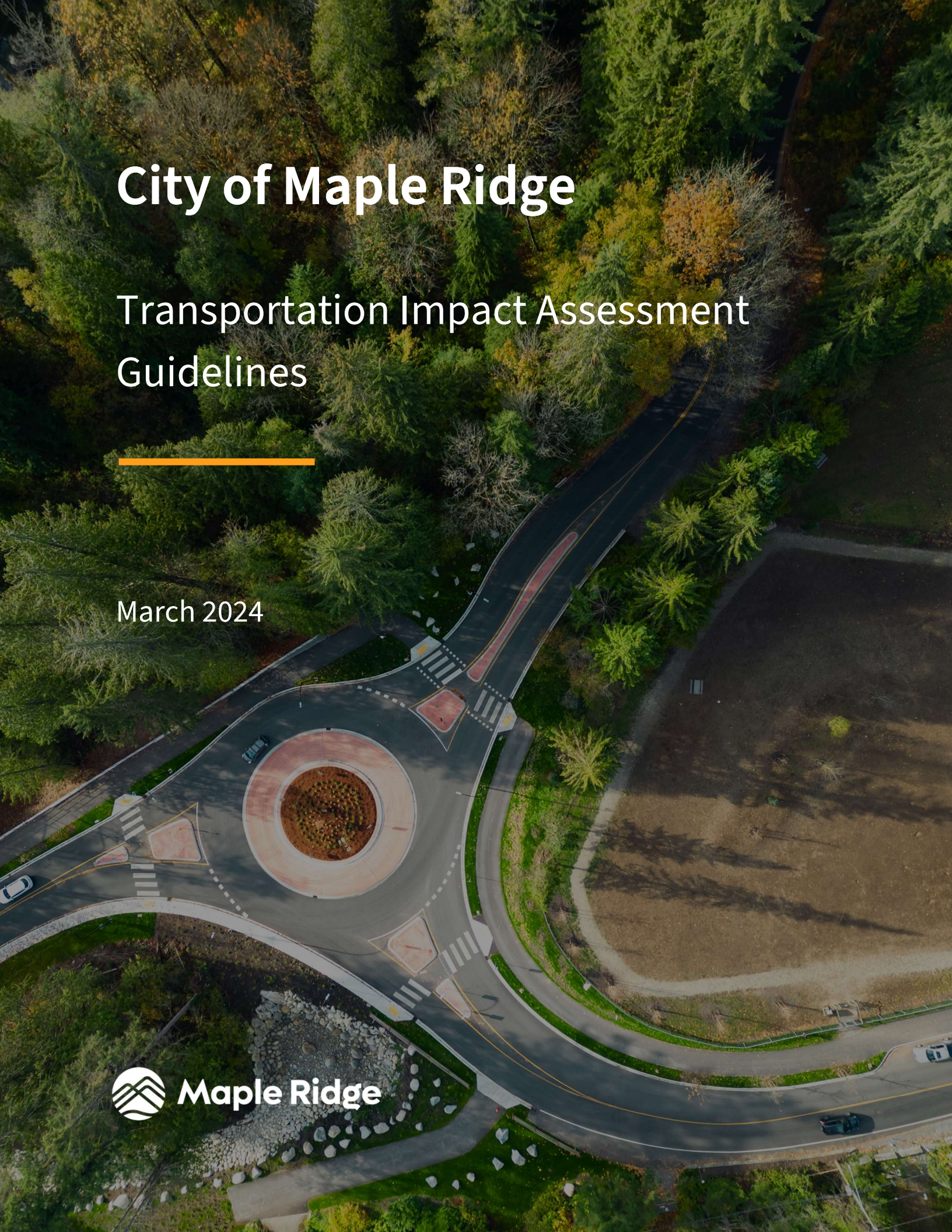


City of Maple Ridge

Transportation Impact Assessment Guidelines

March 2024

Maple Ridge

Table of Contents

Introduction

What is a Transportation Impact Assessment?

A Transportation Impact Assessment (TIA) is a study intended to assess the impact of a proposed development on existing transportation network infrastructure. It identifies the on-site and off-site measures to be undertaken to maintain or enhance the transportation system's performance when the development is built and is operational.

Key Components of TIAs

Assessment of Current Conditions
The TIA starts with a thorough examination of the existing transportation conditions. This includes traffic volumes, road capacities, transit availability, pedestrian and cycling facilities, and any existing issues or constraints within the study area.

Project Description
The assessment includes a detailed description of the proposed development, including the type of development (e.g. residential, commercial, industrial), the scale (e.g. number of units, square footage), and the expected timing or phases of development.

Traffic Generation
TIAs include the number and type of trips (e.g. vehicles, cyclists, pedestrians) the proposed development will generate during peak and off-peak hours. Various methodologies and databases, like the Institute of Transportation Engineers (ITE) Trip Generation Manual, are used for these estimates.

Trip Distribution and Assignment
The TIA predicts which routes the generated traffic will likely take to and from the development site, distributing the traffic across the existing network and identifying key intersections or segments that will be affected.

Impact Analysis
Using the generated traffic and distribution data, the assessment evaluates the potential impacts on the transportation network, including intersection levels of services, 95th percentile queue lengths, delays, and impacts on transit operations, pedestrians, and cyclists.

Mitigation Measures
If the assessment identifies significant negative impacts, it will recommend measures to mitigate these effects. These can include road improvements (e.g., widening, adding turn lanes), traffic signal

adjustments, enhancements to public transit services, and/or improvements to pedestrian and cycling infrastructure.

Consultation and Review
The process involves consultation with City of Maple Ridge transportation staff to gather feedback and ensure all impacts are considered. The draft TIA report is submitted to the City for review as part of the development approval process.

The overarching goal of a TIA is to ensure that new developments are compatible with the existing transportation network and that necessary improvements are made to accommodate growth while promoting sustainable transportation options and maintaining or improving safety and mobility for all users.

Purpose of the Maple Ridge TIA Guidelines

The City of Maple Ridge has prepared this document to streamline the approval process and provide a standardized framework for consultants to follow when submitting studies for review. This document provides guidelines for transportation consultants who will undertake a Transportation Impact Assessment (TIA) for the City of Maple Ridge. These guidelines establish the scope, format, and analysis required to properly assess the impacts of a proposed development on the existing transportation infrastructure, identify mitigation measures, and document the results. These guidelines ensure that TIAs are conducted in a systematic, comprehensive, and consistent manner.

Who Can Undertake a TIA?

When a TIA is required for the proposed development, the study must be undertaken by a Qualified Engineer, with sufficient experience in traffic engineering, licensed to practice in British Columbia. The final report must be signed and sealed by the Qualified Engineer. Any memos, drawings or letters submitted independent of the TIA must also be signed and sealed by the Qualified Engineer.

Transportation impact assessments submitted to the City that are not signed and sealed by a Qualified Engineer licensed to practice in British Columbia will not be accepted.

Determining When a TIA is Required

Trip Generation

A TIA is required when the proposed development is anticipated to generate **100 trips** or more in any one hour. If the site is located within the Maple Ridge Town Centre (as shown in Appendix A), then a TIA is required when the proposed development is anticipated to generate **70 trips** or more in any one hour.

The quantity of vehicle trips generated is determined using the most current version of the Institute of Transportation Engineers (ITE) Trip Generation Manual. If the proposed land use is not contained in the most current ITE Trip Generation Manual, then the Qualified Engineer must submit a technical memorandum detailing the proposed trip generation rate and how it was determined. The memorandum is to be signed and sealed by the Qualified Engineer and submitted for approval by the City prior to initiating the analyses.

Land Use

For development applications where land uses are not clearly identified or which require further analysis to determine whether a TIA is warranted, the City may require a technical memorandum documenting the trip generation and a qualitative assessment of the impact on critical movements at adjacent intersections.

A TIA is required for all development proposals requiring an amendment to the Official Community Plan.

The City of Maple Ridge Director of Engineering, or Manager of Transportation, may require a TIA for the proposed development regardless of the quantity of vehicle traffic generated in specific circumstances where there are existing traffic problems.

Maple Ridge will review all submissions against the requirements as set out in the checklist in Appendix E, prior to reviewing the report. **Submissions that do not fulfill these basic requirements will be returned to the applicant with the missing elements listed.**

Date Relevancy

Given the dynamic nature of development in the City, a TIA maintains relevancy for five (5) years. If major changes have occurred to either the area development or the transportation network within the study area that were not contemplated within the original TIA, then the City may require an update to the TIA regardless of when the original TIA was created.

Scope of Work

The scope of work for a TIA is to include, but is not limited to:

1. Identify the project site and its location relative to the existing transportation network.
2. Identify a suitable study area to be submitted to the City for approval prior to initiating the study.
3. Reference of relevant documents that potentially affect the study area including, but not limited to:
    a. Official Community Plan
    b. Strategic Transportation Plan
    c. Zoning Bylaw
    d. City of Maple Ridge Design Criteria Manual
    e. Neighbourhood Area Plans, if available
    f. Neighbourhood Improvement projects
    g. Traffic Calming Policy
    h. Translink Area Transport Plans
    i. BC MoTI infrastructure plans
4. Identify anticipated future developments within the study area that may affect the generation of vehicular trips
5. Specify the design peak hour(s) of analysis.
6. Analyze the capacity of signalized and unsignalized intersection(s) within the study area for future horizon years with and without the proposed development traffic.
7. Propose a traffic projection methodology, trip distribution and traffic assignment parameters, and traffic volume growth rate to the Municipal Engineer for approval prior to initiating the analysis.
8. Develop improvements to the road layout, traffic control and facilities to accommodate future growth of pedestrian, bicycle, transit and vehicular traffic
9. Estimate potential costs to upgrade the existing transportation network (roads, pedestrian facilities and cycling facilities) that would accommodate additional trips generated by the proposed development.
10. Conduct a swept path analysis.
11. Conduct a sightline analysis when possible.

Methodology

The Qualified Engineer shall prepare a DRAFT Terms of Reference (ToR) to be submitted to the City for approval prior to initiating the study. An example ToR is included in Appendix B.

Examples of the various figures and tables listed below are included in Appendix C and D, respectively.

Initial Development Proposal Analysis

1. **Development Proposal Details**: Identify the development proposal details including:
    a. Type and size of each land use within the proposed development
    b. Timing and size of each phase (if more than one phase)
    c. Layout and access to each phase
    d. Bylaw requirements for bicycle and vehicle parking
    e. Bylaw requirements for loading zone (including solid waste handling).

Site and Study Area Identification

2. **Project Site and Transportation Network:** Using a figure, identify the project site and its location relative to the existing transportation network.
3. **Study Area Determination:** Using a figure, identify a suitable study area which shall at a minimum extend beyond the boundaries of the development to at least the next major intersection anticipated to be impacted by the development. The study area may be expanded as directed by the City to respond to the scale and nature of development.

Regulatory and Strategic Context

4. **Jurisdiction and Regulatory Compliance:** Identify if the proposed development falls within the jurisdiction of the Ministry of Transportation and Infrastructure (typically within 800 metres of an access to a roadway under the Ministry's jurisdiction).
5. **Reference Documents:** Reference relevant documents that potentially affect the study area including, but not limited to:
    a. Official Community Plan
    b. Strategic Transportation Plan
    c. Zoning Bylaw
    d. City of Maple Ridge Design Criteria Manual
    e. Area Plans, if available
    f. Neighbourhood Improvement projects
    g. Traffic Calming Policy

h. Translink Area Transit Plans
i. BC MoTI infrastructure plans
j. Development permit areas

Traffic Analysis Preparation

6. **Future Developments:** Using a figure, identify anticipated future developments within the study area that may affect the generation of vehicular trips.
7. **Design Peak Hours:** Specify design peak hour(s) of analysis – typically the AM and PM peak hours but within the Maple Ridge Town Centre, commercial/retail developments may require analysis for weekend mid-day.
8. **Traffic Growth Rate:** Use a traffic volume growth rate of 3% per annum, straight line, unless otherwise permitted by the Municipal Engineer.
9. **Trip Generation:** Trip Generation is to be undertaken using the most current version of the Institute of Transportation Engineers Trip Generation Manual for each land use and for each phase within the development. The trip generation table must present both the peak hour of the generator and the peak hour of the adjacent street traffic, as available. The study must identify the setting/location as set out in the ITE Trip Generation Manual. The capacity analyses must be based on the peak hour of the adjacent street traffic. If an appropriate land use cannot be determined within the ITE Trip Generation Manual then the proponent must propose an alternative with supporting technical justification to the Municipal Engineer for approval prior to initiating the analysis.
10. **Trip Distribution:** Illustrate the trip distribution and assignment in the report for both existing and proposed transportation networks. Computer modelling may be used or required. If a computer model is used, all assumptions and zonal inputs must be documented.

Traffic Data Collection

11. **Data Collection Protocols:** Data collection must be undertaken for all existing intersections included in the study. Traffic data must not be more than two (2) years old. Data collection must occur on days when Maple Ridge schools (School District #42) is in session. The days for data collection for weekday analysis are Tuesday, Wednesday or Thursdays. Data collection may not occur on the two (2) days prior to, or two (2) days after a Statutory Holiday.
12. **Peak Hour Factor:** Based on the collected data, the engineer is to determine the Peak Hour Factor (not to exceed 0.95), and the appropriate truck percentage to be used in subsequent analyses.

Traffic Scenarios and Intersection Analysis

13. **Horizon Years:** Analyze the following scenarios with and without development traffic:
    a. Existing conditions

   b. Opening Day (for each phase)
   c. Opening Day + 5 years (from final phase)
   d. Opening Day + 10 years (from final phase)

14. **Intersection Capacity and Performance:** Intersection capacity analysis must be undertaken using the Highway Capacity Manual procedures using a current version of Synchro and SIDRA for roundabout analysis. The report must clearly document, for each movement:
   a. Traffic Volume
   b. Level of Service (LoS)
   c. Volume/Capacity Ratio
   d. Delay (in seconds)
   e. 95th Percentile Queue length from Synchro
15. **Volume-Capacity Ratio:** The intersection analyses must clearly highlight all movements with a V/C ratio more than 0.85.
16. **95th Percentile Queues:** The intersection analyses must clearly highlight all movements where the 95th Percentile queue exceeds the existing queue storage. Where the 95th percentile queue length exceeds the storage length, the applicant must provide a mitigation measure(s) to ensure that the queue does not spill out of the storage area.
17. **Cycle Length:** The maximum permitted cycle length is 120 seconds. Minor street minimum green is 7 seconds and Major Street minimum green is 15 seconds.
18. **Pedestrian Walking Speed:** Typical pedestrian walking speed 1.2 m/s; but within 200 metres of an elementary school or seniors facility, 1.0 m/s.

Design and Infrastructure Evaluation

19. **Acceptable Levels of Service:** The minimum acceptable LOS for an Intersection is LoS D, with individual movements not worse than LoS E. For all movements or intersections that do not achieve these Levels of Service, the applicant must propose appropriate mitigation measures.
20. **Transit Network Improvements:** Evaluate demand for transit with recommendations for on and off-site improvements to accommodate the anticipated demand generated by the development.
21. **Pedestrian Network Improvements:** Evaluate the pedestrian network and desire lines with recommendations for on and off-site improvements to meet the desire lines. Include a review of existing and future connections to the network as outlined in the Strategic Transportation Plan.
22. **Cycling Network Improvements:** Evaluate the cycling network and connections from the proposed development to the network. Include a review of existing and future connections to the network as outlined in the Strategic Transportation Plan. Provide recommendations for on and off-site improvements to meet the anticipated demand.
23. **Road Layout and Traffic Control Improvements:** Develop improvements to the road layout, traffic control and facilities to accommodate future growth of vehicular traffic.
24. **Transportation Network Cost Estimation:** Estimate potential costs to upgrade the existing transportation network (roads, pedestrian facilities and cycling facilities) that would accommodate

additional trips generated by the proposed development. These cost estimates are to be Class "D" or better.

Specific Studies and Analyses

25. **Swept Paths:** Conduct a swept path analysis using an appropriate software package for loading zones solid waste handling and parkades. An appropriate design vehicle must be selected. Typically:
    - P-TAC for parkades
    - HSU-TAC for solid waste handling
    - WB-20 for larger commercial enterprises
    - BC Building Code requirements for Fire Department access
    - Other design vehicles will be considered on a case-by-case basis at the discretion of the Municipal Engineer.
26. **Sightlines:** Sightline analysis to be undertaken for all site access points to ensure safe operations on opening day. The minimum required sightline is based on Stopping Sight Distance as set out in the Transportation Association of Canada Geometric Design Guide. The design speed shall be the posted speed limit. The Qualified Engineer is to identify all deficiencies and recommend an appropriate mitigation strategy(s).
27. **Parking Layouts:** Evaluate parking layout to ensure sufficient magazine storage between the access at the property line and the first parking stall. The minimum distance is 6 metres. For parking lots with more than 200 stalls, the minimum distance is 20 metres.
28. **Parking Variances:** Evaluate the parking requirements using the City of Maple Ridge Off-Street Parking Bylaw. Where applicable, the engineer may utilize the principles of shared parking as set out in the most current edition of Shared Parking, published by the Urban Land Institute. If there is a parking variance of 10% or less, the TIA is to provide a technical rationale to support the variance. If the variance is greater than 10%, the City may require a proxy survey (consisting of at least three comparable sites) within Maple Ridge.
29. **Drive-Thru Services:** Evaluate the queueing for drive-through service. Drive-thru businesses, such as restaurants, pharmacies, and financial institutions, shall provide a vehicle access lane that meets the following requirements:
    a. Drive-thru restaurants
        i. The minimum vehicle stacking length from the order point to the street line or to any internal access road or circulation aisle that provides direct access from the street shall be:
            1. 60 metres (10 vehicles) for typical drive-thru restaurants, and
            2. 120 metres (20 vehicles) for high-volume drive-thru restaurants, 60 metres of which may also provide access to parking stalls
        ii. The minimum vehicle stacking length from the order point to the pick-up window shall be 24 metres (four vehicles).
    b. For non-restaurant drive-thru businesses, the minimum vehicle stacking length from point

of contact to the street line or to any internal access road or circulation aisle that provides direct access from the street shall be 30 metres (five vehicles); and

c. For all drive-thru businesses
    i. The minimum access lane width shall be 3.65m; and
    ii. The minimum access lane setback shall be 1 metre from any street line and 3 metres from any property line abutting a residential zoned property, and this setback area shall include landscape screening.
d. "Restaurant, High Volume Drive-Thru" means a restaurant or café that generates 200 or more vehicle trips during the busiest hour of operation.

Traffic Warrant Standards

30. **Traffic Warrants:** Use the Transportation Association of Canada (TAC) methodology for traffic signal warrants, BC MoTI methodology for left-turn warrants, and MUTCDC methodology for all-way stop warrants.
31. **Pedestrian Crossing Warrants:** Use the most current TAC Pedestrian Crossing Control Guide for pedestrian crossing warrants.

Report

The Qualified Engineer shall submit a draft report in PDF format to the City and other Key Stakeholders for review and comment. The draft report must document all of the above and clearly identify all the study conclusions and recommendations. The site plan, collected data, and analysis output shall be included in appendices to the report. Any report more than 20 pages in length (excluding appendices) shall have an executive summary of not more than two (2) pages. All reports submitted to the City must include all appendices.

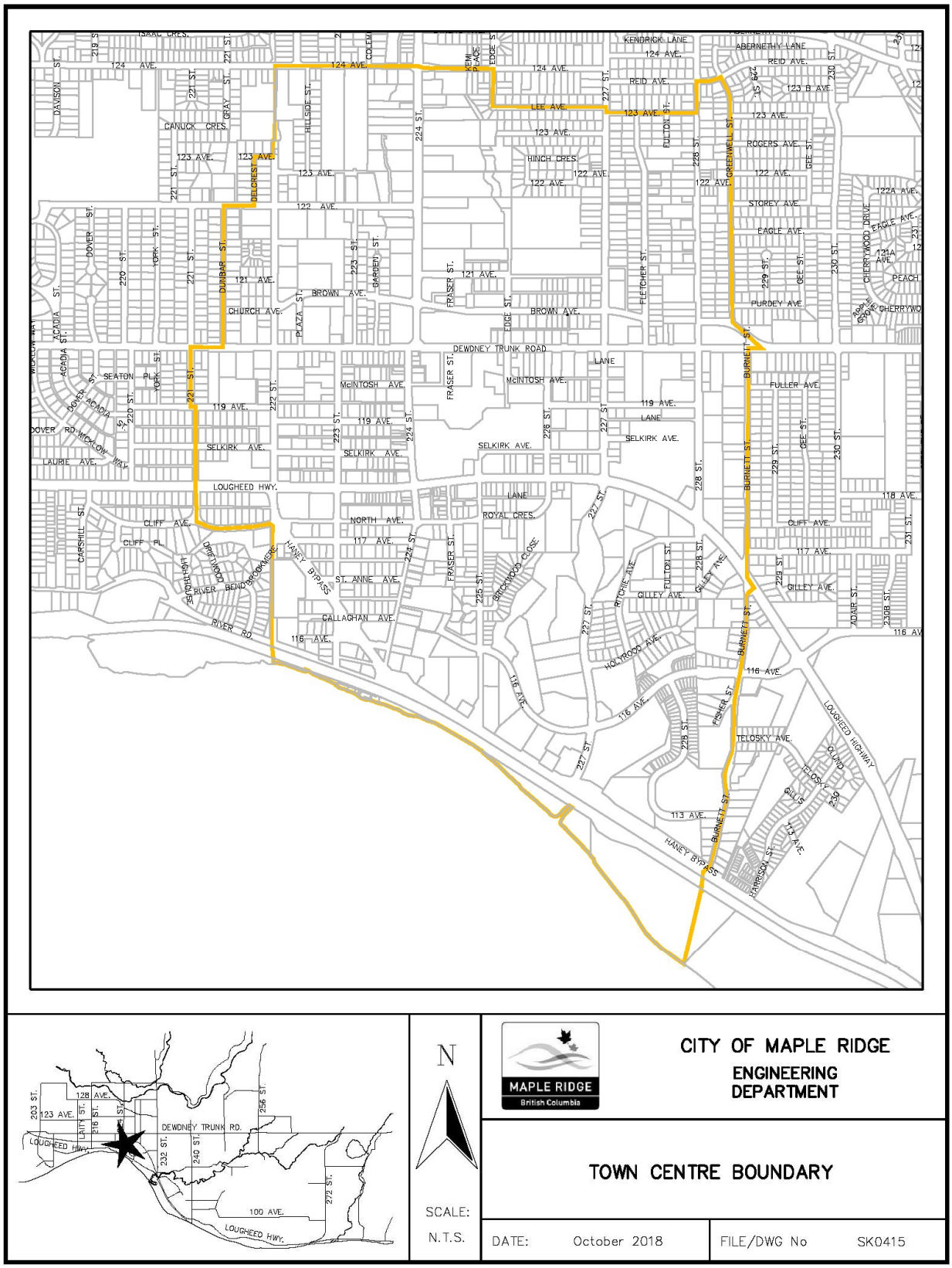
The City shall provide the Qualified Engineer with written comments on the draft report. The engineer shall review the comments and amend the draft report. For all comments that the engineer elects not to amend the report, the engineer shall provide a detailed written explanation as to why the report was not amended.

The Qualified Engineer shall provide the City with a signed and sealed final report in PDF format and three (3) paper copies.

The Qualified Engineer shall provide all traffic data collected to the City in Excel format.

The Qualified Engineer shall provide all data files (e.g., HCS, Synchro, SIDRA, etc) used in the analysis to the City in printed format. Synchro output shall be in the HCM format. It is understood that the Qualified Engineer relies solely on the printed copies of the model(s) output provided with the final, signed and sealed report.

Appendix A: Maple Ridge Town Centre Boundary Map



Appendix B: Example TIA Terms of Reference (ToR)

Draft Terms of Reference (March 31, 2024)

Study Intersections
Study area to include the following intersections:

1. LIST OF INTERSECTIONS

Existing and Future Adjacent Road Network
City of Maple Ridge to advise if any proposed changes to road network.

Relevant Background Material
Consultant to use the information provided by City of Maple Ridge.

Anticipated Adjacent Developments
To be provided by the City of Maple Ridge. The consultant shall incorporate traffic volumes into the analysis for a holistic assessment for mitigation measures.

Design Peak Hour of Analysis
Examine the weekday morning and afternoon peak periods and analyse two peak hours for analysis.

Horizon Years of Analysis
Examine the following years:

- 2024 (i.e. existing base)
- 2026 (future base)
- 2026 (future base + site generated traffic from full build-out)
- 2031 (future base)
- 2031 (future base + site generated traffic from full build-out)
- 2036 (future base)
- 2036 (future base + site generated traffic from full build-out)

Traffic Volume Growth Rate
Propose to use 3.0% per year (simple straight line) to factor up existing base volumes to future horizon years.

Traffic Projection Methodology
Use current accepted traffic engineering practices for traffic projections and to document any assumptions in the report.

Trip Generation Methodology

Use the latest Institute of Transportation Engineers (ITE) vehicle trip generation to estimate site traffic volumes which represent the "worst case scenario" for the impact assessment.

Trip Distribution and Traffic Assignment Parameters

Use existing travel patterns in the study area to develop trip distribution and traffic assignment parameters.

Traffic Engineering Methodology for Analysis

Use 2016 Highway Capacity Manual methodologies for all intersection capacity analysis. (HCS software for unsignalized intersections and Synchro Ver. 10 for signalized intersections).

Engineering Standards

Use City of Maple Ridge standards for the adjacent roadways.

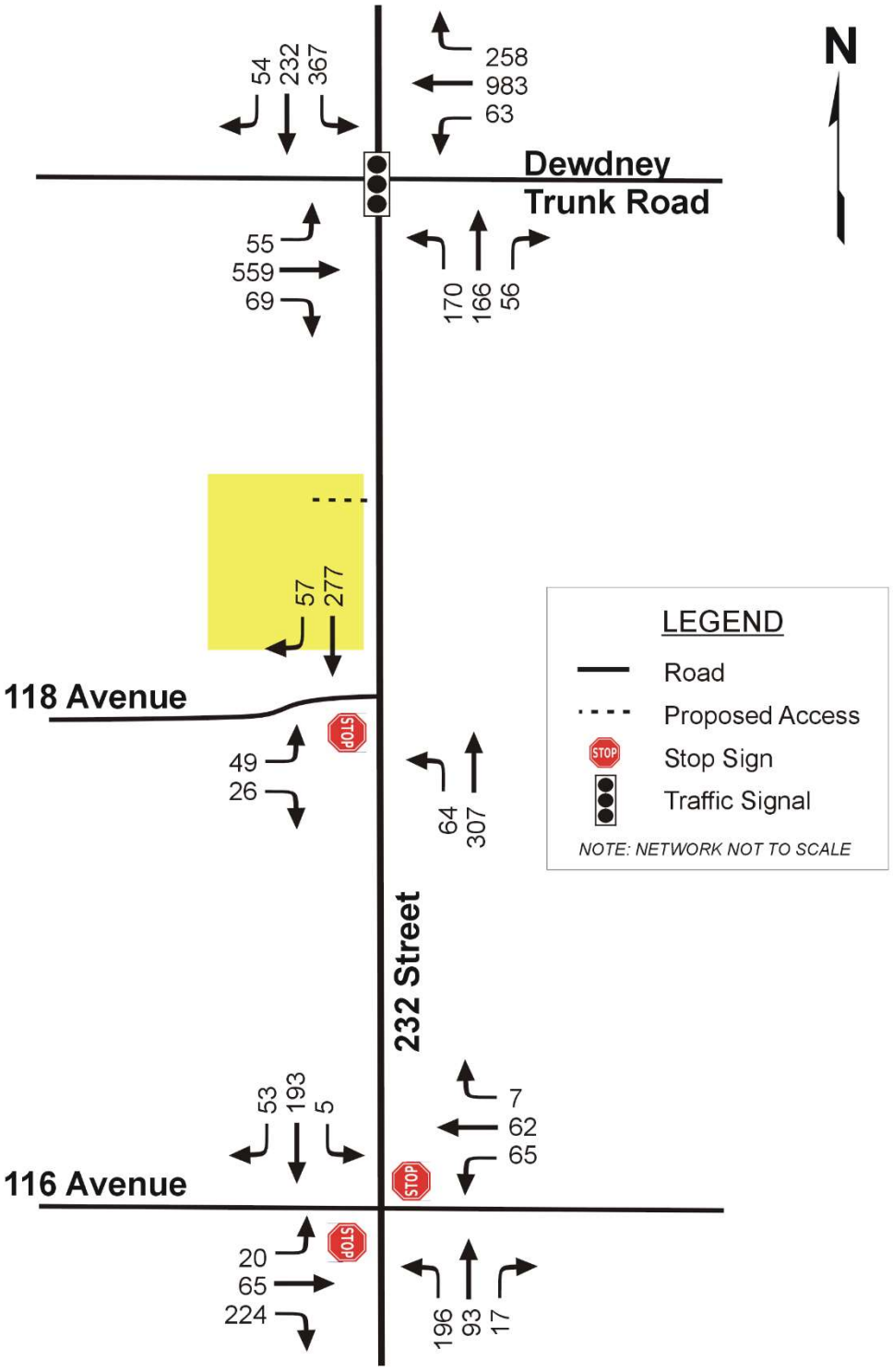
Number of Final Report Copies

- City of Maple Ridge — 3 bound copy + 1 digital copy
- Client — 1 bound copy + 1 digital copy

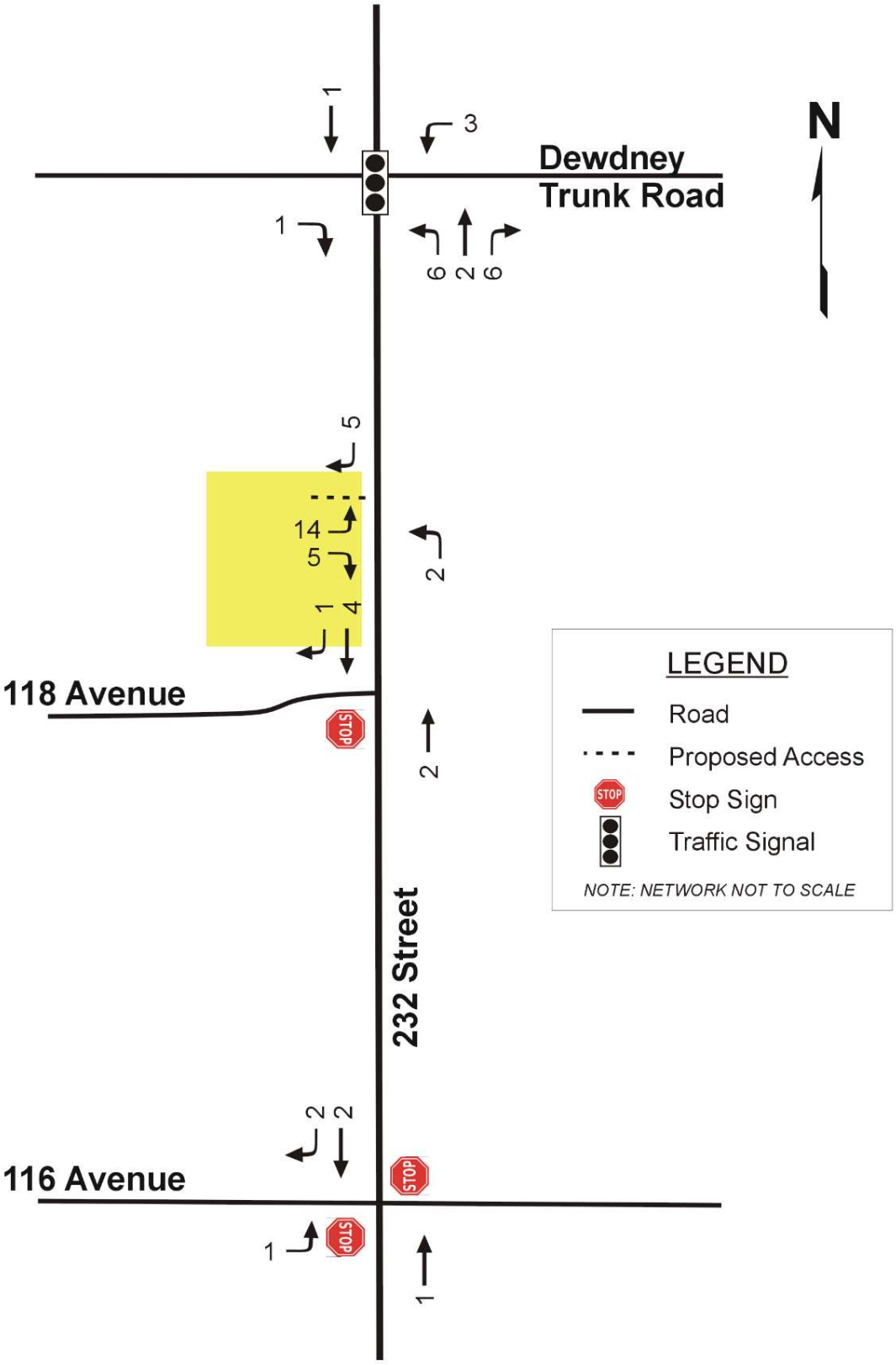
Other Matters

Appendix C: Example Figures

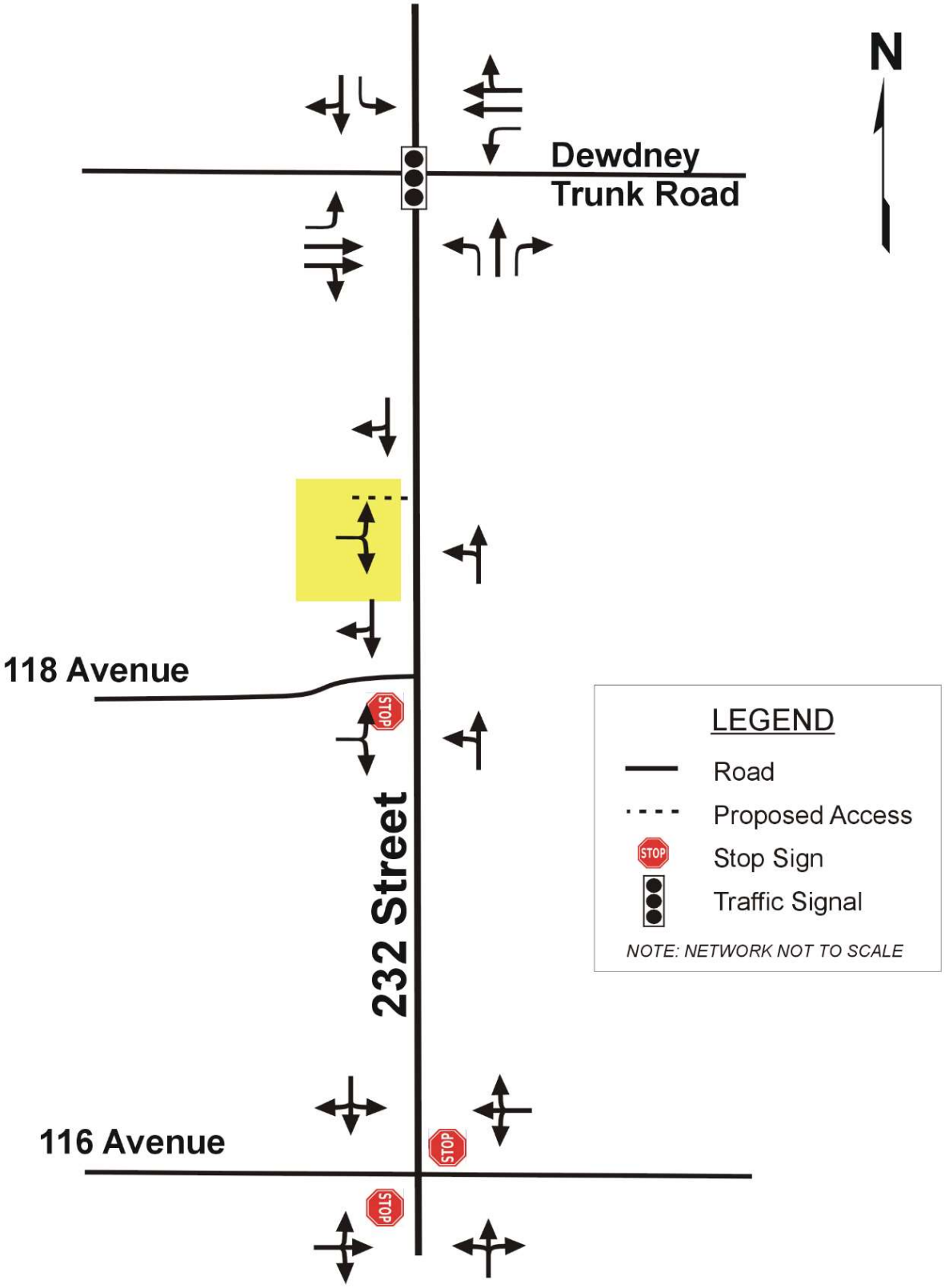
Example of a Base Traffic Figure



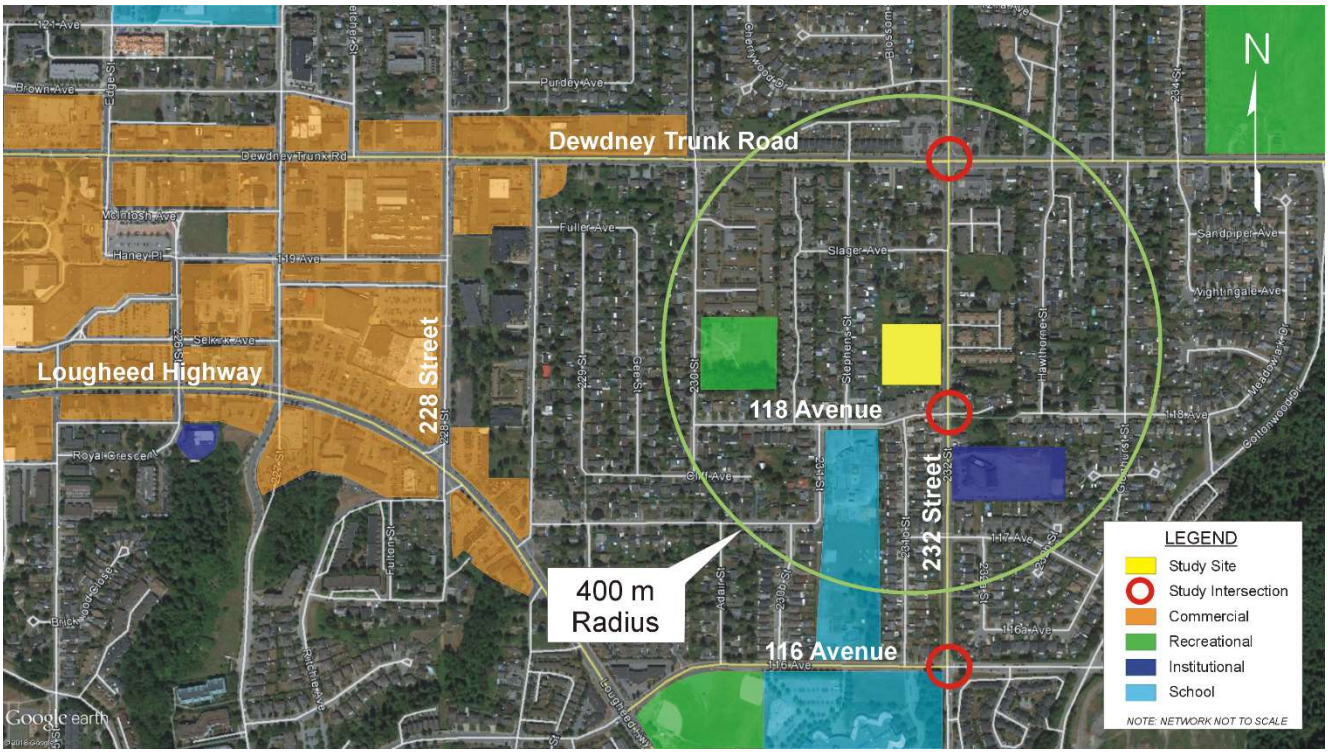
Example Trip Distribution Figure



Example Lane Configuration Figure



Example Study Area Figure



Appendix D: Example Tables

Example Trip Generation Table

Land Use	Peak Hour	Trip Generation Variable	Scope of Development	Vehicle Trip Generation Rate	Trip Rate Source	Directional Split		Passby Credit	Peak Hour Volumes (vph)		
						% in	% out		in	out	total
Multifamily Housing (Low-Rise)	Morning Peak	Dwelling Units	83	0.46	ITE 10th Edition - Code 220	23%	77%	0%	8	31	39
	Afternoon Peak			0.56		63%	37%	0%	29	18	47

Land Use	Peak Hour	Trip Generation Variable	Scope of Development	Vehicle Trip Generation Rate	Trip Rate Source	Directional Split		Passby Credit	Peak Hour Volumes (vph)		
						% in	% out		in	out	total
TownHouses	Morning Peak	Dwelling Units	45	0.57	Local Trip Rate	28%	72%	0%	7	19	26
	Afternoon Peak			0.67		66%	34%	0%	20	11	31

Example of Trip Distribution Tables

FROM / TO	WD AM PEAK HOUR		WD PM PEAK HOUR	
	INBOUND	OUTBOUND	INBOUND	OUTBOUND
North	18.9%	13.1%	18.6%	15.4%
East	41.5%	29.1%	24.8%	51.1%
South	8.8%	13.1%	11.3%	6.2%
West	30.8%	44.7%	45.3%	27.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

FROM / TO via	WEEKDAY AM PEAK HOUR		WEEKDAY PM PEAK HOUR	
	INBOUND	OUTBOUND	INBOUND	OUTBOUND
232 Street (N)	1	2	4	2
Dewdney Trunk Road (E)	3	6	5	5
116 Avenue (E)	0	0	0	0
232 Street (S)	1	2	2	1
116 Avenue (W)	1	2	1	1
118 Avenue (W)	0	1	0	0
Dewdney Trunk Road (W)	1	6	8	2
TOTAL	**7**	**19**	**20**	**11**
	26		**31**	

Example of Signalized Intersection Capacity Analysis Summary Table

INTERSECTION	TIME OF DAY	SCENARIO	PERFORMANCE MEASURE	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			LOS	NOTES
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
232 Street & Dewdney Trunk Road	Weekday Morning Peak	2017 Base	Volumes	55	559	69	63	983	258	170	166	56	367	232	54	C	WB thru-right is approaching capacity; SB left is over capacity
			V/C	0.74	0.43		0.27	0.85		0.75	0.60	0.19	1.05	0.75			
			Delay (s)	68.5	13.7		16.3	24.0		37.2	38.3	3.1	80.6	37.3			
			95% Queue (m)	32.0	55.0		17.2	138.8		34.4	46.0	2.4	103.4	69.8			
			Level of Service (LOS)	E	B		B	C		D	D	A	F	D			
		2019 Base	Volumes	57	581	72	66	1022	268	177	173	58	382	241	56	C	WB thru-right is approaching capacity; SB left is over capacity
			V/C	0.77	0.45		0.31	0.90		0.78	0.61	0.19	1.08	0.75			
			Delay (s)	73.0	14.4		17.8	27.9		39.1	37.7	3.2	90.5	37.0			
			95% Queue (m)	33.5	59.0		18.6	166.3		35.0	47.2	2.9	110.0	71.4			
			Level of Service (LOS)	E	B		B	C		D	D	A	F	D			
		2029 Base	Volumes	68	693	86	78	1219	320	211	206	69	455	288	67	E	Interseciton is approaching capacity
			V/C	1.19	0.53		0.46	1.06		1.02	0.74	0.24	1.29	0.88			
			Delay (s)	197.2	18.7		26.8	64.4		90.3	54.4	8.9	172.4	57.1			
			95% Queue (m)	34.7	81.0		27.0	249.2		77.4	71.6	9.3	173.5	113.2			
			Level of Service (LOS)	F	B		C	E		F	D	A	F	E			
		2019 Base + Site	Volumes	57	581	73	69	1022	268	183	175	64	382	242	56	D	Interseciton is approaching capacity
			V/C	0.77	0.45		0.32	0.90		0.80	0.61	0.21	1.08	0.75			
			Delay (s)	73.1	14.4		18.2	28.0		42.0	37.8	3.9	91.7	37.0			
			95% Queue (m)	33.5	59.0		19.6	166.3		35.9	47.6	4.1	110.3	71.6			
			Level of Service (LOS)	E	B		B	C		D	D	A	F	D			
		2029 Base + Site	Volumes	68	693	87	81	1219	320	217	206	75	455	589	67	E	Interseciton is approaching capacity
			V/C	1.19	0.53		0.48	1.06		1.06	0.74	0.26	1.29	0.88			
			Delay (s)	197.2	18.7		27.9	64.7		99.9	54.9	10.1	174.7	57.2			
			95% Queue (m)	34.7	80.9		28.6	249.2		81.3	72.4	11.1	174.6	113.4			
			Level of Service (LOS)	F	B		C	E		F	D	B	F	E			
	Weekday Afternoon Peak	2017 Base	Volumes	122	1139	105	36	541	268	65	128	41	425	176	69	C	SB left is over capacity
			V/C	0.47	0.77		0.34	0.66		0.19	0.41	0.12	1.07	0.51			
			Delay (s)	15.3	17.5		27.8	18.7		14.2	26.3	0.6	84.6	22.4			
			95% Queue (m)	20.1	112.4		15.9	72.0		12.6	29.5	0.0	120.7	48.4			
			Level of Service (LOS)	B	B		C	B		B	C	A	F	C			
		2019 Base	Volumes	127	1185	109	37	563	279	68	133	43	442	183	72	C	SB left is over capacity
			V/C	0.51	0.80		0.37	0.68		0.22	0.49	0.12	1.02	0.57			
			Delay (s)	17.0	19.3		30.5	19.7		15.6	31.6	0.6	70.1	25.4			
			95% Queue (m)	21.1	125.6		17.0	77.7		13.7	33.7	0.0	126.7	52.4			
			Level of Service (LOS)	B	B		C	B		B	C	A	E	C			
		2029 Base	Volumes	151	1412	130	45	671	332	81	159	51	527	218	86	D	Interseciton is approaching capacity
			V/C	0.82	0.94		0.67	0.78		0.35	0.65	0.17	1.11	0.55			
			Delay (s)	49.7	35.2		73.4	29.5		24.6	52.6	1.1	100.6	30.5			
			95% Queue (m)	57.7	245.7		32.0	133.5		21.0	56.4	0.0	179.1	82.4			
			Level of Service (LOS)	D	D		E	C		C	D	A	F	C			
		2019 Base + Site	Volumes	127	1185	117	42	563	279	70	135	48	442	187	72	C	SB left is over capacity
			V/C	0.51	0.81		0.42	0.68		0.23	0.49	0.13	1.03	0.57			
			Delay (s)	17.1	19.6		34.4	19.8		15.7	31.6	0.7	70.5	25.5			
			95% Queue (m)	21.3	130.3		20.3	78.2		13.9	34.0	0.0	127.0	53.4			
			Level of Service (LOS)	B	B		C	B		B	C	A	E	C			
		2029 Base + Site	Volumes	151	1412	138	50	671	332	83	161	56	527	222	86	D	Interseciton is approaching capacity
			V/C	0.82	0.94		0.75	0.78		0.35	0.65	0.18	1.11	0.55			
			Delay (s)	49.9	36.1		85.4	29.6		24.7	52.6	1.2	101.2	30.7			
			95% Queue (m)	58.0	248.7		35.8	133.9		21.4	57.1	0.0	179.8	83.4			
			Level of Service (LOS)	D	D		F	C		C	D	A	F	C			

V/C = Volume to Capacity Ratio

Intersection approaching capacity (LOS 'D' or 'E'); or approach demand near capacity (v/c 0.85 to 0.99)

Intersection equals or exceeds capacity (LOS 'F'); or approach demand exceeds capacity (v/c >= 1.00)

95% Queue length exceeds the capacity of existing storage bay (m)

Example of Unsignalized Intersection Capacity Analysis Summary Table

UNSIGNALIZED INTERSECTION	TIME OF DAY	SCENARIO	PERFORMANCE MEASURE	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			LOS	NOTES
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
232 Street & 116 Avenue	Weekday Morning Peak	2017 Base	Volumes	20	65	224	65	62	7	196	93	17	5	193	53	C	Okay
			V/C	0.65			0.33			0.68			0.56				
			Delay (s)	19.8			13.7			22.4			17.3				
			95% Queue (veh)	4.7			1.4			5.2			3.4				
			Level of Service (LOS)	C			B			C			C				
		2019 Base	Volumes	21	68	233	68	64	7	204	97	18	5	201	55	C	Northbound is approaching capacity
			V/C	0.70			0.36			0.74			0.60				
			Delay (s)	23.3			14.8			26.8			19.7				
			95% Queue (veh)	5.6			1.6			6.2			4.0				
			Level of Service (LOS)	C			B			D			C				
		2029 Base	Volumes	25	81	278	81	77	9	243	115	21	6	239	66	F	Intersection over capacity
			V/C	1.00			0.53			1.07			0.87				
			Delay (s)	69.3			22.2			93.4			45.8				
			95% Queue (veh)	13.2			3.0			15.3			8.9				
			Level of Service (LOS)	F			C			F			E				
		2019 Base + Site	Volumes	22	68	233	68	64	7	204	98	18	5	203	57	C	Northbound is approaching capacity
			V/C	0.71			0.36			0.75			0.62				
			Delay (s)	23.8			14.9			27.3			20.2				
			95% Queue (veh)	5.7			1.6			6.3			4.1				
			Level of Service (LOS)	C			B			D			C				
		2029 Base + Site	Volumes	26	81	278	81	77	9	243	116	21	6	241	68	F	Intersection over capacity
			V/C	1.01			0.53			1.08			0.89				
			Delay (s)	71.4			22.4			96.7			48.1				
			95% Queue (veh)	13.5			3.0			15.6			9.2				
			Level of Service (LOS)	F			C			F			E				
	Weekday Afternoon Peak	2017 Base	Volumes	51	83	103	14	34	3	165	215	29	5	88	24	B	Okay
			V/C	0.23			0.05			0.40			0.11				
			Delay (s)	11.6			9.6			16.2			9.6				
			95% Queue (veh)	1.8			0.3			4.4			0.7				
			Level of Service (LOS)	B			A			C			A				
		2019 Base	Volumes	53	86	110	15	35	3	172	224	30	5	92	25	B	Okay
			V/C	0.41			0.10			0.66			0.20				
			Delay (s)	12.1			9.7			17.5			9.9				
			95% Queue (veh)	2.0			0.3			5.0			0.7				
			Level of Service (LOS)	B			A			C			A				
		2029 Base	Volumes	63	103	131	17	42	4	205	267	36	6	109	30	C	Northbound is approaching capacity
			V/C	0.53			0.13			0.84			0.26				
			Delay (s)	15.2			10.7			30.7			11.1				
			95% Queue (veh)	3.1			0.4			9.3			1.1				
			Level of Service (LOS)	C			B			D			B				
		2019 Base + Site	Volumes	54	86	110	15	35	3	172	225	30	5	93	26	B	Okay
			V/C	0.41			0.10			0.66			0.21				
			Delay (s)	12.1			9.7			17.7			9.9				
			95% Queue (veh)	2.0			0.3			5.0			0.8				
			Level of Service (LOS)	B			A			C			A				
		2029 Base + Site	Volumes	64	103	131	17	42	4	205	268	36	6	110	31	C	Northbound is approaching capacity
			V/C	0.53			0.13			0.85			0.27				
			Delay (s)	15.3			10.7			31.2			11.2				
			95% Queue (veh)	3.1			0.4			9.4			1.1				
			Level of Service (LOS)	C			B			D			B				

Delay = Average Delay (seconds/vehicle)

Intersection approaching capacity (LOS 'D' or 'E'); ; or medium approach delays (25sec to <50sec)

Intersection equals or exceeds capacity (LOS 'F'); or high approach delays (=> 50sec)

95% Queue length exceeds the capacity of existing storage bay, queue is per vehicle for unsignalized intersection

Appendix E: TIA Checklist

	Yes	No
Referenced appropriate background documents		
Site statistics (development square footage, number of residential units, quantity parking, etc.)		
Study area figure		
ITE trip generation table		
Figures illustrating traffic volumes		
Analysis summary table (with and without development) Existing Opening Day Opening Day + 5 years Opening Day + 10 years		
Swept path analysis		
Sightline analysis		
Cost estimate for mitigation measures		
Summary and recommendations		
Site plan (appendix)		
Traffic count data (appendix)		
Analytical model output		

Maple Ridge