Logy Bay-Middle Cove-Outer Cove
Transportation Study

Prepared For:
Town of Logy Bay-Middle Cove-Outer Cove

Prepared by:
Harbourside Transportation Consultants

Robin King, P. Eng
Email: rking@harboursideengineering.ca
Tel: (709) 579.6435

Michael MacDonald, P. Eng
Email: mmacdonald@harboursideengineering.ca
Tel: (902) 405.4696

10 May 2019
Status: Draft Report – Revision 1

Project No.: 172055
**Project Name:** Town of Logy Bay-Middle Cove-Outer Cove Transportation Study

**Project Number:** 172055

<table>
<thead>
<tr>
<th>Client:</th>
<th>Town of Logy Bay-Middle Cove-Outer Cove</th>
</tr>
</thead>
</table>
| Status:                  | Draft Report Revision 1 – Issued for Client Review – May 10, 2019  
                          | Draft Report – Issued for Client Review – May 08, 2018             |

**Engineering Seal**

**Permit to Practice**

<table>
<thead>
<tr>
<th>Prepared By:</th>
<th>Reviewed By:</th>
<th>Approved By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: F. Allaire</td>
<td>M. MacDonald</td>
<td>R. King</td>
</tr>
<tr>
<td>Initial:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date: May 10, 2019</td>
<td>May 10, 2019</td>
<td>May 10, 2019</td>
</tr>
</tbody>
</table>
# Table of Contents

1.0 **Introduction** .......................................................... 1
   1.1 Objectives of the Transportation Study .................................. 1

2.0 **Context** .................................................................. 1
   2.1 Study Area .................................................................. 1
   2.2 Data Collection ............................................................ 2
   2.3 Study Horizons and Background Traffic Forecasting ............... 3

3.0 **Stakeholder Consultation** ........................................... 3
   3.1 Caddigan Development .................................................... 5
   3.2 Pinnacle Engineering ....................................................... 5
   3.3 St. John’s Regional Fire Department .................................. 6
   3.4 Resident Concerns ......................................................... 6

4.0 **Development Proposal** .............................................. 7
   4.1 Trip Generation ............................................................ 8
   4.2 Trip Distribution and Assignment ....................................... 9

5.0 **Intersection Performance Analysis** .............................. 10
   5.1 Scenario 1: Existing Conditions (2017) ............................. 11
      5.1.1 Traffic Signal Warrant Analysis .................................. 13
      5.1.2 Left-turn Lane Warrants Analysis ................................ 13
      5.1.3 Right-turn Lane Warrants Analysis ............................... 14
   5.2 Scenario 2: Five-year Development Projection (2022) ......... 15
      5.2.1 Traffic Signal Warrant Analysis .................................. 17
      5.2.2 Five-year Improvements .......................................... 17
   5.3 Scenario 3: Ten-year Development Projection (2027) ......... 20
      5.3.1 Traffic Signal Warrant Analysis .................................. 22
      5.3.2 Ten-year Improvements ............................................ 22

6.0 **Road Network Review** ............................................. 23
   6.1 Review of Road Network Concept Plans in the Development Area 23
   6.2 Proposed Road Network for the Development Area ............... 24
   6.3 Cross Sections ............................................................ 28
   6.4 Roadway Classification System ....................................... 30
   6.5 Emergency Response Times ........................................... 31

7.0 **Snow’s Lane Traffic and Safety Assessment** .................... 35
   7.1 Existing Traffic Operations ............................................ 35
      7.1.1 Safety Assessment .................................................. 35
   7.2 Snow’s Lane Improvements ............................................ 39
      7.2.1 Logy Bay Road and Snow’s Lane Intersection Improvements 39
      7.2.2 Safety Improvements .............................................. 41
      7.2.3 Snow’s Lane Cost Estimate ..................................... 41

8.0 **Active Transportation** .............................................. 43
   8.1 Network Connectivity ................................................... 43
   8.2 Parking Areas ............................................................ 43
   8.3 Trail Crossings ............................................................ 44
   8.4 Trailheads and Signage ................................................ 44

*Harbourside Transportation Consultants – Project No. 172055*
8.5 Active Transportation Cross Sections........................................................................45
9.0 Traffic Calming........................................................................................................47
  9.1 Traffic Calming Policy ............................................................................................47
  9.2 Traffic Calming in New Residential Subdivisions......................................................47
10.0 Residential Subdivision Standards Review.............................................................48
  10.1 Inclusive Design...................................................................................................49
11.0 Conclusions and Recommendations.......................................................................50

List of Figures

Figure 1: Study area...........................................................................................................2
Figure 2: Development proposals under consideration in the development area.............4
Figure 3: Scenario 1 Existing Conditions (2017) – Synchro level of service results..........12
Figure 4: Scenario 2 Five-year Development Projection (2022) – Synchro level of service results 16
Figure 5: Scenario 2 Five-year Development Projection with Improvements (2022) – Synchro level of service results 19
Figure 6: Scenario 3 Ten-year Development Projection (2027) – Synchro level of service results 21
Figure 7: Alternative Road Network- Development Area..................................................27
Figure 8: Typical cross sections for a local roadway.........................................................29
Figure 9: Typical cross sections for a local roadway with a walkable shoulder ................29
Figure 10: Typical cross sections for a collector roadway with an active transportation trail 30
Figure 11: Travel times from the Town boundary on Logy Bay Road under existing traffic conditions 33
Figure 12: Travel times from the Town boundary on Logy Bay Road under future traffic conditions 34
Figure 13: Pavement markings on Snow’s Lane at the Town Boundary............................35
Figure 14: Varying shoulder width and condition on Snow’s Lane....................................36
Figure 15: Sight distance from the driveway at civic address #65.......................................37
Figure 16: Asphalt condition on Snow’s Lane.................................................................37
Figure 17: Plan view of existing signage and pavement markings on Snow’s Lane...........38
Figure 18: Plan view of proposed signage and pavement markings on Snow’s Lane........38
Figure 19: Grand Concourse Authority trail marker.......................................................45
Figure 20: Typical cross section and design for granular walkway....................................46
Figure 21: Typical cross section and design for granular walkway in wet locations............46

List of Tables

Table 1: Average daily traffic and 85th percentile speed results.......................................3
Table 2: Summary of development proposals...................................................................7
Table 3: Trip generation rates for the proposed developments included in the five-year horizon 8
Table 4: Trip generation rates for the proposed developments included in the ten-year horizon 8
Table 5: Comparison of trip generation for single-family housing and senior adult housing 8
Table 6: LOS Criteria Signalized and Unsignalized Intersections....................................10
Table 7: Roadway classification for LBMCCOC...............................................................31
Appendices

Appendix A – Intersection Turning Movement Counts
Appendix B – Link Volume and Speed Counts
Appendix C – Visum Model Calibration
Appendix D – Design Volumes
Appendix E – Analysis Summary Tables
Appendix F – Synchro/SimTraffic Reports
Appendix G – Traffic Signal Warrant Analysis Sheets
Appendix H – Turning Lane Warrants
Appendix I – Arcady Reports
Appendix J – Road Network Concept Plans
Appendix K – Roadway Classification List and Map
Appendix L – Snow’s Lane Pavement Markings and Signage Plans
Appendix M – Logy Bay Road & Snow’s Lane Intersection - Improvement Options
Appendix N – Cost Estimates
Appendix O – Traffic Calming Policy
1.0 Introduction

The Town of Logy Bay-Middle Cove-Outer Cove (LBMCOC) has experienced a fair amount of residential development over the past number of years. Residential development has been primarily focused in the central area of the Town; including the Sandalwood Drive and Killick Drive area. This main development area is generally bounded by Torbay Road to the west, the Town boundary with the City of St. John’s to the south, Logy Bay Road to the east and Pine Line to the north.

There are a number of different developers that are ready to proceed with residential subdivision proposals in this area; some of which are currently underway while others remain in the planning process with no formal approval from the Town Council. Conceptual plans provided by various developers indicate that a total of 268 dwelling units can be expected to be built in this area over the next 10 years.

Harbourside Transportation Consultants (HTC) was retained by the Town of LBMCOC to complete a transportation study to identify the long-term transportation needs required to support future development in the Town.

1.1 Objectives of the Transportation Study

The objectives of the transportation study were to address a number of concerns raised by the Town:

1. Identify road network improvements required to support the projected residential development and develop a timeframe for the implementation of these improvements.
2. Verify that the configuration of the proposed internal road network in the best interest of the Town of LBMCOC. Review the use of cul-de-sacs and identify opportunities to improve the connectivity of the road network to increase efficiencies and traffic flow for service vehicles.
3. Identify if the development area has sufficient access for both emergency vehicles and normal traffic flow.
4. Review anticipated emergency response routes in relation to the proposed road network.
5. Identify if sufficient allowance has been made for open space and trail connections.
6. Identify substandard roads that require upgrading as part of the planning process for both traffic operations and pedestrian safety.
7. Review the Town’s residential subdivision standards.
8. Identify existing intersection configurations incapable of handling projected increases in traffic.
9. Identify the impact of future development on the existing school zone along Outer Cove Road.

2.0 Context

2.1 Study Area

The main development area, shown in Figure 1, is located in the central portion of the Town. There are a number of key roadways in the study area including:

- Cadigan’s Road
- Logy Bay Road
- Lower Road
- Middle Cove Road
- Outer Cove Road
- Pine Line
- Snow’s Lane
All key roadways within the study area have one lane of travel in each direction and a speed limit of 50 km/h, with the exception of a section of Logy Bay Road in the school zone around St. Francis School which has a reduced speed limit of 30 km/h.

Figure 1: Study area

2.2 Data Collection

Intersection turning movement counts were gathered at the fourteen study intersections using Miovision Scout video data collection units. The traffic counts were collected in September 2017 during the AM (7:00am to 9:00am), midday (11:00am to 1:00pm) and PM (4:00pm to 6:00pm) peak hours. Traffic count data can be found in Appendix A. Intersection turning movement counts were gathered at the following intersections:

1. Marine Drive & Middle Cove Road – Tuesday, September 19th, 2017
2. Marine Drive & Outer Cove Road – Tuesday, September 19th, 2017
3. Marine Drive & Lower Road – Tuesday, September 19th, 2017
4. Outer Cove Road & Pine Line – Wednesday, September 27th, 2017
5. Pine Line & Sandalwood Drive – Thursday, September 28th, 2017
Logy Bay-Middle Cove-Outer Cove
Transportation Study

6. Outer Cove Road & Big Meadow Drive – Wednesday, September 20th, 2017
7. Outer Cove Road & St. Francis Road – Thursday, September 21st, 2017
8. Logy Bay Road & Outer Cove Road/Lower Road – Thursday, September 21st, 2017
9. Logy Bay Road & Clover Dale Close – Wednesday, September 27th, 2017
10. Logy Bay Road & Cadigan’s Road – Thursday, September 21st, 2017
11. Marine Drive & Cadigan’s Road – Tuesday, September 26th, 2017
12. Logy Bay Road & Snow’s Lane – Tuesday, September 26th, 2017
13. Snow’s Lane & Ashkay Drive – Tuesday, September 26th, 2017
14. Logy Bay Road & Marine Drive – Wednesday, September 27th, 2017

Link speed and volume counts were collected at ten locations throughout the Town using BlackCAT radar recorders to obtain average daily traffic (ADT) and 85th percentile speed values. The ADT is the total volume of vehicular traffic over a 24-hour period, and the 85th percentile speed is the speed value that 85 percent of vehicles do not exceed. A summary of the ADT counts and 85th percentile speeds are shown in Table 1, the detailed volume and speed reports can be found in Appendix B.

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>ADT</th>
<th>85th Percentile Speed (km/h)</th>
<th>Posted Speed Limit (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-Sep-17</td>
<td>Logy Bay Road (Town Boundary) - Near Civic Address #542</td>
<td>4,741</td>
<td>59</td>
<td>50</td>
</tr>
<tr>
<td>27-Sep-17</td>
<td>Snow’s Lane - Near Civic Address #80-86</td>
<td>3,721</td>
<td>56</td>
<td>50</td>
</tr>
<tr>
<td>28-Sep-17</td>
<td>Lower Road - Near Civic Address #59</td>
<td>513</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>3-Oct-17</td>
<td>Marine Drive (Town Boundary) - Near Civic Address #272</td>
<td>894</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>3-Oct-17</td>
<td>Middle Cove Road - Near Civic Address #232</td>
<td>1,211</td>
<td>62</td>
<td>50</td>
</tr>
<tr>
<td>4-Oct-17</td>
<td>Outer Cove Road - Near Civic Address #102</td>
<td>1,635</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>4-Oct-17</td>
<td>Pine Line - Near Civic Address #171-397</td>
<td>941</td>
<td>69</td>
<td>50</td>
</tr>
<tr>
<td>5-Oct-17</td>
<td>Logy Bay Road - Near Civic Address #744</td>
<td>4,194</td>
<td>67</td>
<td>50</td>
</tr>
<tr>
<td>5-Oct-17</td>
<td>Marine Drive - Near Civic Address #200</td>
<td>887</td>
<td>61</td>
<td>50</td>
</tr>
<tr>
<td>11-Oct-17</td>
<td>St. Francis Road - Near Civic Address #14</td>
<td>239</td>
<td>43</td>
<td>30</td>
</tr>
</tbody>
</table>

2.3 Study Horizons and Background Traffic Forecasting

Two study horizons were selected for the purpose of this study. The horizon years for the study are 2022, a five-year projection of growth and development, and 2027, a ten-year projection of growth and development. Existing traffic volumes were factored using a background traffic growth rate of 0.8 percent per year to reflect normal increases in traffic on the study area road network.

3.0 Stakeholder Consultation

Interviews were conducted with stakeholders (developers and/or engineering/planning staff) to obtain information regarding development projections. There are five main properties in the development area, including the Cadigan property, the Power Estate, the Sylvester Power property, the O’Brien property and the Dobbin property. An overall development plan is shown in Figure 2, the plan reflects the combination of proposals by private developers and shows the location of each property within the main development area and the road network proposed by the developers. Some of the development proposals that form the basis for this plan have not received approval from the Town; therefore, the overall development plan does not reflect an approved development plan for the area.
Figure 2: Development proposals under consideration in the development area
3.1 Caddigan Development
An interview was conducted with the developer of the Caddigan Property on August 25th, 2017. The developer indicated that the development plans for the study area include single-family housing (one-acre lots) and senior adult housing with a density of two units per acre. The developer noted that in order for his proposal to proceed, an amendment to the existing zoning in the area is required.

Development plans for the Caddigan property (Figure 2) include 82 senior adult housing units and 64 one-acre lots. The development proposal for the area is subdivided into three phases. The developer has indicated that Phase 1, which includes the 82 senior adult housing units, would be completed in the 0-5 year timeframe and Phases 2 and 3 in the 5-10 year timeframe. The proposed internal road network for the development will connect to Killick Drive and Middle Ledge Drive.

It should be noted that the development plan for the Caddigan property has not been approved by the Town. The zoning for the property allows for a maximum density of one unit per acre and the Town Council does not support increasing density. Without an amendment to the existing zoning, a revised development plan could include 41 one-acre lots in place of the 82 senior adult housing units.

3.2 Pinnacle Engineering
An interview was conducted with Pinnacle Engineering Limited on September 13th, 2017. On behalf of a number of private developers, Pinnacle Engineering has undertaken the planning and design work for the remainder of the development area, including the Power Estate, the Sylvester Power Property, the O’Brien property and the Dobbin Property (Figure 2).

Power Estate: The Town has not received any development plans for the Power Estate; there are no plans for development in the Power Estate property within the study timeframe (10 years). There is a stream and wetland area running through the property. The proposed road network includes a roadway connection through the Power Estate to connect the Caddigan property to Clover Dale Close.

Sylvester Power & O’Brien Properties: Development plans for the properties include a total of 5 one-acre lots. These properties are expected to be developed in the 5-10 year timeframe. The proposed internal road network will extend Clover Dale Close and Stick Pond Road into the Sylvester Power and O’Brien properties.

Dobbin Property: Development plans for the property include a total of 49 one-acre lots, subdivided into three stages. Stage 1 will include 27 lots; Stage 2 will include 8 lots and Stage 3 will include 14 lots. An additional 18 lots can be developed in the area between Stages 1 and 2. Stage 1 is expected to be completed in the 0-5 year timeframe and Stages 2 and 3 in the 5-10 year timeframe. The proposed internal road network will connect to Skip’s Place and Stick Pond Road.

3.3 St. John’s Regional Fire Department
A meeting was held with fire prevention and senior management staff at the St. John’s Regional Fire Department (SJRFD) to discuss the road network proposed by the developers from an operational perspective and identify any issues with servicing.

The SJRFD indicated that the Town is primarily serviced by the Kent’s Pond Station No. 6 on Portugal Cove Road. If necessary, a pumper truck is also dispatched from the Paradise Station No. 8. No existing concerns were identified with respect to the current level of service that they have contracted with the Town to
provide. SJRFD did indicate that they have done some work in conjunction with Town staff with respect to identifying water sources that can be used by the pumper truck if necessary.

The SJRFD did not provide any comments with respect to the road network proposed by developers (Figure 2), but provided documentation referring to the elements they look for when reviewing a new development. The documentation included the SJRF Proposal Development Commentary Manual and the standard form for development review comments. The SJRFD also indicated that the Town is welcome to forward any development plans to their attention for review and comment during the approval process.

3.4 Resident Concerns

Resident concerns were identified by reviewing social media posts on the Facebook group “Safe Streets of LB-MC-OC”. The two common themes that emerged are speeding and traffic calming and their impacts on pedestrian safety.

Speeding: Vehicle speeds are considered high throughout the entire Town. Specific roads identified to have very high speeds include:

- Pine Line
- Red Cliff Road
- O’Neil’s Road
- Middle Cove Road
- Outer Cove Road
- Lower Road
- Marine Drive
- Marine Lab Road

Traffic Calming: The comments include positive feedback regarding traffic calming measures employed by the Town (speed bumps and radar speed displays). Residents have also indicated that they would like to see other traffic calming measures explored.

Request for speed bumps or other traffic calming measures on the following streets were identify through the comments:

- Red Cliff Road
- Outer Cove Road near Kelly Park. Some residents would also like to see a crosswalk in this area.
- Sandalwood Drive (replace the speed bumps that were removed)
- Pine Line
- Middle Cove Road

Other concerns noted include:

- Lack of enforcement/RNC patrol in the area
- High volumes ATV and dirt bike traffic on roads
- Dangerous driving behavior is common (drag racing, racing, burnouts, etc.)
- Pedestrian safety
- Traffic congestion
- Roadside parking
- Drop off and pick up activities in the school zone
4.0 Development Proposal

The proposed development plans for the study area (Figure 2) include residential land uses only. The overall development plan is based on proposals by private developers some of which have not been approved by the Town; therefore, the overall development plan does not reflect an approved development plan for the area.

While the overall development plan is not an approved development plan, the plan provides an overall picture of potential development in the area and forms the basis for developing future development projections. The overall development plan includes a total of 268 dwelling units; the breakdown of dwelling units by property is shown in Table 2. The main development area was divided into two areas, the area north of the Power Estate property and the area south of the Power Estate property.

**North of the Power Estate:** The area to the north of the Power Estate property includes the Caddigan property and the remaining lots to be developed in the Pine Line Holdings and Eaglewood Estates subdivision. As of the fall of 2017, approximately 50 lots remained to be developed this area. A total of 114 single-family and 82 senior adult housing units are proposed for the area north of the Power Estate property; note the senior adult housing proposal does not meet the Town’s minimum lot size.

**South of the Power Estate:** The area to the south of the Power Estate property includes the Dobbin, Sylvester and O’Brien properties. A total of 72 single-family dwelling units are proposed for the area south of the Power Estate property.

<table>
<thead>
<tr>
<th>Property/Land Use</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine Line Holdings</td>
<td></td>
</tr>
<tr>
<td>Single-Family Detached Housing</td>
<td>37</td>
</tr>
<tr>
<td>Eaglewood Estates</td>
<td></td>
</tr>
<tr>
<td>Single-Family Detached Housing</td>
<td>13</td>
</tr>
<tr>
<td>Caddigan Property</td>
<td></td>
</tr>
<tr>
<td>Single-Family Detached Housing</td>
<td>64</td>
</tr>
<tr>
<td>Senior Adult Housing - Detached¹</td>
<td>82</td>
</tr>
<tr>
<td>O’Brien &amp; Sylvester Properties</td>
<td></td>
</tr>
<tr>
<td>Single-Family Detached Housing</td>
<td>5</td>
</tr>
<tr>
<td>Dobbin Property</td>
<td></td>
</tr>
<tr>
<td>Single-Family Detached Housing</td>
<td>67</td>
</tr>
<tr>
<td><strong>Total Dwelling Units</strong></td>
<td>268</td>
</tr>
</tbody>
</table>

1. The development proposal including senior adult housing units has not been approved by Council. If revised to include single-family detached housing only, the senior housing units would result in approximately 41 single-family detached housing units; resulting in 227 total dwelling units for the development area.
4.1 Trip Generation
The trip generation rates for the proposed developments were quantified using the 10th edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). Two land use codes were used:

- 210 – Single-Family Detached Housing
- 251 – Senior Adult Housing - Detached

The trip generation rates for the proposed developments are summarized in Table 3 and Table 4 for the five-year and ten-year horizons respectively. At full build-out in 2027, the proposed developments are expected to generate 160 trips in the AM peak hour (44 trips in/116 trips out) and 211 trips in the PM peak hour (137 trips in/74 trips out).

Table 3: Trip generation rates for the proposed developments included in the five-year horizon

<table>
<thead>
<tr>
<th>Property</th>
<th>Land Use</th>
<th>Units</th>
<th>AM Rate</th>
<th>AM Total</th>
<th>AM In</th>
<th>AM Out</th>
<th>PM Rate</th>
<th>PM Total</th>
<th>PM In</th>
<th>PM Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Power Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine Line Holdings/Eaglewood Estates</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>50</td>
<td>0.74</td>
<td>37</td>
<td>10</td>
<td>27</td>
<td>0.99</td>
<td>50</td>
<td>32</td>
<td>18</td>
</tr>
<tr>
<td>Caddigan Property (Phase 1)</td>
<td>ITE 251 - Senior Adult Housing - Detached</td>
<td>82</td>
<td>0.24</td>
<td>20</td>
<td>7</td>
<td>13</td>
<td>0.30</td>
<td>25</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>18</td>
<td>0.74</td>
<td>14</td>
<td>4</td>
<td>10</td>
<td>0.99</td>
<td>18</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>South of Power Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dobbin Property (Stage 1)</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>27</td>
<td>0.74</td>
<td>20</td>
<td>5</td>
<td>15</td>
<td>0.99</td>
<td>27</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Trips Generated at Full Build-Out</td>
<td></td>
<td>91</td>
<td>26</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Trip generation rates for the proposed developments included in the ten-year horizon

<table>
<thead>
<tr>
<th>Property</th>
<th>Land Use</th>
<th>Number</th>
<th>AM Rate</th>
<th>AM Total</th>
<th>AM In</th>
<th>AM Out</th>
<th>PM Rate</th>
<th>PM Total</th>
<th>PM In</th>
<th>PM Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Power Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caddigan Property (Phases 2 &amp; 3)</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>46</td>
<td>0.74</td>
<td>35</td>
<td>9</td>
<td>26</td>
<td>0.99</td>
<td>46</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>South of Power Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O'Brien &amp; Sylvester Properties</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>5</td>
<td>0.74</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>0.99</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Dobbin Property (Stage 2 &amp; 3)</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>40</td>
<td>0.74</td>
<td>30</td>
<td>8</td>
<td>22</td>
<td>0.99</td>
<td>40</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Trips Generated at Full Build-Out</td>
<td></td>
<td>69</td>
<td>18</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The development plan for the Caddigan property includes 82 senior adult housing units with a density of two units per acre. However, the zoning for the property allows for a maximum density of one unit per acre; the Town Council does not support an amendment to the zoning to reduce lot size and increase density in the area. Without the amendment, a revised development plan could include 41 one-acre lots (single-family housing) in place of the 82 senior adult housing units. Single-family housing has higher trip generation rates than senior adult housing, as a result the 41 single-family detached housing would generate more trips than 82 senior housing units (Table 5). The single-family housing would generate additional 11 in the AM peak hour (1 trip in/10 trips out) and 16 trips in the PM peak hour (10 trips in/6 trips out). The difference between the two development scenarios is considered negligible.

Table 5: Comparison of trip generation for single-family housing and senior adult housing

<table>
<thead>
<tr>
<th>Property</th>
<th>Land Use</th>
<th>Units</th>
<th>AM Rate</th>
<th>AM Total</th>
<th>AM In</th>
<th>AM Out</th>
<th>PM Rate</th>
<th>PM Total</th>
<th>PM In</th>
<th>PM Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caddigan Property (Phase 1)</td>
<td>ITE 210 - Single Family Detached Housing</td>
<td>41</td>
<td>0.74</td>
<td>31</td>
<td>8</td>
<td>23</td>
<td>0.99</td>
<td>41</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>ITE 251 - Senior Adult Housing - Detached</td>
<td>82</td>
<td>0.24</td>
<td>20</td>
<td>7</td>
<td>13</td>
<td>0.30</td>
<td>25</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Difference in Trips Generated at Full Build-Out</td>
<td></td>
<td>11</td>
<td>1</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Harbourside Transportation Consultants – Project No. 172055
4.2 Trip Distribution and Assignment

The St. John’s Regional PTV Visum models were used to distribute the projected development traffic onto the study area road network. PTV Visum is a macroscopic transportation planning modelling software used to model transportation networks and travel demand to forecast traffic flows.

In 2011, the City of St. John’s developed AM and PM peak hour regional models for traffic conditions in 2025. For the purposes of this study, the Visum models were updated and calibrated to reflect the existing and future road networks and travel patterns in the LBMCOC area. The four traffic analysis zones (TAZs) in the immediate area of the Town were examined in detail to ensure they were coded correctly and to ensure they were generating traffic properly. The road network and TAZs were adjusted as required. Details of the Visum model calibration can be found in Appendix C.

At this time, the Town has not approved a road network for the development area. For modelling purposes, a high-level future road network is required to assign and distribute future traffic volumes associated with new developments; therefore, the most recent road network proposed by developers (Figure 2) was used in the traffic analysis. While the road network in Figure 2 is not an approved road network and is subject to change, the distribution future traffic volumes is determined primarily by major roadways and the connections to the existing road network. Minor changes to the road network, such as changes to local roadways, removal of cul-de-sacs and changes to roadway alignment will not have an impact on the distribution of future traffic volumes.

The trip distribution and assignment in this study are based on the assumptions that the future road network in the development will include a north-south collector roadway and connections to the existing road network at: Sandalwood Drive, St. Francis Road, Clover Dale Close, Stick Pond Road and Skips Place. It was assumed that the north-south roadway through the Power Estate would not be constructed before the 5-year study horizon (2022), but that it would be constructed before the 10-year study horizon (2027).

The road network in the development area and four project zones were added to the model to reflect future development in the Town of LBMCOC. The new project zones listed below were coded using the ITE trip generation rates described in section 4.1.

- Zone 911 – North of Power Estate (0 to 5 year timeframe)
- Zone 912 – South of Power Estate (0 to 5 year timeframe)
- Zone 913 – North of Power Estate (5 to 10 year timeframe)
- Zone 914 – South of Power Estate (5 to 10 year timeframe)

The trips associated with each zone were distributed to the road network along defined multipoint assignments (MPAs). The MPAs were manually coded for each zone based on existing travel patterns and local knowledge of the study area. The “select zone analysis” feature of the software was used to obtain traffic volumes at intersections in the model that are associated with the specified zones. These volumes were then superimposed on the base volumes for each of the defined scenarios to produce design volumes. The traffic design volumes for each scenario can be found in Appendix D.
5.0 Intersection Performance Analysis

The performance of an intersection can be evaluated using a number of measures of effectiveness. Delay and level of service (LOS), volume-to-capacity ratio (v/c) and vehicle queuing are the primary measures of effectiveness used in traffic analyses.

Delay is defined in the Highway Capacity Manual as the additional travel time experienced by a motor vehicle, pedestrian or cyclist attributable to the presence of traffic control (unsignalized or signalized intersection) and conflicting traffic. Delay is used as the basis to calculate LOS, a qualitative measure used to describe operational conditions based on service measures such as freedom to maneuver, travel time, speed, and traffic interruptions. LOS is 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 level of service criteria for unsignalized (stop/yield controlled and roundabouts) and signalized intersections are described in Table 6.

Table 6: LOS Criteria Signalized and Unsignalized Intersections

<table>
<thead>
<tr>
<th>LOS</th>
<th>Level of Service (LOS) Description</th>
<th>Signalized Intersection Control Delay</th>
<th>Unsignalized Intersection Control Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Very low delay. Majority of through traffic on main street does not stop at all. <strong>(Excellent)</strong></td>
<td>≤ 10 sec/veh</td>
<td>≤ 10 sec/veh</td>
</tr>
<tr>
<td>B</td>
<td>Somewhat higher delay. More vehicles have to stop for red lights. <strong>(Very Good)</strong></td>
<td>10-20 sec/veh</td>
<td>10-15 sec/veh</td>
</tr>
<tr>
<td>C</td>
<td>Higher level of congestion and vehicles wait through more than one signal indication, occasionally backups may develop, however traffic flow is still stable and acceptable. <strong>(Good)</strong></td>
<td>20-35 sec/veh</td>
<td>15-25 sec/veh</td>
</tr>
<tr>
<td>D</td>
<td>Congestion is noticeable and delays may become extensive. Most cars have to wait more than one red light to pass. This threshold is the upper limit for design. <strong>(Satisfactory)</strong></td>
<td>35-55 sec/veh</td>
<td>25-35 sec/veh</td>
</tr>
<tr>
<td>E</td>
<td>Congested conditions. Traffic fills intersection capacity with long queues and delays. Many vehicles need to wait more than one green indication. The LOS is nearing capacity and is unsatisfactory. <strong>(Unsatisfactory)</strong></td>
<td>55-80 sec/veh</td>
<td>35-50 sec/veh</td>
</tr>
<tr>
<td>F</td>
<td>Very congested conditions. Traffic demand exceeds capacity of the intersection with very long queues and delays. The LOS is generally considered to be unacceptable. <strong>(Unacceptable)</strong></td>
<td>≥ 80 sec/veh</td>
<td>≥ 50 sec/veh</td>
</tr>
</tbody>
</table>

The volume-to-capacity ratio relates the estimated traffic volume (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.

Vehicle queuing at intersections is critical to the performance of the network. The 95th percentile queue length is typically used to determine if sufficient vehicle storage is available to maintain efficient traffic flow. The 95th percentile queue length is the length of queue which is exceeded only 5 percent of the time.

The Synchro Studio (Version 10) software package was used as the primary evaluation tool. Synchro, an analysis and optimization software package, was used to analyze network intersections based on the
methodology of the *Highway Capacity Manual* 6th edition (2016) published by the Transportation Research Board. SimTraffic, the micro-simulation component of the software package, was also used in the course of the analysis to check delay, illustrate and identify interactions between individual driver types and to illustrate the effects of adjacent or closely spaced intersections.

The combination of the two components within the software allows the analyst to review the intersections using two different approaches. The Synchro software models each intersection in isolation, while the SimTraffic software analyzes the network as a whole. SimTraffic will identify external influences on intersections such as spillbacks from upstream and/or downstream intersections include in the model. Synchro Studio was used to analyze signalized and unsignalized intersections (stop controlled).

The Junctions 8 ARCADY software was used to analyze roundabouts. ARCADY uses an empirical model based on the application of statistical regression of a large data set of observed roundabout operations in the United Kingdom. The tool is intended to aid designers in selecting the best geometry for a given location and traffic demand.

Three assessment scenarios were performed to quantify the impact of the future development on the Town’s road network, including:

- Scenario 1: Existing Conditions (2017)
- Scenario 2: Five-year Development Projection (2022)
- Scenario 3: Ten-year Development Projection (2027)

### 5.1 Scenario 1: Existing Conditions (2017)

Scenario 1 is an assessment of current operations in the study area. The traffic counts collected in 2017 and existing lane configurations were used to reflect existing conditions.

The Synchro level of service conditions for the AM and PM peak hours of Scenario 1 are shown in Figure 3. Results of the Synchro and SimTraffic analyses including LOS, average delay per vehicle, v/c ratio and 95th percentile queue lengths of each approach movement at the individual intersections are summarized in Tables provided in Appendix E. The detailed Synchro/SimTraffic reports can be found in Appendix F.

Results of the Synchro analysis show operational problems at two of the fourteen study intersections during the peak hours.

- **Logy Bay Road and Marine Drive/ORR On-Ramp:** The westbound movements (Marine Drive approach) operate at a LOS E during the AM peak hour. During the PM peak hour, the westbound movements operate at LOS F and experience on average over 1.5 minutes of delay per vehicle. The overall intersection operates at acceptable levels of service during both peak hours.

- **Logy Bay Road and Snow’s Lane:** The intersection operates at acceptable levels of service during the AM peak hour. During the PM peak hour, the eastbound movements (Snow’s Lane approach) operate at LOS F and experience on average over 1.0 minute of delay per vehicle. The overall intersection operates at an acceptable level of service during the PM peak hour. It should be noted that the SimTraffic analysis shows 95th percentile queue lengths in the PM peak hour that exceed the storage capability of the northbound left-turn lane on Logy Bay Road.

While the Synchro analysis show operational problems at some intersections, the results of the SimTraffic analysis show all study intersections operating at acceptable levels of service during both peak hours.
5.1.1 Traffic Signal Warrant Analysis

The Transportation Association of Canada's (TAC) developed the Canadian Traffic Signal Warrant Matrix Procedure in 2005 to provide a basis for making rational, defensible decisions on the installation of traffic signals. The matrix uses a "cumulative factors methodology" to evaluate vehicle to vehicle and vehicle to pedestrian interactions while considering local factors such as demographics and roadway characteristics. The procedure also incorporates collision prediction theory which anticipates the amount of collisions based on traffic volume and intersection geometry. However, it should be noted that some of the data required for this warrant procedure is subjective in nature, such as the intersection being located "near a school". The matrix provides a final score for the intersection, in order for traffic signals to be considered an intersection must score 100 priority points or more. A traffic signal installation would be deemed unwarranted if the scoring is less than 100 points.

The Traffic Signal Warrant Matrix was used to evaluate if traffic signals should be considered at any of the fourteen study intersections. The priority point results are listed below, none of the intersections warrant traffic signals. The traffic signal warrant analysis sheets can be found in Appendix G.

1. Marine Drive & Middle Cove Road = 3 points
2. Marine Drive & Outer Cove Road = 4 points
3. Marine Drive & Lower Road = 0 points
4. Outer Cove Road & Pine Line = 1 point
5. Pine Line & Sandalwood Drive = 0 points
6. Outer Cove Road & Big Meadow Drive = 1 point
7. Outer Cove Road & St. Francis Road = 1 point
8. Logy Bay Road & Outer Cove Road/Lower Road = 6 points
9. Logy Bay Road & Clover Dale Close = 0 points
10. Logy Bay Road & Cadigan’s Road = 25 points
11. Marine Drive & Cadigan’s Road = 2 points
12. Logy Bay Road & Snow’s Lane = 40 points
13. Snow’s Lane & Ashkay Drive = 2 points
14. Logy Bay Road & Marine Drive/ORR On-Ramp = 72 points

5.1.2 Left-turn Lane Warrants Analysis

Left-turning movements on two-way streets can cause both operational and safety problems. Operational problems occur when a left-turning vehicle is required to stop and wait for an opportunity to turn across heavy opposing traffic, creating a queue of stopped vehicles. Safety problems include rear end collisions when a left-turning vehicle is stopped or head-on or right-angle collisions when a left-turning vehicle is making its left turn. In some instances, a left-turn storage may be required to remove left-turning vehicles from the through traffic as they decelerate and wait to complete their maneuver.

The Ministry of Transportation of Ontario (MTO) developed a methodology published in the Geometric Design Standards for Ontario Highways Manual that uses a series nomographs to identify if a left-turn lane is warranted. The nomograph consider factors such as speed, advancing volumes, left-turn volume as a percentage of advancing volumes and opposing volumes. A left-turn lane warrants analysis was completed.
for each of the fourteen unsignalized intersections, warrant calculations can be found in Appendix H. Left-turn lanes are warranted at the following intersections:

- Logy Bay Road and Marine Drive/ORR On-Ramp: Left-turn lanes are warranted on Logy Bay Road in both the northbound and southbound directions. Left-turn lanes already exist in both directions and provided the minimum storage length required.
- Logy Bay Road and Snow’s Lane: A left-turn lane with a minimum storage length of 25 metres is warranted on the northbound approach of Logy Bay Road. While there is an existing left-turn lane, the lane only provides approximately 15 metres of storage length which is insufficient based on the volumes observed at the intersection.

5.1.3 Right-turn Lane Warrants Analysis

Right-turning movements on two-way streets can cause both operational and safety problems. Operational problems occur when a vehicle is required to slow down before making a right-turn. Safety problems include rear end collisions when a right-turning vehicle slows down. In some instances, a right-turn storage lane may be required to remove right-turning vehicles from the through traffic and allow them to decelerate.

The Ohio Department of Transportation (ODOT) methodology developed a methodology published in the *Transportation State Highways Access Management Manual* that uses a nomograph to identify if a right-turn lane is required. The nomograph considers factors such as speed, right-turns and advancing volumes. A right-turn lane warrants analysis was completed for each of the fourteen unsignalized intersections, warrant calculations can be found in Appendix H. Right-turn lanes are warranted at the following intersections:

- Logy Bay Road and Marine Drive/ORR On-Ramp: Right-turn lanes are warranted on Logy Bay Road in both the northbound and southbound directions.
- Logy Bay Road and Snow’s Lane: A right-turn lane is warranted on Logy Bay Road in the southbound direction.
- Logy Bay Road and Cadigan’s Road: A right-turn lane is warranted on Logy Bay Road in the northbound direction.
- Logy Bay Road and Outer Cove Road/Lower Road: A right-turn lane is warranted on Logy Bay Road in the northbound direction.
- Marine Drive and Outer Cove Road: A right-turn lane is warranted on Marine Drive in the westbound direction.
- Marine Drive and Middle Cove Road: A right-turn lane is warranted on Marine Drive in the eastbound direction.

While right-turn lanes are warranted at these intersections, there are no existing operational problems with any of these right-turn movements. Operations should be monitored and there right-turn lanes should be installed when required from an operational perspective or as opportunities arise. All right-turn lanes should be designed according to the TAC *Geometric Design Guide for Canadian Roads*.
5.2 Scenario 2: Five-year Development Projection (2022)

Scenario 2 is an assessment of future operations in the study area with background traffic growth to the year 2022 and the five-year development projection. The future road network included in this scenario does not include the roadway through the Power Estate. Without a connection between the north and south development areas in the five-year scenario, traffic patterns observed in the trip distribution show that future development traffic will primarily travel along St. Francis Road and Stick Pond Road to access Logy Bay Road. It should be noted that these two roadways are currently substandard, further discussion about these roadways is provided in section 6.0.

The Synchro level of service conditions for the AM and PM peak hours of Scenario 2 are shown in Figure 4. Results of the Synchro and SimTraffic analyses including LOS, average delay per vehicle, v/c ratio and 95th percentile queue lengths of each approach movement at the individual intersections are summarized in Tables provided in Appendix E. The detailed Synchro/SimTraffic reports can be found in Appendix F.

Results of the Synchro analysis show operational problems at three of the fourteen study intersections during the peak hours.

- **Logy Bay Road and Marine Drive/ORR On-Ramp**: The delay for the westbound movements (Marine Drive approach) deteriorates to LOS F during the AM peak hour. The westbound movements experience on average over 1.0 minute of delay per vehicle. During the PM peak hour, the westbound movements operate at LOS F and experience on average over 2.5 minutes of delay per vehicle. It should be noted that the volumes on the Marine Drive approach are approaching capacity. The overall intersection operates at acceptable levels of service during both peak hours.

- **Logy Bay Road and Snow's Lane**: The intersection operates at acceptable levels of service during the AM peak hour. During the PM peak hour, the eastbound movements (Snow's Lane approach) operate at LOS F and experience on average over 3.0 minutes of delay per vehicle. The overall intersection operates at LOS E during the PM peak hour. The SimTraffic analysis continues to show 95th percentile queue lengths in the PM peak hour that exceed the storage capability of the northbound left-turn lane on Logy Bay Road.

- **Logy Bay Road and Cadigan's Road/Stick Pond Road**: The delay for the westbound movements (Cadigan's Road approach) deteriorate to LOS E. The westbound movements experience on average over 40 seconds of delay per vehicle during the AM peak hour. The overall intersection operates at an acceptable level of service during the AM peak hour. The intersection operates at acceptable levels of service during the PM peak hour.

While the Synchro analysis show operational problems at some intersections, the results of the SimTraffic analysis show all study intersections operating at acceptable levels of service during both peak hours.
Figure 4: Scenario 2 Five-year Development Projection (2022) – Synchro level of service results
5.2.1 Traffic Signal Warrant Analysis

The traffic signal warrant matrix was used to evaluate if traffic signals should be considered for the three intersections experiencing poor levels of service under the future traffic volumes for the five-year development projection.

Future volumes for the six hours were estimated by expanding the AM and PM peak hour forecast proportionally to the peak hours observed in the traffic counts. For the midday peak hour, since design volumes are not included in this study, existing volumes were factored to represent background traffic growth.

The priority point results are listed below; none of the intersections warrant traffic signals under 2022 volumes. The traffic signal warrant analysis sheets can be found in Appendix G.

- Logy Bay Road & Marine Drive/ORR On-Ramp = 89 points
- Logy Bay Road & Snow’s Lane = 58 points
- Logy Bay Road & Cadigan’s Road = 37 points

5.2.2 Five-year Improvements

Results of the Scenario 2 Synchro analysis indicates that with the five-year development projection, poor levels of service will be observed at three intersections. The following improvements are proposed to improve traffic operations within the Town:

- **Logy Bay Road and Marine Drive/ORR On-Ramp:** Future traffic volumes based on background traffic growth and development projections indicate that the intersection will be close to reaching the threshold for traffic signals in 2022. While the overall volumes at the intersection are high, the total volumes on the Marine Drive approach are less than 60 vehicles during the peak hours.

  The Synchro analysis shows that the Marine Drive approach will experience high delays in both peak hours. The SimTraffic analysis, however, indicates that the approach will experience acceptable levels of delays during both peak hours. Typically, when the results of the two analyses are different, the SimTraffic results are considered to be more representative of the expected field conditions. The intersection should be monitored to ensure that the intersection operates at acceptable levels of service as is anticipated.

  As an interim improvement, a separate left-turn lane should be provided on the Marine Drive (westbound) approach. Separating the left-turn movement from the through and right-turn movements will improve delay for both the through and right-turn movements and increase capacity on the approach. Northbound and southbound right-turn lanes on Logy Bay Road could also be installed at this time.

- **Logy Bay Road and Snow’s Lane:** The intersection should be converted to a single-lane rural roundabout. Justification for the roundabout improvement is provided under section 7.0.

- **Logy Bay Road and Cadigan’s Road/Stick Pond Road:** A separate left-turn lane should be provided on the Cadigan’s Road (westbound) approach. Separating the left-turn movement from the through and right-turn movements will improve delay for both the through and right-turn movements. A northbound right-turn lane on Logy Bay Road could also be installed at this time.
The Scenario 2 analysis was run with the five-year improvements in place. The Synchro level of service conditions for the AM and PM peak hours of Scenario 2 with Improvements are shown in Figure 5. Results of the Synchro, SimTraffic and Arcady analyses including LOS, average delay per vehicle, v/c ratio and 95th percentile queue lengths of each approach movement at the individual intersections are summarized in Tables provided in Appendix E. The detailed Synchro/SimTraffic and Arcady reports can be found in Appendix F and Appendix I.

Results of the Synchro analysis show the following improvements during the peak hours at the three study intersections with improvements in place.

- **Logy Bay Road and Marine Drive/ORR On-Ramp:** The westbound (Marine Drive approach) through and right-turn movements improve to LOS A during the AM peak hour. The westbound left-turn movement continues to operate at LOS F and experiences on average over 1.0 minute of delay per vehicle. During the PM peak hour, the westbound through and right-turn movements improve to LOS C. The westbound left-turn movement continues to operate at LOS F and experiences on average over 1.5 minutes of delay per vehicle. The westbound movements are no longer near capacity during the PM peak hour. The overall intersection operates at acceptable levels of service during both peak hours.

- **Logy Bay Road and Snow’s Lane:** The intersection operates at acceptable levels of service during both peak hours.

- **Logy Bay Road and Cadigan’s Road/ Stick Pond Road:** The westbound (Cadigan’s Road approach) through and right-turn movements improve to LOS B during the AM peak hour. The westbound left-turn movement continues to operate at LOS E and experiences on average over 40 seconds of delay per vehicle. The overall intersection operates at an acceptable level of service during the AM peak hour. The intersection operates at acceptable levels of service during the PM peak hour.

While the Synchro analysis show operational problems at some intersections, the results of the SimTraffic analysis show all study intersections operating at acceptable levels of service during both peak hours.
Figure 5: Scenario 2 Five-year Development Projection with Improvements (2022) - Synchro level of service
5.3 Scenario 3: Ten-year Development Projection (2027)

Scenario 3 is an assessment of future operations in the study area with background traffic growth to the year 2027 and the ten-year development projection. The road network in this scenario reflects the five-year improvements discussed in section 5.2.1 and includes the roadway connection through the Power Estate. With the connection between the north and south development areas in the ten-year scenario, traffic patterns observed in the trip distribution show that future development traffic will primarily travel along the connector roadway to the intersections of Logy Bay Road and Clover Dale Close and Logy Bay Road and Stick Pond Road/Cadigan’s Road. It should be noted that this scenario does not account for the potential redistribution of existing traffic in the northern development area along the connector roadway.

The Synchro level of service conditions for the AM and PM peak hours of Scenario 3 are shown in Figure 6. Results of the Synchro, SimTraffic and Arcady analyses including LOS, average delay per vehicle, v/c ratio and 95th percentile queue lengths of each approach movement at the individual intersections are summarized in Tables provided in Appendix E. The detailed Synchro/SimTraffic and Arcady reports can be found in Appendix F and Appendix I.

Results of the analysis show operational problems at two of the fourteen study intersections during the peak hours.

- **Logy Bay Road and Marine Drive/ORR On-Ramp:** The westbound (Marine Drive approach) left-turn movement operates at LOS F and experiences on average over 1.5 minutes of delay per vehicle during the AM peak hour. During the PM peak hour, the westbound left-turn movement operates at LOS F and experiences on average over 3.0 minutes of delay per vehicle. The overall intersection operates at acceptable levels of service during both peak hours. It should be noted that SimTraffic results show the westbound left-turn movement operating at LOS E during the PM peak hour. All other movements operate at acceptable levels of service in SimTraffic during both peak hours.

- **Logy Bay Road and Cadigan’s Road/ Stick Pond Road:** The westbound (Cadigan’s Road approach) left-turn movement deteriorates to LOS F and experiences on average over 3.0 minutes of delay per vehicle during the AM peak hour. The westbound left-turn movement is over capacity. The westbound left-turn movement deteriorates to LOS F and experiences on average over 1.0 minute of delay per vehicle during the PM peak hour. The overall intersection operates at acceptable levels of service during both peak hours. It should be noted that SimTraffic results show the eastbound (Stick Pond Road approach) left-turn movement operating at LOS E during the AM peak hour. All other movements operate at acceptable levels of service in SimTraffic during both peak hours.

While the Synchro analysis show operational problems at some intersections, the results of the SimTraffic analysis show all other study intersections operating at acceptable levels of service during both peak hours.
5.3.1 Traffic Signal Warrant Analysis

The traffic signal warrant matrix was used to evaluate if traffic signals should be considered for the three intersections experiencing poor levels of service under the future traffic volumes for the five-year development projection. Future volumes for the six hours were based on expanding the AM and PM peak hour forecast proportionally to the peak hours observed in the traffic counts. For the midday peak hour, since design volumes are not included in this study, existing volumes were factored to represent background traffic growth.

The priority point results are listed below, the intersection of Logy Bay Road and Marine Drive/ORR On-Ramp warrants traffic signals under 2027 volumes. The traffic signal warrant analysis sheets can be found in Appendix G.

- Logy Bay Road & Marine Drive/ORR On-Ramp = 101 points
- Logy Bay Road & Snow’s Lane = 69 points
- Logy Bay Road & Cadigan’s Road = 46 points

5.3.2 Ten-year Improvements

Results of the Scenario 3 analysis indicates that with the ten-year development projection poor levels of service will be observed at two intersections. The following improvements are proposed to improve traffic operations within the Town:

- **Logy Bay Road and Marine Drive/ORR On-Ramp**: Future traffic volumes based on background traffic growth and development projections indicate that the intersection will reach the threshold for traffic signals in 2027. While the overall volumes at the intersection are high, the volumes on the Marine Drive approach are still less than 60 vehicles during the peak hours.

  As previously indicated, based on the SimTraffic analysis it is unlikely that high delays will materialize. The left-turn movement on Marine Drive may begin to experience some longer delays, however, due to the small proportion of left-turn volumes this does not justify installing a traffic signal.

  The intersection should continue be monitored to ensure that the intersection operates at acceptable levels of service as is anticipated. If high delays are observed, then conversations must occur with the Provincial Government and/or the City of St. John’s to discuss any future improvements to the intersection. The intersection should not be signalized without giving consideration to signalizing the intersection of Logy Bay Road and ORR Off-Ramp, located approximately 200 m to the south in the City of St. John’s. The interactions between the two intersections should be assessed.

- **Logy Bay Road and Cadigan’s Road/Stick Pond Road**: A separate left-turn lane should be provided on the Stick Pond Road (eastbound) approach. Separating the left-turn movement from the through and right-turn movements will improve delay for both the through and right-turn movements.
6.0 Road Network Review

The proposed road network for the study area was reviewed to ensure that a safe, efficient and well-connected road network is achieved throughout the Town. The primary routes entering/exiting the Town are:

- Logy Bay Road from the City of St. John’s to the South
- Marine Drive from the Town of Torbay to the North
- Snow’s Lane from the City of St. John’s to the West
- Pine Line from the Town of Torbay to the West
- Middle Cove Road from the Town of Torbay to the West

The existing road network in the Town has, for the most part, evolved in an unplanned manner following established travel paths and property lines as the town developed and grew in response to individual subdivision development applications without a general transportation plan. The Town’s Municipal Plan classifies Logy Bay Road as a Collector Road intended to collect traffic from or distribute traffic to local roads. Direct access to abutting properties is permitted in accordance with the Town’s standards. Marine Lab Road and Marine Drive are classified as Scenic Roads. These roads are intended primarily to be scenic routes. Direct access to the abutting land is permitted in accordance with the Town’s standards. The Municipal Plan indicates that Council shall continue to seek the cooperation of the Department of Transportation to develop roadside parking areas in conjunction with development of the proposed scenic outlooks. All remaining roads within the Town are currently classified as Local Roads, the primary purpose of which are to provide direct access is permitted to abutting properties.

An updated road classification system is proposed in Section 6.4. It is important that consistency be maintained throughout the Town’s documentation (i.e. Municipal Plan, Development Regulations, Development Standards, etc.).

6.1 Review of Road Network Concept Plans in the Development Area

The Town is taking a proactive approach to planning for future development and has at times considered various plans for the future road network in the development area. While the Town has not approved a road network for the development area, at least three different conceptual plans for a proposed road layout have been shown in various documents. These include:

- The road network concept plan produced by Pinnacle Engineering Limited showing the developments planned for the development area. The plan is a proposal by the developers and has not been approved by Council. The road network concept plan for the development area is referenced as P1; this road network also corresponds to the road network shown in Figure 2.

- A future land use map that had been included in the Town’s Municipal Plan Amendment No. 17 and Development Regulations Zoning Amendment No. 23 but has since been withdrawn. The road network concept plan for the development area include in the land use map is referenced as P2.

- The road network concept shown in the Grand Concourse Authority’s (GCA) Trail Development Plan for the Town. The draft plan is a proposal by the GCA and has not been approved by Council. The road network concept plan for the development area is referenced as P3.
All three plans, shown in Appendix I, have some components in common and some components that vary. All the three plans will present the same outcomes with respect to trip distribution and assignment of future traffic volumes on the existing roadways — Logy Bay Road, Outer Cove Road, Pine Line and Snow’s Lane.

The P1 concept plan shows connections to Skip’s Place, Stick Pond Road/Clovelly Lane, Cloverdale Close, St. Francis Road, Killick Drive, Middle Ledge Drive and Pine Line. Alternatively, the P2 plan shows connections to Power’s Lane and a new street just south of Cloverdale Close. The P1 plan also shows the extension of Sandalwood Drive, Middle Ledge Drive and a new street just south of Middle Ledge Drive to be cul-de-sacs, while the P2 plan shows these three streets to be interconnected with no cul-de-sac treatment on either street. The P3 plan includes elements of both plans P1 and P2.

As previously discussed, the road network presented in the P1 concept plan was used for modelling purposes as it was the most recently prepared/up to date plan. Again, it is stressed that the differences between the proposed street layouts results in no overall difference in the modelling outcomes with respect to traffic volumes and patterns on the existing street network. Either scenario could have been used. It is also acknowledged that the Town has not selected or approved a final or definitive street layout at this point in time. The traffic volumes anticipated to result from the development of the study area were discussed in detail in Section 4.0. Generally, the volumes are light enough such that the Town can consider a number of different alternatives with respect to the proposed street network and associated connections to existing streets without significant variations in the associated impacts.

6.2 Proposed Road Network for the Development Area

The internal road network within the development area should be configured in such a manner as to reflect the best interests of the Town. Specifically, the road network must be safe, and it should reflect efficiencies for operations such as garbage collections, snow clearing and ice control. It should also be configured in such a manner as to reduce traffic volumes through the St. Francis School Zone on Logy Bay Road.

To address these issues, modifications were made to the proposed road network for the development area. The alternative road network shown in Figure 7 is proposed for approval by the Town. The proposed road network configuration incorporates some of the features shown in plans P1-P3, but addresses a number of important considerations for including:

- **North-South Collector Roadway**: The road network shown in plan P1 was developed to maximize the number of lots that can be developed on the various parcels of land in the development area. As such the main route travelling north-south is not continuous. The proposed road network in Figure 7 has been modified to ensure that the main collector roadway, referenced as Road 1, extends from Pine Line in a southerly direction to connect with Logy Bay Road. When constructed in the 10-year horizon, this roadway will provide good access to and from the development area; connecting the proposed developments south of the Power Estate and those north of the Power Estate. When completed, this roadway will become an attractive route, a roundabout is suggested midway along the route to control vehicle speeds. It is also noted that this street will require two stream crossings.

- **Impact on School Zone**: The north-south collector roadway (Road 1) will likely not be completed until the 10-year horizon; until its completion, all new development traffic north of the Power Estate travelling to/from Logy Bay Road will be required to travel on Outer Cove Road and through
the St. Francis school zone. During the AM peak hour, the development will add approximately 60 vehicles to the existing two-way traffic volumes in the school zone (approximately 350 vehicles per hour), representing a 17 percent increase. The completion of Road 1 will eliminate the need for motorists to travel on Outer Cove Road during their normal commutes to and from work in St. John’s and significantly reduce traffic volumes through the school zone. If both the 5 and 10-year developments are allowed to proceed without Road 1, the traffic volumes in the school zone would experience a total increase of approximately 100 vehicles per hour during the AM peak hour.

- **Cul-de-sacs:** The road networks shown in plans P1-P3 have all incorporated a number of different cul-de-sacs. Cul-de-sacs are generally preferred from a residential/real estate perspective. They are viewed as being safer or more ‘family friendly’ as there is no through traffic and lots in the bulb are generally bigger which allow for larger yards. Connected roadways are generally preferable from a pedestrian/cycling point of view and from an emergency services and public transportation point of view (bus routes, ease of access, etc.). Some municipalities also prefer connectivity to benefit snow clearing and garbage collection operations. For snow clearing, cul-de-sacs often represent additional time and expense for municipalities due to the nature of clearing the bulb. For garbage collection, both sides of the roadway have to be serviced in any case and there is little difference in route planning/efficiency. The acceptance of cul-de-sacs as they relate to development is generally a Municipal preference. The Town’s Municipal Engineering Residential Subdivision Standards indicate that “cul-de-sacs are restricted and used only where land access is not possible by through streets. The use of a cul-de-sac shall be approved by the Town”. The road network shown in plan P1 utilizes cul-de-sacs at the end of Sandalwood Drive, Middle Ledge Drive and a new roadway just south of Middle Ledge Drive. The proposed road network in Figure 7 eliminates these the cul-de-sac bulbs and connects these roadways through roadways 14 and 15; this will result in some operational efficiencies and would be preferable from an access and municipal and emergency services point of view.

- **Secondary Connection to Pine Line:** All concept plans show a secondary connection between Sandalwood Drive and Pine Line. As indicated by the traffic analysis, a secondary connection to Pine Line is not required from a traffic volume perspective. However, from a connectivity and municipal service perspective, this secondary connection is desirable. The proposed connection will align with the principle of having a linear corridor that continues in a north-south direction throughout the development area; from the Pine Line to Logy Bay Road. It is noted that any roadway connection between Sandalwood and Pine Line will require a properly designed stream crossing. There have been preliminary discussions regarding a new SIRFD fire station in the east end of the City of St. John’s, a potential location for the station is Torbay Road. While emergency services currently enter the Town from its southern boundary, if a new fire station was located on Torbay Road, the secondary connection to Pine Line could potentially have a significant impact on emergency response times.

- **Connections to Substandard Roadways:** The proposed road network in the development area will connect to a number of existing roadways, some of which are considered substandard, including:
  - **St. Francis Road:** The road network in the development area will connect to St. Francis Road. St. Francis Road will be an attractive route for traffic in the 5-year study horizon and this will remain the case until the proposed collector roadway (Road 1) is completed to Logy...
Bay Road. St. Francis Road should be considered for future upgrading. TAC recommends a minimum lane width of 3.5m for a rural street cross section; it is recommended that the Town adopt a 7.0m wide asphalt cross section for future development and upgrades. A minimum 1.2m wide shoulder on at least one side of St. Francis Road would improve the walkability of this street for pedestrians. More discussion regarding cross sections is provided in Section 0.

- **Stick Pond Road:** The road network in the development area will connect to St. Francis Road. In plans P1-P3, Stick Pond Road is shown as one of the main connections from the development area to Logy Bay Road. The proposed road network in Figure 7 includes Road 1 as the direct connection to Logy Bay Road, as a result, Stick Pond Road (Road 3) will take on a lesser role in terms of managing traffic; non the less the alignment of Stick Pond Brook should be straightened and the roadway should be upgraded to TAC standards. This should be completed as condition of the development approval; a roadway width of 7.0m should be considered with a 1.2m wide walkable shoulder.

- **Power’s Lane:** While not shown on plan P1 a connection to, or extension of, Power’s Lane is likely at some point in the future (Road 9). If/when this does occur, Power’s Lane will require upgrading. This should be completed as condition of the development approval; a roadway width of 7.0m should be considered with a 1.2m wide walkable shoulder. This will also require upgrading of the existing stream crossing on Power’s Lane.

- **Minor Connections:** There are a number of minor roadway connections that have been shown in plans P1-P3 which have also been included in the proposed road network in Figure 7. Connections to existing cul-de-sacs including one to Skip’s Place via Road 8 and one to Clover Dale Close via Road 2 are optional and not required from a technical perspective. If the Town would like to have these cul-de-sacs removed for reasons noted previous in bullet 2 then the option is there to do so under the road configuration noted in Figure 7.

- **Secondary Connection to St. John’s:** Consideration was given to an additional roadway connection between the Town and the City of St. John’s through the municipal boundary along the west side of the study area. Such a connection is not required from a traffic perspective and would likely be undesirable for existing residents in both municipalities as it could potentially attract traffic that would otherwise use Snow’s Lane to travel to/from the Stavanger Drive commercial area. However, a proposed connection should still be considered in the planning process should it be required to improve emergency vehicle access or planned trail connectivity in the area. There have been preliminary discussions regarding a new SJRFD fire station in the east end of the City of St. John’s, a potential location for the station is Torbay Road. The secondary connection to St. John’s could potentially have a significant impact on emergency response times if the new fire station was located in the Stavanger Drive area. Careful consideration should be given to traffic calming measures in the design of this roadway connection to minimize the potential for shortcutting through residential neighborhoods.

- **Snow’s Lane:** Snow’s Lane requires upgrades which are further addressed in Section 7.0.
Figure 7: Alternative Road Network - Development Area
At this point, the Town has the option of establishing a ‘set’ road network or establishing a more general conceptual road network and leaving the option for some changes to be proposed by prospective developers. Policies 13 (Residential Subdivisions) and 14 (Area Concept Plans) in Section 4.4.1 - Specific Land Use Policies – Residential of the Town’s Municipal Plan, specifically address the Town’s expectations of developers in this regard and can generally be adhered to in developing a ‘final’ development plan for the study area.

From a traffic volume perspective, it has been determined that traffic can be accommodated for the full build-out of the area without many significant impacts on the existing network. Whatever route the Town decides to take with respect to establishing a set road network or a more flexible conceptual network, it is important that one plan be reflected in all of the Town’s documents and that plan respect the principles of the road network proposed in Figure 7.

6.3 Cross Sections

Standard cross sections were prepared for local and collector roadways, the cross sections were developed based on the TAC Geometric Design Guide for Canadian Roads.

The typical cross sections for a local roadway are shown in Figure 8. The cross section for a two-lane local roadway includes a 3.5m travel lane in each direction and 1.0m shoulders on each side with 4 to 1 slopes. The cross section for a two-lane local roadway with an exclusive left turn lane includes a 3.5m through travel lane in each direction, a 3.0m left turn lane and 1.0m shoulders on each side with 4 to 1 slopes.

The Town has indicated the desire to remain rural in nature and create a system of off-road active transportation trails rather than install sidewalks. In areas where it may be difficult to incorporate trails, walkable shoulders should be implemented as an alternative to sidewalks and trails on local roadways. The typical cross section for a two-lane local roadway with a walkable shoulder is shown in Figure 9. The cross section includes a 2.2m shoulder on one side and a 1.0m shoulder on the other side, both with 4 to 1 slopes. The 2.2m shoulder provides a 1.2m walkable shoulder, the minimum width required to accommodate a single pedestrian, and a 1.0m of buffer space to the edge of the travel lane.

The typical cross sections for a collector roadway are shown in Figure 10. The cross section for a two-lane collector roadway includes a 3.5m travel lane in each direction and 1.0m shoulders on each side with 3 to 1 slopes. The cross section for a two-lane collector roadway with an exclusive left turn lane includes a 3.5m through travel lane in each direction, a 3.0m left turn lane and 1.0m shoulders on each side with 3 to 1 slopes. To accommodate active transportation users along collector roads, where possible off-road trails should be used rather than walkable shoulders to provide separation from roadways with higher volumes and/or speeds. The cross sections include a 3.0m active transportation trail on one side of the roadway.
Figure 8: Typical cross sections for a local roadway

Figure 9: Typical cross sections for a local roadway with a walkable shoulder
Figure 10: Typical cross sections for a collector roadway with an active transportation trail

6.4 Roadway Classification System

The Town’s municipal plan outlines a roadway classification system that includes local roads, collector roads and scenic roads. Logy Bay Road is identified as the only collector road, Marine Drive and Marine Lab Road are classified as scenic roads and all other roadways are local roads.

The existing classification system does not align with TAC’s guidelines for roadways classifications outlined in the Geometric Design Guide for Canadian Roads. The roadway classification system was updated to reflect TAC’s rural road classification system. The classification system classifies rural roadways into four categories:

- Freeways – A freeway is a major highway with controlled access.
- Arterial Roadways - The primary function of an arterial roadway is to move traffic within the road network system.
- Collector Roadways - Roadways classified as collector roadways are designed and intended to provide access to adjacent properties that are balanced by the need to collect and distribute traffic travelling to and from a neighbourhood.
- Local Roadways - The primary function of a local roadway is to provide access to adjacent properties. Local residential streets are not intended for use as through traffic routes.
The roadway characteristics utilized in the TAC’s rural road classification system were compiled for all roadways in the Town of LBMCOC. Detailed information for individual roadways can be found in Appendix K. Characteristics for each roadway include:

- Traffic service function
- Land service/access
- Traffic volumes (select locations only)
- Flow characteristic
- Date of traffic count (select locations only)
- 85th percentile speed (select locations only)
- Speed limit (The NL Highway Traffic Act states that if not otherwise posted, the speed limit is of 50 km/hr on through settlements and 80km/hr on paved highways)
- Accommodation of cyclists
- Accommodation of pedestrians
- Parking
- Right-of-way (not populated)
- Owner

Using these characteristics, each roadway within the Town was reviewed and classified according to TAC’s rural road classification system. The recommended roadway classification for the Town is provided in Table 7. It should be noted that there are no roadways classified as freeways or arterial roadways within the Town’s boundary. Six roadways were identified as collector roadways based on daily traffic volumes and their function within the road network. In addition, the proposed north-south roadway through the development area (Road 1 in Figure 7) should be classified as a collector roadway when constructed.

A roadway classification map depicting the classification was prepared; the full-size map can be found in Appendix K.

<table>
<thead>
<tr>
<th>Freeways</th>
<th>Arterial Roadways</th>
<th>Collector Roadways</th>
<th>Local Roadways</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>Cadigan’s Road</td>
<td>All other roadways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Logy Bay Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle Cove Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outer Cove Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snow’s Lane</td>
<td></td>
</tr>
</tbody>
</table>

6.5 Emergency Response Times

The SJRFD response times to all areas of the Town were modelled for existing traffic conditions and the ten-year planning horizon with the proposed road network in place. The SJRFD indicated that the current response time from Kent’s Pond Station No. 6 to the Town boundary on Logy Bay Road is 4 minutes and 33 seconds (based on NFPA 1710).

The version of the St. John’s Regional PTV Visum models updated and calibrated for the Town of LBMCOC were used to establish travel times from the Town boundary on Logy Bay Road. Isochrones maps were
developed showing the constrained travel times from the point of entry in color coded increments of two minutes. The constrained travel time is based on congestion conditions observed using the model’s peak hour volumes.

The travel time for the AM and PM peak hours of existing traffic conditions are displayed in Figure 11. All areas of the Town can be accessed from the Town boundary on Logy Bay Road in ten minutes or less. An additional 4 minutes and 33 seconds of response time from the station to the Town boundary must be added to the maps’ response time to obtain total response time from the station.

The travel times for the AM and PM peak hours of future traffic conditions (ten-year horizon) with the proposed road network are displayed in Figure 12. All areas of the Town will still be accessible from the Town boundary on Logy Bay Road in ten minutes or less. An additional 4 minutes and 33 seconds of response time from the station to the Town boundary must be added to the maps’ response time to obtain total response time from the station. With the north-south collector road through the Power Estate, all areas of the proposed road network are accessible from the Town boundary on Logy Bay Road within eight minutes.

The SJRFD indicated that there are have been preliminary discussions regarding a new fire station in the east end of the City of St. John’s, which will likely be located closer to the Town. There are currently no confirmed plans with respect to the location and or probable construction date. Some areas which have been preliminarily considered as possible locations include Snow’s Lane, the Aberdeen Avenue Extension Area, Hebron Way Area and Torbay Road. It is unlikely that a new station, if approved, would be constructed within the next 5 years. It is recommended, that the Town maintain close contact with the SJRFD in this regard to ensure that the new location is in the mutual best interests of both the SJRFD and the Town.
Figure 11: Travel times from the Town boundary on Logy Bay Road under existing traffic conditions.
Figure 12: Travel times from the Town boundary on Logy Bay Road under future traffic conditions
7.0 Snow’s Lane Traffic and Safety Assessment

A detailed traffic and safety assessment was completed for Snow’s Lane. A site visit was performed to observe existing conditions and collect field data including pavement markings, signage, lane widths and sight distance measurements.

7.1 Existing Traffic Operations

The average daily traffic on Snow’s Lane is approximately 3721 vehicles based on a 24-hour counting period. According to the roadway classification exercise described in section 6.4, Snow’s Lane classifies as a collector roadway. A collector roadway is designed and intended to provide access to adjacent properties and collect and distribute traffic travelling to and from neighborhoods.

Snow’s Lane has one travel lane in each direction and is posted to a speed limit of 50 km/h. The 85\text{th} percentile speed on Snow’s Lane, measured over a 24-hour period, was 56 km/h.

Results of the intersection performance analysis show operational problems at the intersection of Logy Bay Road and Snow’s Lane during the PM peak hour. Vehicles on Snow’s Lane experience poor levels of service and queues for the northbound left-turn on Logy Bay Road exceed the storage capacity of the left-turn lane.

There are no existing operational problems at the intersection of Snow’s Lane and Ashkay Drive. Operations at the intersection of Stavanger Drive and Snow’s Lane, located in the City of St. John’s, were not analyzed.

7.1.1 Safety Assessment

**Pavement markings**: Pavement markings include a yellow centerline and white edge lines on the St. John’s portion of Snow’s Lane, and yellow centerline only on the LBMCOC portion. The centerline pavement marking on the LBMCOC portion, shown in Figure 13, were clearly visible in late August but completely faded by the end of the following February. It should be noted that at that time, both the centerline and edge line markings were still visible on the St. John’s portion of Snow’s Lane.

![Figure 13: Pavement markings on Snow’s Lane at the Town Boundary](image-url)
**Signage:** Existing signage along Snow’s Lane is minimal and only includes stop signs on minor streets, trucking restrictions and speed limit signage. The level of signage is adequate for the roadway.

**Lane widths:** Snow’s Lane has a cross section width of 6.0 m with a 3.0 m travel lane in each direction.

**Pedestrian facilities:** There are no existing pedestrian facilities on Snow’s Lane. Pedestrians and cyclists are required to use the road or gravel shoulders which range from widths of 0-1.5 m with trees and utility poles located within 2.0 m of the edge of asphalt (Figure 14). The narrow width of the travel lanes forces vehicles to stop if a pedestrian or cyclist is travelling along the edge of asphalt when a vehicle is also approaching from the opposite directions. There is insufficient width to allow two vehicles to maneuver around the pedestrian or cyclist.

![Varying shoulder width and condition on Snow’s Lane](image)

**Figure 14:** Varying shoulder width and condition on Snow’s Lane

**Intersection sight distance:** There is limited sight distance on Snow’s Lane looking to the left on Logy Bay Road at the intersection of Logy Bay Road and Snow’s Lane.

**Driveway visibility:** The driveway at civic address #65 has poor visibility as shown in Figure 15. While civic address #65 is located in St. John’s, trees in both St. John’s and the Town restrict visibility at the driveway.

**Lighting:** The lighting provided along Snow’s Lane appears to be adequate, lights are provided on at least every four poles.
Figure 15: Sight distance from the driveway at civic address #65

**Asphalt condition:** The asphalt on Snow's Lane is in poor condition (Figure 16), a number of flexible pavement surface distress types were observed including fatigue cracking, longitudinal cracking and potholes.

Figure 16: Asphalt condition on Snow’s Lane

Figure 17 shows an aerial view of the existing conditions along the entire length of Snow’s Lane. A full-size drawing can be found in Appendix L.
Figure 17: Plan view of existing signage and pavement markings on Snow's Lane
7.2 Snow's Lane Improvements

7.2.1 Logy Bay Road and Snow's Lane Intersection Improvements

The intersection of Logy Bay Road and Snow's Lane currently operates as a unsignalized intersection with minor street (Snow's Lane) stop control. At the intersection, Logy Bay Road has one travel lane in each direction and is posted to a speed limit of 50 km/h. There is a substandard left-turn lane on the northbound approach — the lane is less than 3 metres wide and only 15 metres long (storage capacity of approximately two vehicles). Under existing conditions during the PM peak hour, vehicles on Snow's Lane experience poor levels of service and queues for the northbound left-turn on Logy Bay Road exceed the storage capacity of the left-turn lane.

A review of improvement options was completed for the intersection of Logy Bay Road and Snow's Lane. The review evaluated five improvement options for the intersection under existing and future traffic volumes. The improvement options included:

- Option 1A – Unsignalized Intersection (Status Quo)
- Option 1B – Unsignalized Intersection with Lane Improvements
- Option 2 – 3-way Stop Controlled Intersection
- Option 3 – Signalized Intersection
- Option 4 – Rural Single-Lane Roundabout

It should be noted that as per the Town’s request, the review of future operations at the intersection of Logy Bay Road and Snow's Lane was completed prior to the development of the future scenarios based on development projections (Scenario 2 and Scenario 3). As a result, the existing traffic volumes were factored by 25 percent to represent background growth and development in the Town for the purpose of evaluating intersection improvements.

A summary of the review of improvement options and the recommendation is provided below. The detailed report Logy Bay Road & Snow's Lane Intersection – Improvement Options can be found in Appendix M; the report includes analysis results, conceptual drawings and cost estimates.

**Option 1A – Unsignalized Intersection (Status Quo):** Under existing conditions, the intersection operates at acceptable levels of service during the AM peak hour. During the PM peak hour, the left and right turn movement on Snow's Lane operate at LOS F and experience on average over 1 minute of delay per vehicle. The overall intersection operates at an acceptable level of service during the PM peak hour.

Under future conditions, the intersection continues to operate at an acceptable of service during the AM peak hour. During the PM peak hour, the conditions on Snow's Lane deteriorate to an average of over 6 minutes of delay per vehicle and the movements are over capacity. The overall intersection operates at LOS F.

**Option 1B – Unsignalized Intersection with Lane Improvements:** The unsignalized intersection was modelled with the following lane improvements:

- Upgrade the northbound left turn lane on Logy Bay Road to provide 25 metres of storage and appropriate deceleration distance,
- New southbound right turn deceleration lane of 35 metres on Logy Bay Road, and
• New eastbound left-turn lane on Snow’s Lane to provide 70 metres of storage space and appropriate deceleration distance.

Under existing conditions, the intersection operates at acceptable levels of service during the AM peak hour. The lane improvements reduce the overall delay at the intersection by one second.

During the PM peak hour, the lane improvements improve delay for the right-turn movement on Snow’s Lane. The left turn movement on Snow’s Lane continues to operates at LOS F, experiencing approximately 1 minute of delay, similar to conditions without improvements. The overall intersection operates at an acceptable level of service during the PM peak hour.

Under future conditions, the intersection operates at acceptable levels of service during the AM peak hour. The level of service at the southbound approach is improved from LOS D to LOS C. During the PM peak hour, the left turn movement on Snow’s Lane operates at LOS F experiencing on average over 4.5 minutes of delay per vehicle and the movement is over capacity. The overall intersection operates at an acceptable level of service during the PM peak hour.

Overall, the addition of auxiliary lanes to the unsignalized intersection under Option 1B does not have a significant impact on operations.

**Option 2 – 3-way Stop Controlled Intersection:** The all-way stop control warrants analysis outlined in the TAC Manual of Uniform Traffic Control Devices (MUTCD) was completed for the intersection to determine if all-way stop control should be provided at the intersection. Based on the TAC criteria, the intersection of Logy Bay Road and Snow’s Lane does not warrant all-way stop control. Providing a 3-way stop at the intersection would cause unnecessary delay on Logy Bay Road and worsen the overall operations at the intersection.

**Option 3 – Signalized Intersection:** TAC’s Traffic Signal Warrant Matrix was used to evaluate if traffic signals should be considered for the intersection of Logy Bay Road and Snow’s Lane. The intersection scored 40 points using existing traffic volumes and 64 points under the future traffic volumes; therefore, the intersection does not warrant traffic signals even though poor levels of service are observed on Snow’s Lane.

When warranted, traffic signals can improve safety and operations at intersections. However, in instances where they are not warranted they have been shown to create problems. Unwarranted signals typically increase delay on the major street (Logy Bay Road) and the frequency of rear end collisions.

**Option 4 – Rural Single-Lane Roundabout:** The roundabout operates at acceptable levels of service during both peak hours under existing and future conditions. It should be noted that based on the conceptual drawings, the roundabout option requires 60 percent more land acquisition than the lane improvement option.

The results of the analysis show that the lane improvement option does not significantly improve operations at intersection under both existing and future conditions and that all-way stop control and traffic signals are not warranted. The roundabout option significantly reduces delay under existing conditions and continues to be efficient under future conditions.
In addition, roundabouts provide significant safety benefits, reduce vehicle emissions and require little to no maintenance. If the societal costs associated with injuries, fatalities and property damage were considered, the roundabout would certainly be the preferred means of traffic control at this intersection.

7.2.2 Safety Improvements

Pavement markings: A yellow centerline, white edge lines and a stop bar on Ashkay Drive should be installed as shown in Figure 18. The appropriate roundabout pavement markings should be installed at the intersection of Logy Bay Road and Snow’s Lane.

Signage: No improvements are required.

Lane widths: The TAC Geometric Design Guide for Canadian Roads recommends a minimum lane width of 3.5 m for rural roadways with daily volumes greater than 450 vehicles and a speed limit of 50 km/h. Snow’s lane should be widened to accommodate a 3.5 m lane in each direction.

A minimum of 1.2 m wide shoulders should be provided on both sides of the road and maintained for the entire length of the road. Trees alongside of the roadway should be cleared to provide adequate lateral sight distance at the horizontal curve in the vicinity of civic address #41.

Pedestrian safety: The high traffic volumes and speeds observed on Snow’s Lane combined with the narrow cross-section and lack of pedestrian facilities or shoulders create an environment that can perceived as unsafe to pedestrians and cyclists. The Town has indicated the desire to remain rural in nature and not install sidewalks on their roadways but rather create a system of off-road active transportation trails. Since the limited right-of-way along Snow’s Lane makes it challenging to incorporate an active transportation trail, the Town should ensure that a consistent shoulder width of minimum 1.2 m is provided along Snow’s Lane. Pedestrians and cyclists will then be able to travel along the shoulder rather than within the travel lane.

Intersection sight distance: The proposed roundabout will resolve the sight distance issue at the intersection of Logy Bay Road and Snow’s Lane.

Driveway visibility: The trees within the sight triangles on either side of the driveway at civic address #65 should be cleared. Only one sight triangle is located partially within the Town’s boundary.

Lighting: No improvements are required.

Asphalt conditions: The asphalt along Snow’s Lane should be replaced.

Figure 18 shows an aerial view of the proposed improvement plan along the entire length of Snow’s Lane. A full-size drawing can be found in Appendix L.

7.2.3 Snow’s Lane Cost Estimate

A Class “D” cost estimate was prepared for the improvements on Snow’s Lane. It should be noted that the cost estimate does not include HST or the costs associated with utility relocations and property acquisitions. The estimate includes a 20 percent contingency and a 10 percent engineering design fee.

The cost to widen Snow’s Lane and upgrade the intersection of Logy Bay Road and Snow’s Lane to a single-lane roundabout is estimated at approximately $859,000. Of this cost, approximately $495,000 is allocated for the construction of the roundabout. A detailed breakdown of the costs is provided in Appendix N.
Figure 18: Plan view of proposed signage and pavement markings on Snow's Lane
8.0 Active Transportation

The Grand Concourse Authority GCA) has prepared a trail development plan. The trail development plan proposed by the GCA is still in the conceptual stages and has not been approved by the Town Council. The trail development plan, included in Appendix J, proposes a number of walking trails, roadside links, key crossing locations as well as trail amenities and parking locations.

The overall plan shows a proposed trail network (solid red lines) with roadside links (dashed green lines) that is mainly focused in the Town’s main development area, the area under review in this study. Trails proposed for the longer term (dashed red lines) will connect this trail network to other areas of the Town.

8.1 Network Connectivity

The trail development plan was reviewed to ensure the connectivity of the proposed trail network. As the Town wishes to remain rural in nature and not provide sidewalks on residential streets, it is important that the trail system provides a high-level of connectivity that will allow users to navigate the Town using active transportation.

The proposed trail network provides a good level of connectivity throughout the main development area. The system also provides a number of_loop opportunities which are typically preferred by recreational users.

There are two future connections proposed to connect the trail network in the main development area to other areas of the Town. Both locations are located in the northern area of the Town, one connection from St. Francis Road ending opposite of O’Rourke’s Lane and the other connection crossing at the Logy Bay Road and Lower Road intersection and continuing to Outer Cove.

There are no connections to the trail network across Logy Bay Road in the southern portion of the Town. In addition, there are no connections to the following key locations in the Town:

- Kelly Park/Justina Centre
- Town Hall
- St. Francis of Assisi School from the east side of the Town
- Neighbourhood commercial area (convenience store, liquor store and wellness clinic)
- Places of worship

The proposed trail network does not provide sufficient connectivity to allow users to navigate the entire Town using active transportation. However, the proposed trail network will promote recreational use of active transportation in the main development area. The Town should consider completing a trail development plan for the entire Town, proper planning of the active transportation network in all areas of the Town will ensure that the network provides connectivity to allow users to navigate the entire Town. The trail development plan should explore options to connect to trails in St. John’s and other areas.

8.2 Parking Areas

The trail development plan was reviewed to ensure suitable parking areas are recommended for trail users. The parking areas must provide safe access to trail entrances in order to encourage use of the trail system. The plan identifies a total of six parking areas in the Town.

Three parking areas are proposed in the development area, two in the area north of the Power Estate (one adjacent to Soldiers Pond and one on Middle Ledge Drive) and one in the area south of the Power Estate.
In addition, the parking lot at the St. Francis of Assisi school is included as a parking area central to the main development area. The plan proposes sufficient parking areas in the main development area.

The two other parking areas identified on the plan include the existing parking areas at the Kelly Park/Justina Centre and the Town Hall. As previously indicated, the plan does not include connections to the trail system at these locations. These parking areas cannot be considered parking areas for the trail system if no connections exist.

Both parking areas are also located on the east side of the road and would require trail users to cross collector roadways to access the trail system. The plan does not include any crossings locations in the vicinity of the parking areas at the Kelly Park/Justina Centre and the Town Hall. Trail connections and proper crossing control should be provided at these two locations.

8.3 Trail Crossings
The proposed trail development plan includes a number of trail crossing along both low volumes residential roads and higher volume collector roads. The plan proposes crosswalks at a number of proposed crossings, crosswalks should be provided at all trail crossings, including those on the following roadways:

- St. Francis Road
- Big Meadow Drive
- Outer Cove Road at O’Rourke’s Lane
- Future roadway connection through the Power Estate
- Clovelly Lane
- Future residential roads in the Dobbin Property

Consideration should be given to providing proper crossing control at crossing locations, especially on collector roadways. Higher volume crossings should be reviewed according to the TAC Pedestrian Crossing Control Guide. The guide provides a decision support tool to assist in the selection of the most appropriate configuration to enable pedestrians to cross safely at a specific location.

8.4 Trailheads and Signage
Adequate trailheads should be provided at each trail entrance, the entrance to the trail should be clearly indicated and some level of signage and amenities should be provided. The lack of proper signage and trailheads have been identified to hamper the user’s ability to find and access trails. While residents may be able to find their way, lack of signage can deter tourism and new users.

A trailhead and signage standard should be developed for all trailheads to ensure they are clearly visible to both trail users and vehicles and that appropriate wayfinding signage is provided. Trailhead signage should include a map of the overall trail network indicating to users the layout of the trail network, connections to other trails and services, the presence of amenities and their current location. These maps should also be provided at any major internal trail junctions.

Trail markers such as those used by the Grand Concourse Authority, shown in Figure 19, can also be used to mark trails on roadside links and at internal trail junctions.
Figure 19: Grand Concourse Authority trail marker

8.5 Active Transportation Cross Sections

All active transportation trails should be designed according the GCA standards. The typical cross sections and design for granular walkways in dry or wet areas are shown in Figure 20 and Figure 21 respectively. The GCA cross sections specify a varying trail width of 1.5-3.0 m. The minimum width of 1.5 m provides the minimum width required to accommodate two pedestrians walking abreast.

It should be noted that the TAC Geometric Design Guide for Canadian Roads recommends a minimum width of 3.0 m for a shared multi-use path that allows both pedestrians and cyclists. It is recommended that the Town implement trails with 3.0 m wide cross sections to accommodate cycling.
Figure 20: Typical cross section and design for granular walkway

Figure 21: Typical cross section and design for granular walkway in wet locations
9.0 Traffic Calming

Traffic calming is defined by the Institute of Transportation Engineers (ITE) as the combination of physical measures designed to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for pedestrians and cyclists.

The Town of LBM Coc currently employs speed bumps and radar speed display signs as traffic calming measures on a number of streets. Residents have expressed positive feedback regarding traffic calming measures employed by the Town and indicated that they would like to see more traffic calming measures implemented throughout the Town.

9.1 Traffic Calming Policy

A traffic calming policy was prepared to assist the Town in addressing traffic and safety issues on residential roadways in a consistent and transparent manner. The policy outlines a ten-step process suggested to manage traffic calming requests throughout the Town. The methodology includes:

- Step 1 – Initial request for traffic calming
- Step 2 – Initial screening process
- Step 3 – Prioritizing requests
- Step 4 – Council approval and funding allocation
- Step 5 – Initial resident support
- Step 6 – Traffic calming plan
- Step 7 – Final resident support
- Step 8 – Final Council approval
- Step 9 – Design, tender and construction
- Step 10 – Follow up

The complete traffic calming policy can be found in Appendix O. The traffic calming policy document also includes a "traffic calming toolbox" section that describes common traffic calming measures, their uses and costs.

9.2 Traffic Calming in New Residential Subdivisions

Traffic calming should be introduced into the design stage of new developments to improve the aesthetics of the subdivision, reduce the speeds and through traffic volumes and provide a safer and friendlier environment for children and other users. A section should be included in the Town’s design standards stating that traffic calming measures should be incorporated into the design of subdivisions to encourage traffic-calmed neighbourhoods and provide safer environments for pedestrians.

In addition, it should be required that the layout of the internal road network and its connections to other roadways be reviewed to ensure their layout will not foster traffic issues such as shortcutting or speeding.
10.0 Residential Subdivision Standards Review

The Town has several documents which reference streets and outline various requirements pertaining to streets. The documents and their relevant sections include but are not limited to:

- Strategic Plan for 2014-2017
  - Strategic Initiatives - Page 12
- Municipal Plan for 2005-2015 (currently under review)
  - 3.6 Transportation – Page 10
  - 4.3.2 Subdivision Policies – Page 14
  - 4.3.4 Council Assumption of Private Roads – Page 14
  - 4.4.9 Scenic Route – Page 53
  - 4.4.10 Transportation – Page 55
  - 5.4 Capital Works – Page 63
- Development Regulations for 2005-2015 (currently under review)
  - PART II - General Development Standards
    - 37. Accesses and Service Streets – Page 17
    - 58. Street Construction Standards – Page 26
    - 61. Corner Lot Sight Triangle – Page 26
  - PART IV - Subdivision of Land
    - 80. Subdivision Design Standards – Page 33
    - 83. Street Works May be Deferred – Page 35
    - 84. Transfer of Streets and Utilities to Authority – Page 36
- Municipal Engineering Residential Subdivision Standards (November 2015)
  - Division 6 – Streets

It is important that any overlap of information in the above referenced documents is consistent. The following comments pertain to a specific review of Division 6 of the Town’s Municipal Engineering Residential Subdivision Standards.

Section 6.1:

- References table 5.1 in error, the reference should be to table 6.1

Section 6.2.1:

- References Dwg 002 in Appendix A which shows a 6m wide asphalt width, as per Section ?? the recommended minimum asphalt width is 7m.

Table 6.2:

- Row 6 - Minimum Stopping Sight Distance and Turning Sight Distance
  - “and Turning Sight Distance” should be removed.
  - Arterials & Collectors indicate “Refer to Urban Supplement to TAC”. This should be revised to “Reference Section 2.5 of the TAC Geometric Design Guide for Canadian Roads”
  - Locals indicates 45m. This should be increased to 65m
• Row 7 – Pavement Widths
  ▪ Locals indicate 6m. This should be increased to 7m
• Row 10 – Minimum Length of Vertical Curve
  ▪ All columns should indicate “Not less than the design speed in km/h and no less than 60m except on Local streets where a vertical curve is required at the approach to a stop-controlled intersection to make the transition to the maximum approach grade of 2% (6.3.4). In this instance, the length of vertical curve may be reduced to 30m.”
• Row 11 Vertical curve maximum length (length for drainage)
  ▪ This information appears to be redundant included in Row 9). Row 11 can be removed.
• Row 13 – Minimum Edge of Asphalt at Intersections
  ▪ Should be revised to Minimum Edge of Asphalt Radius at Intersections

Section 6.3 Intersections:
• Remove 6.3.2
• 6.3.3 Should be revised to “As far as possible intersections should be aligned at 90°. Maximum permitted deviation is 10° (i.e. 80° to 110°).

Section 6.4 Driveways
• Second paragraph should be revised to “No driveway (ramp) shall be permitted to enter onto an existing or proposed designated...”

10.1 Inclusive Design
To ensure future residential developments incorporate features necessary to make neighbourhood streets safe and pleasant for all users, the subdivision standards should outline what the Town expects from developers with respect to traffic calming, pedestrian safety and trail network connectivity. Considerations could include:

• Traffic Calming: The layout of the internal road network and its connections to other roadways be reviewed to ensure their layout will not foster traffic issues such as shortcutting or speeding. On long, straight and/or wide road segments, traffic calming measures might be included in the initial street design to keep speeds lower. Roundabouts might be considered at major intersections to reduce traffic speeds.
• Pedestrian Safety: Walkable shoulders should be provided on local roadways and active transportation trails should be provided along collector roadways.
• Access and Trail Connectivity: The ease of access to and from a subdivision should be considered for all modes of transportation, ensuring that appropriate connections are provided to and from the development not only from a street perspective, but also from existing or planned trail and/or other active transportation facilities.
11.0 Conclusions and Recommendations

The Town of Logy Bay-Middle Cove-Outer Cove (LBMOC) has experienced a fair amount of residential development over the past number of years. Residential development has been primarily focused in the central area of the Town; including the Sandalwood Drive and Killick Drive area. There are a number of proposals currently underway or in the planning process for this area. A total of 268 dwelling units are expected to be built over the next 10 years. Harbourside Transportation Consultants was retained by the Town of LBMOC to complete a transportation study to identify the long-term transportation needs required to support future development in the Town of LBMOC.

Interviews were conducted with stakeholders including developers and engineering/planning staff to obtain information regarding development projections and timeframes. The proposed developments include residential land uses only.

In the five-year development timeframe (2022), 177 dwelling units are anticipated to be constructed. An additional 91 dwelling units are expected for the ten-year timeframe (2027). At full build-out, the proposed developments are expected to generate 160 trips in the AM peak hour (44 trips in/116 trips out) and 211 trips in the PM peak hour (137 trips in/74 trips out).

The St. John’s Regional PTV Visum models were used to distribute the projected development traffic onto the study area road network. As part of this study, the models were updated and calibrated to reflect the existing and future road networks and travel patterns in the LBMOC area. The volumes obtained from the models were superimposed on the base volumes for each of the defined scenarios to produce design volumes.

Three assessment scenarios were performed to quantify the impact of the future development on the Town’s road network, including:

- Scenario 1: Existing Conditions (2017)
- Scenario 2: Five-year Development Projection (2022)
- Scenario 3: Ten-year Development Projection (2027)

Under Scenario 1, an assessment of existing conditions, poor levels of service are observed in Synchro at Logy Bay Road and Marine Drive/ORR On-Ramp and Logy Bay Road and Snow’s Lane. All other twelve study intersections operate at acceptable levels of service in Synchro. SimTraffic shows all fourteen study intersections operating at acceptable levels of service. Based on existing traffic volumes, traffic signals are not warranted at any of the study intersections.

Under Scenario 2, an assessment of future operations in the study area with background traffic growth and the five-year development projection, poor levels of service are observed in Synchro at Logy Bay Road and Marine Drive/ORR On-Ramp, Logy Bay Road and Snow’s Lane and Logy Bay Road and Cadigan’s Road/Stick Pond Road. All other eleven study intersections operate at acceptable levels of service in Synchro. SimTraffic shows all fourteen study intersections operating at acceptable levels of service.

The following improvements are recommended for the 0-5 year timeframe to improve traffic operations throughout the Town:
Logy Bay Road and Marine Drive/ORR On-Ramp: Provide a separate left-turn storage lane on the Marine Drive approach. Northbound and southbound right-turn lanes on Logy Bay Road could also be installed at this time.

Logy Bay Road and Snow’s Lane: Convert the intersection to a roundabout.

Logy Bay Road and Cadigan’s Road/Stick Pond Road: Provide a separate left-turn storage lane on the Cadigan’s Road approach. A northbound right-turn lane on Logy Bay Road could also be installed at this time.

Under Scenario 3, an assessment of future operations in the study area with background traffic growth and the ten-year development projection, poor levels of service are observed in Synchro at Logy Bay Road and Marine Drive/ORR On-Ramp and Logy Bay Road and Cadigan’s Road/Stick Pond Road. All other twelve study intersections operate at acceptable levels of service in Synchro. SimTraffic shows poor levels of service at Logy Bay Road and Marine Drive/ORR On-Ramp. All other study intersections operate at acceptable levels of service in Synchro.

The following improvements are recommended for the 5–10 year timeframe to improve traffic operations throughout the Town:

Logy Bay Road and Marine Drive/ORR On-Ramp: Future traffic volumes based on background traffic growth and development projections will likely reach the threshold for traffic signals by 2027. While the overall volumes at the intersection are high, the volumes on the Marine Drive approach are less than 60 vehicles during the peak hours. The left-turn movement on Marine Drive may begin to experience some longer delays, however, due to the small proportion of left-turn volumes this does not justify installing a traffic signal.

Based on SimTraffic results, it is unlikely that the high delays observed in Synchro will materialize. The intersection should continue be monitored to ensure that the intersection operates at acceptable levels of service as is anticipated. If high delays are observed, then conversations must occur with the Provincial Government and/or the City of St. John’s to discuss any future improvements to the intersection.

Logy Bay Road and Cadigan’s Road/Stick Pond Road: Provide a separate left-turn storage lane on the Stick Pond Road approach.

The proposed road network for the study area was reviewed and modified to ensure that a safe, efficient and well-connected road network is achieved throughout the Town. The traffic volumes generated by the proposed developments are such that the Town can consider multiple alternatives with respect to the proposed road network and associated connections to existing streets. However, a number of important considerations were identified, including:

North-South Collector Roadway: The proposed road network should include a main north-south collector roadway through the development area; connecting the proposed developments south of the Power Estate and those north of the Power Estate. When completed, this roadway will become an attractive route, a roundabout is suggested midway along the route to control vehicle speeds. It should be noted that this roadway will go through a wetland area.

Impact on School Zone: Until a north-south connection though the development area is completed, all new development traffic north of the Power Estate travelling to/from Logy Bay Road will be required to travel on Outer Cove Road and through the St. Francis school zone. If both the 5 and
10-year developments are allowed to proceed without a connection through the Power Estate, the traffic volumes in the school zone would experience a total increase of approximately 100 vehicles per hour during the AM peak hour.

- **Cul-de-sacs**: Cul-de-sac are generally preferred from a residential/real estate perspective; however, they reduce connectivity for emergency and service vehicles and pedestrian/cycling opportunities. Where possible cul-de-sacs should be eliminated in the proposed road network to improve operational efficiencies and access.

- **Secondary Connection to Pine Line**: A secondary connection to Pine Line is not required from a technical perspective. However, the secondary connection would improve connectivity and access for municipal service and emergency vehicles. It should be noted that this roadway will go through a wetland area.

- **Connections to Substandard Roadways**: The proposed road network in the development area will connect to a number of existing roadways, some of which are considered substandard, including St. Francis Road, Stick Pond Road and Power’s Lane. These roadways should be upgrades as a condition of the development approval. In addition, there are some geometric issues with the proposed geometry at the intersection of Stick Pond Road and Clovelly Lane in the developers’ concept plans; the alignment of the intersection must be improved.

- **Minor Connections**: There are a number of minor roadway connections that have been shown in plans P1-P3 which have also been included in the proposed road network in Figure 7. Connections to existing cul-de-sacs including one to Skip’s Place via Road 8 and one to Clover Dale Close via Road 2 are optional and not required from a technical perspective. If the Town would like to have these cul-de-sacs removed for reasons noted previous in bullet 2 then the option is there to do so under the road configuration noted in Figure 7.

- **Secondary Connection to St. John’s**: Consideration was given to an additional roadway connection between the Town and the City of St. John’s through the municipal boundary along the west side of the study area. The secondary connection is not required from a technical perspective and would likely be undesirable for residents of the affected neighborhoods due it’s the potential for short-cutting. However, the connection should still be considered in the planning process should it be required to improve emergency vehicle access or planned trail connectivity in the area. Careful consideration should be given to traffic calming measures in the design of this roadway connection to minimize the potential for short-cutting through residential neighborhoods.

- **Snow’s Lane**: Snow’s Lane requires upgrades along the entire length of the roadway and at the intersection of Logy Bay Road and Snow’s Lane. A portion of Snow’s Lane is located outside of the Town’s boundary, the Town should consult with the City of St. John’s to discuss plans to upgrade the St. John’s portion of Snow’s Lane.

Standard cross sections were prepared for local and collector roadways. Cross sections prepared include local road, local road with left-turn lane, local road with walkable shoulder, collector road, collector road with left-turn lane. The following minimum width are recommended:

- 3.5m through travel lanes
- 3.0m exclusive turning lanes
- 1.0m shoulders
- 1.2m shoulder for walkable shoulders (a 2.2m shoulder should be provided where possible to include a 1.0m buffer)
- 3.0m for active transportation trails
The Town’s existing roadway classification system does not align with TAC’s guidelines for roadways classifications. The roadway classification system was updated to reflect TAC’s rural road classification system which includes freeways, arterial roadway, collector roadways and local roadways. Each roadway within the Town was reviewed and classified according to the TAC classification. There are no roadways are classified as freeways or arterial roadways within the Town’s boundary. Six roadways were identified as collector roadways based on traffic volumes and roadway function: Cadigan’s Road, Logy Bay Road, Marine Drive, Middle Cove Road, Outer Cove Road and Snow’s Lane. A roadway classification map depicting the classification was developed.

The SJRFD response times to all areas of the Town were modelled for existing traffic conditions and the ten-year planning horizon with the proposed road network in place. The SJRFD’s current response time from Kent’s Pond Station No. 6 to the Town boundary on Logy Bay Road is 4 minutes and 33 seconds. Under both existing conditions and the ten-year horizon, all areas of the Town can be accessed from the Town boundary on Logy Bay Road in ten minutes or less. In the ten-year scenario with the connection through the Power Estate, all areas of the proposed road network are accessible from the Town boundary on Logy Bay Road within eight minutes.

The SJRFD indicated that there are have been preliminary discussions regarding a new fire station in the east end of the City of St. John’s, which will likely be located closer to the Town. It is recommended, that the Town maintain close contact with the SJRFD in this regard to ensure that the new location is in the mutual best interests of both the SJRFD and the Town.

A detailed traffic and safety assessment was completed for Snow’s Lane. A review of existing conditions relating to traffic operations, pavement markings, signage, lane widths, pedestrian facilities, intersection sight distance, driveway visibility lighting and pavement condition was completed. A number of improvements were identified including widening Snow’s Lane and providing walkable shoulders, providing additional pavement markings, clearing of trees within sight lines and repaving the road. As previously discussed in the 5-year traffic analysis improvements, the intersection of Logy Bay Road and Snow’s Lane should be converted to a roundabout. A Class “D” cost estimate was prepared for the improvements on Snow’s Lane, that the cost estimate does not include HST or the costs associated with utility relocations and property acquisitions. The cost to widen Snow’s Lane and upgrade the intersection of Logy Bay Road and Snow’s Lane to a single-lane roundabout is estimated at approximately $858,000. Of this cost, approximately $495,000 is allocated for the construction of the roundabout.

The Grand Concourse Authority (GCA) has prepared a trail development plan for the Town. The plan was reviewed to ensure the connectivity of the proposed trail network. As Town wishes to remain rural in nature and not provide sidewalks on residential streets, it is important that the trail system provides a high-level of connectivity that will allow user to navigate the Town using active transportation.

The plan shows a proposed trail network with roadside links that is mainly focused in the Town’s main development area, the area under review in this study. Trails proposed for the longer term will connect this trail network to other areas of the Town. The proposed trail network provides a good level of connectivity throughout the main development area. The system also provides a number of loop opportunities which are typically preferred by recreational users.

The proposed trail network does not provide sufficient connectivity to allow users to navigate the entire Town using active transportation. The plan lacks connectivity across Logy Bay Road in the lower portion of
the Town, connections to key locations and to parking areas. However, the proposed trail network will promote recreational use of active transportation in the main development area. The Town should consider completing a trail development plan for the entire Town, proper planning of the active transportation network in all areas of the Town will ensure that the network provides connectivity to allow users to navigate the entire Town. The trail development plan should explore options to connect to trails in St. John’s and other areas.

The proposed trail development plan includes a number of trail crossings along both low volume residential roads and higher volume collector roads. Consideration should be given to providing proper crossing control at crossing locations, especially on collector roadways.

Adequate trailheads should be provided at each trail entrance, the entrance to the trail should be clearly indicated and some level of signage and amenities should be provided. A standard should be developed for all trailheads to ensure they are clearly visible to both trail users and vehicles and that appropriate wayfinding signage is provided.

All active transportation trails should be designed according the GCA standards. The GCA cross sections specify a varying trail width of 1.5-3.0m. The minimum width of 1.5m provides the minimum width required to accommodate two pedestrians walking abreast. A minimum width of 3.0m is required for a shared multi-use path that allows both pedestrians and cyclists. It is recommended that the Town implement trails with 3.0m wide cross sections to accommodate cycling.

The Town currently employs traffic calming measures on a number of streets. Residents have expressed positive feedback regarding traffic calming measures employed by the Town and indicated that they would like to see more traffic calming measures implemented throughout the Town. A traffic calming policy was prepared to assist the Town in addressing traffic and safety issues on residential roadways in a consistent and transparent manner. The policy outlines a ten-step process suggested to manage traffic calming requests throughout the Town.