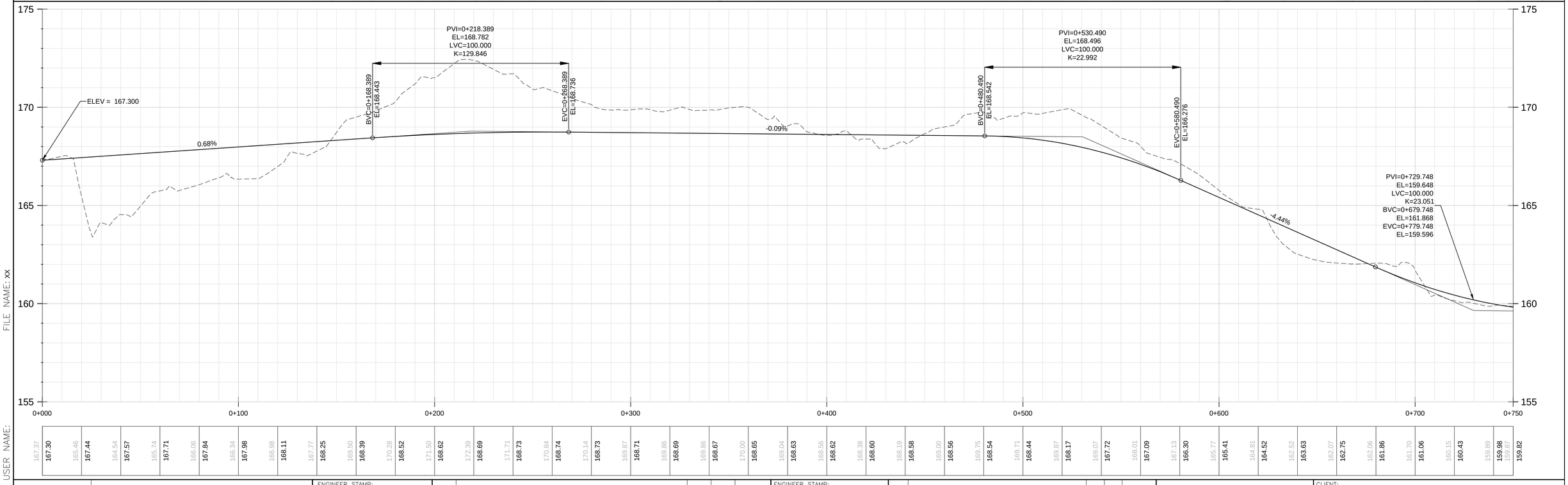
CLIENT:

DESIGNED BY: - DATE: -	DRAWN BY: - DATE: -
CHECKED BY: - DATE: -	PROJECT MANAGER: - DATE:
BAR SCALE:	

GENERAL ARRANGEMENT

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:500	HMM-325480-C-000	0	A

ANSI A1 (841mm x 594mm) FULL SIZE



FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH.	BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

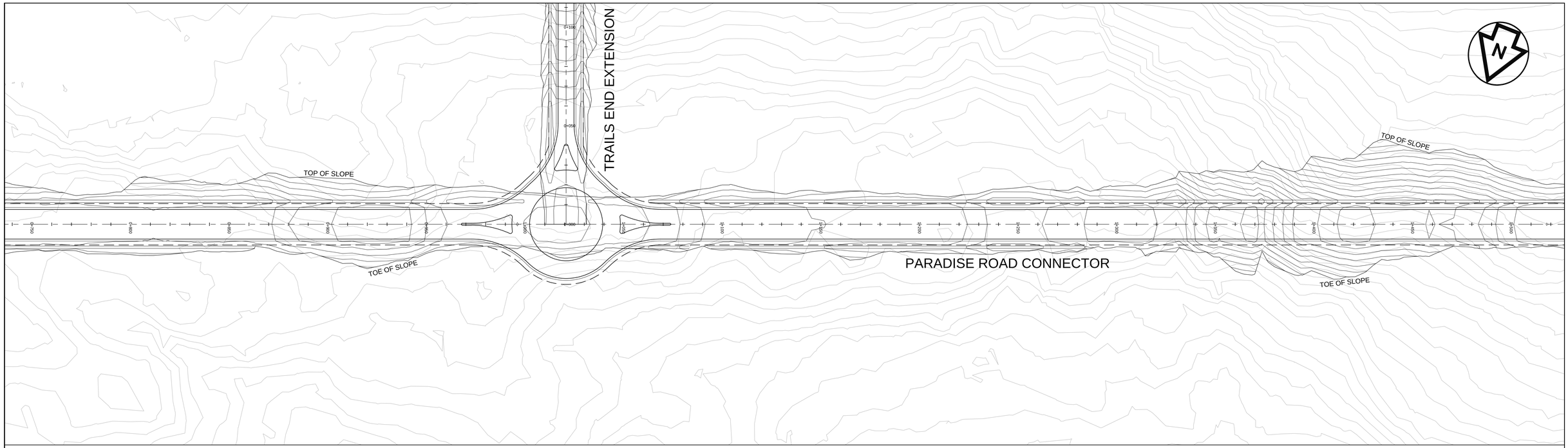
CLIENT:

DESIGNED BY: - DATE: -
DRAWN BY: - DATE: -
CHECKED BY: - DATE: -
PROJECT MANAGER: - DATE:
BAR SCALE:

PARADISE ROAD CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+000 TO STA. 0+750

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-001	1	A

ANSI A1 (841mm x 594mm) FULL SIZE



FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

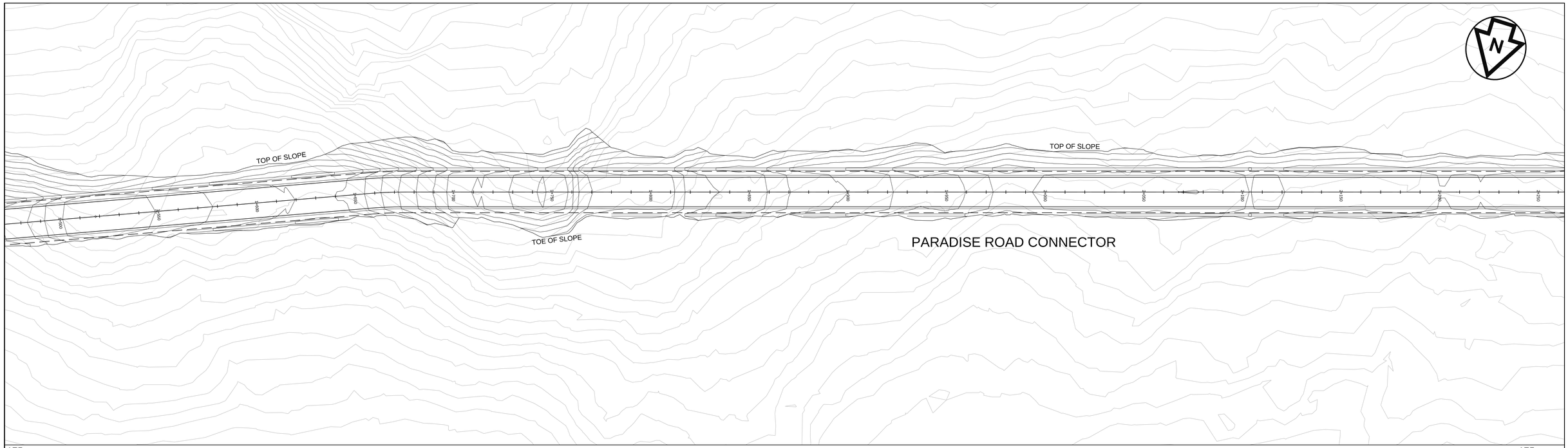
CLIENT:

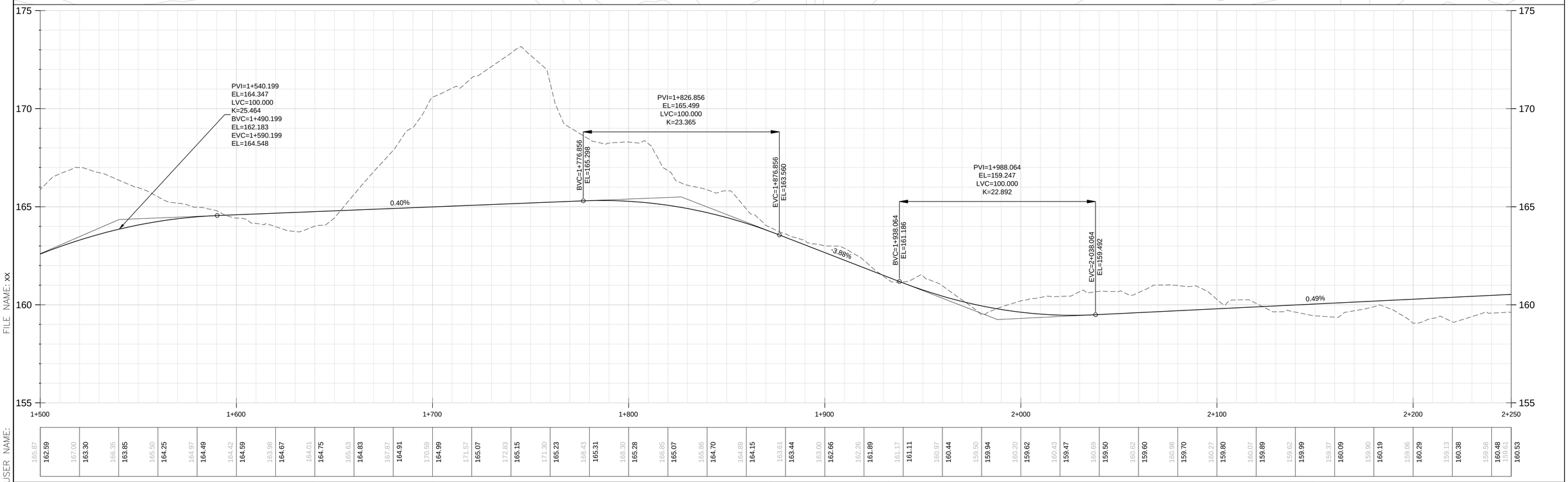
DESIGNED BY: - DATE: -	DRAWN BY: - DATE: -
CHECKED BY: - DATE: -	PROJECT MANAGER: - DATE:
BAR SCALE:	

PARADISE ROAD CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 0+750 TO STA. 1+500

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-002	2	A

ANSI A1 (841mm x 594mm) FULL SIZE





1+500	1+525	1+550	1+575	1+600	1+625	1+650	1+675	1+700	1+725	1+750	1+775	1+800	1+825	1+850	1+875	1+900	1+925	1+950	1+975	2+000	2+025	2+050	2+075	2+100	2+125	2+150	2+175	2+200	2+225	2+250
165.87	167.00	166.35	165.50	164.97	164.42	163.98	164.01	165.63	167.87	170.59	171.57	172.83	171.30	168.43	168.20	166.85	165.86	164.89	163.61	163.00	162.26	161.17	160.97	159.50	160.20	160.43	160.69	160.62	160.98	160.27
162.59	163.30	163.85	164.25	164.49	164.59	164.67	164.75	164.83	164.91	164.99	165.07	165.15	165.23	165.31	165.28	165.07	164.70	164.15	163.44	162.66	161.89	161.11	160.44	159.94	159.62	159.47	159.50	159.60	159.70	159.80

2+250	2+275	2+300	2+325	2+350	2+375	2+400	2+425	2+450	2+475	2+500
160.07	159.89	159.62	159.99	160.37	160.09	159.90	160.19	160.06	160.29	160.13
159.89	159.99	160.09	160.19	160.29	160.38	159.58	160.48	159.61	160.53	

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY:	DRAWN BY:
- DATE: -	- DATE: -
CHECKED BY:	PROJECT MANAGER:
- DATE: -	- DATE:

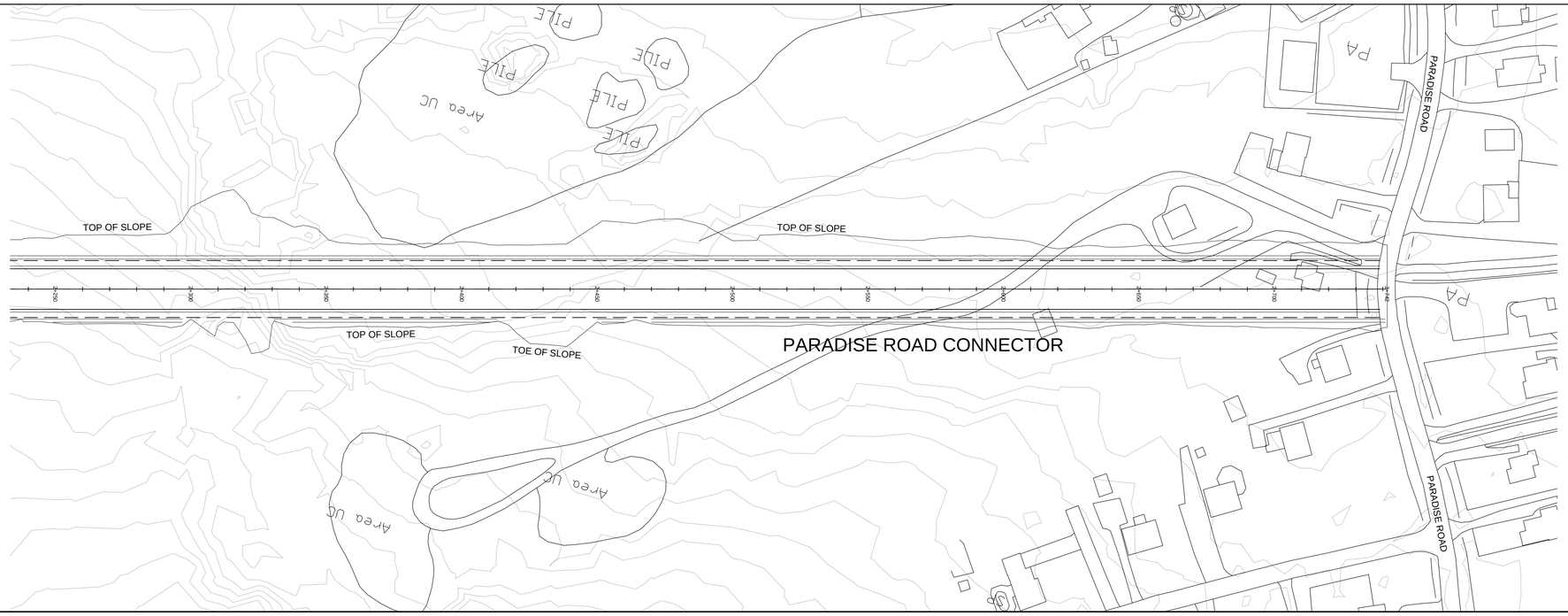
BAR SCALE:

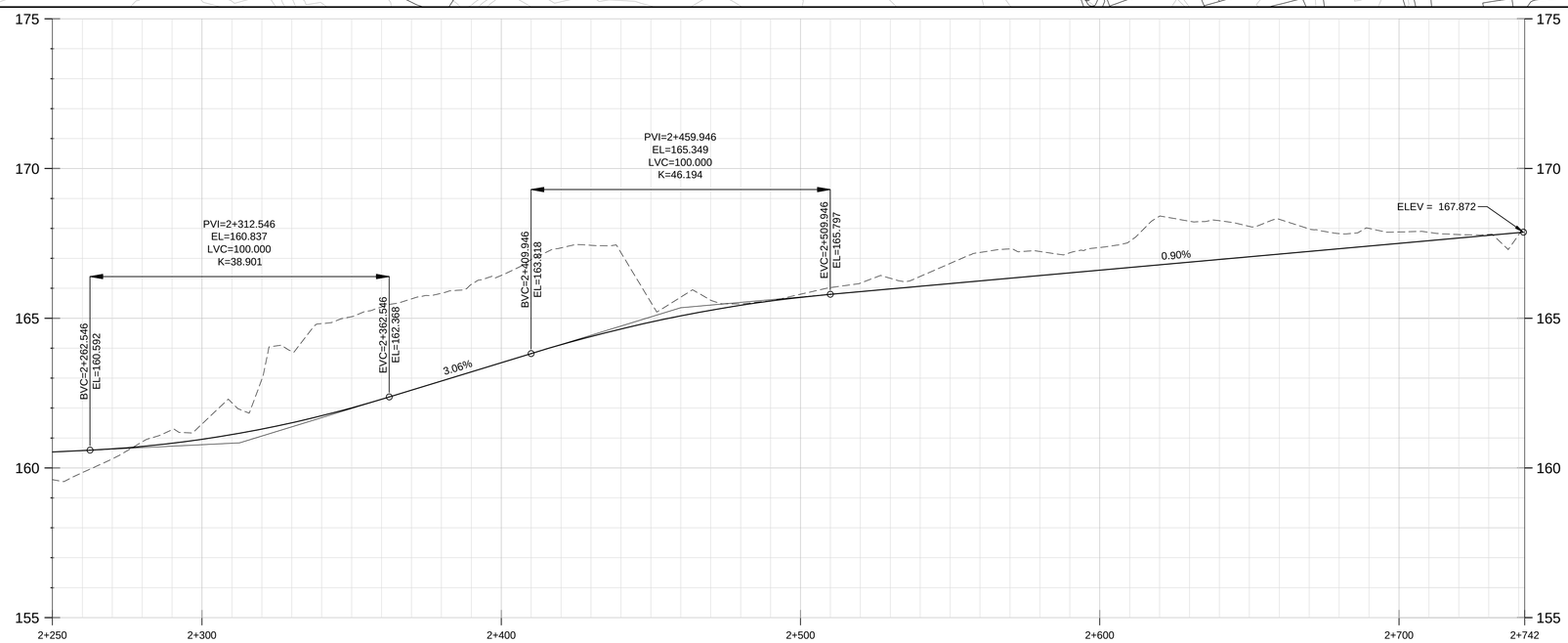
PARADISE ROAD CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 1+500 TO STA. 2+250

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-003	3	A

ANSI A1 (841mm x 594mm) FULL SIZE

PLOT DATE:
USER NAME:
FILE NAME: xx





FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY:	DRAWN BY:
-	-
DATE: -	DATE: -
CHECKED BY:	PROJECT MANAGER:
-	-
DATE: -	DATE:

BAR SCALE:

PARADISE ROAD CONNECTOR
(PRELIMINARY) PLAN AND PROFILE
STA. 2+250 TO STA. 2+741.607

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-004	4	A

ANSI A1 (841mm x 594mm) FULL SIZE

FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

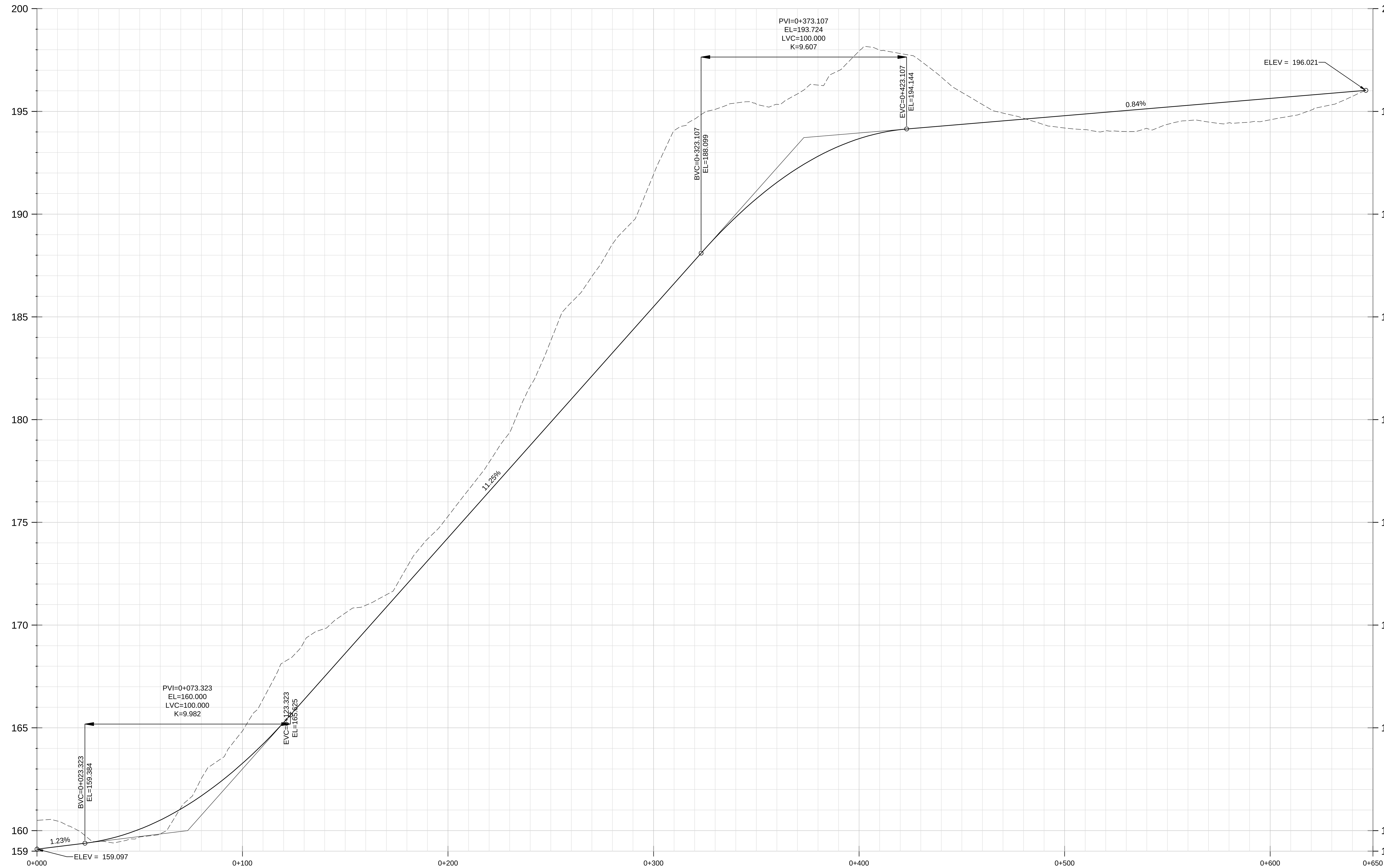
CLIENT:

DESIGNED BY:	DRAWN BY:
- DATE: -	- DATE: -
CHECKED BY:	PROJECT MANAGER:
- DATE: -	- DATE:
BAR SCALE:	

TRAILS END EXTENSION
(PRELIMINARY) PLAN
STA. 0+000 TO STA. 0+650

HMM PROJECT No:	DWG SCALE(FULL SIZE)	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-005	5	A

ANSI A1 (841mm x 594mm) FULL SIZE



160.50	159.10
160.01	159.34
159.45	159.73
159.84	160.51
162.54	161.69
164.85	163.27
168.19	165.26
169.83	167.50
170.97	169.75
172.82	172.00
175.30	174.25
177.93	176.50
181.62	178.75
185.71	181.00
188.55	183.25
191.93	185.50
194.63	187.75
195.41	189.85
195.34	191.54
196.28	192.81
197.93	193.67
197.82	194.11
196.67	194.29
195.33	194.45
194.66	194.62
194.19	194.79
194.05	194.96
194.17	195.13
194.55	195.29
194.44	195.46
194.59	195.63
195.07	195.80
195.73	195.97

FILE NAME: xx

USER NAME:

PLOT DATE:

DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

ENGINEER STAMP:

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	DRAFT	–	–	XX/XX/XX

REVISIONS

ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE

ISSUE AUTHORIZATION

Hatch Mott MacDonald

CLIENT:

DESIGNED BY: -
DATE: -

DRAWN BY: -
DATE: -

CHECKED BY: -
DATE: -

PROJECT MANAGER: -
DATE:

BAR SCALE:

TRAILS END EXTENSION
(PRELIMINARY) PROFILE
STA. 0+000 TO STA. 0+650

HMM PROJECT No:	DWG SCALE(FULL SIZE):	DWG No:	SHT No	REV No
325480	1:1000	HMM-325480-C-006	6	A

ANSI A1 (841mm x 594mm) FULL SIZE