

2016 EDITION |

TRANSPORTATION IMPACT ASSESSMENT GUIDELINES

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INTRODUCTION: TRANSPORTATION IMPACT ASSESSMENT GUIDE



0.1 INTRODUCTION

These Transportation Impact Assessment (TIA) Guidelines are intended to assist land owners, developers, and consultants with the required content, presentation, and analysis methods which should be utilized in the preparation and presentation of transportation impact assessment reports.

While the following sections provide general guidance, analyses required in support of each development proposal may vary. Certain sections may or may not be required for each specific site, or additional analysis may be required. The City of Edmonton may request additional analysis or information on a case-by-case basis to support development.

A scoping meeting will be required with the City of Edmonton staff prior to commencing work on the report.

0.2 GUIDELINE OVERVIEW

This guide is divided into the following parts:

- Part 1: Requirements for various levels of Transportation Impact Assessments
- Part 2: Content/presentation requirements for various document sections
- Part 3: Analysis requirements, standards, and methodology

0.3 SUBMISSION REQUIREMENTS

Reports dealing with complex projects should be submitted in two parts. An initial submission should be provided to the City for review to confirm basic assumptions and methodology. Once the first part has been reviewed by the City, the second part should include the detailed analysis, conclusions and recommendations. Further detailed analysis may be requested based on initial findings of the report. Formal approval and acceptance of the transportation impact assessment report may require revisions to address all concerns.

Final versions of the report shall be stamped and signed by a Professional Engineer. A copy of the final report shall be submitted to the City electronically, either via email, web file transfer, or USB Drive. Electronic copies of Synchro files may also be requested by the City for all traffic analysis.

Interim drafts do not require stamping and signing.

A minimum of three hard copies of each draft are required for all comprehensive Transportation Impact Assessments (as defined in Part 1). Hard copies for other submissions may be required at the discretion of the City.



PART 1: TRANSPORTATION IMPACT ASSESSMENT REQUIREMENTS



1.1 WHEN IS A TRANSPORTATION IMPACT ASSESSMENT REQUIRED?

The following examples outline a few development characteristics which would require the completion of a Transportation Impact Assessment.

This list is not exhaustive.

- Area Structure Plans (ASPs) and ASP amendments
- Neighbourhood Structure Plans (NSPs) and NSP amendments
- When higher density/intensity is proposed in a developed area (“upzoning”)
- When land is redesignated from residential to commercial, or when a commercial component is added to a residential development
- When the proposed land use or development does not align with an existing plan (such as a Neighbourhood Structure Plan, Outline Plan, etc.), or where no such plans exist
- When the intensity of a site use increases substantially from previous TIAs
- When high trip-generating uses are proposed (i.e. Walmart, Costco, etc.).
- For special land use scenarios such as concert venues, sporting event centres, and recreation centres
- When there are significant community concerns or challenges with regard to traffic in the local community based on stakeholder engagement and feedback received either by the City or Developer



1.2 PRE-CONSULTATION & SCOPING

It is highly recommended that all applicants contact City of Edmonton staff prior to beginning work on any Transportation Impact Assessments to determine the required scope, content and the City's expectations and requirements, as well as to collect the necessary background information and data that may be available from the City.

Applicants are encouraged to discuss any anticipated analysis that may not be considered within these guidelines prior to undertaking detailed work. Similarly, applicants are encouraged to contact City of Edmonton staff regarding any concerns, issues, or anomalies that are observed while carrying out the analysis.

Report scope can be discussed via email, pre-application meetings, or via a technical advisory group, depending on the magnitude of the proposed development. To initiate discussions, information should be provided on:

- Location of the site
- Current land use for the site (existing zoning, accesses, uses, size, and buildings)
- Proposed development (proposed zoning, accesses, uses, size, and buildings)
- Proposed access locations & configurations
- Proposed trip generation rates and sources for the development
- Location and sensitivity of the adjacent community
- Existing transportation infrastructure

1.3 LEVELS OF ASSESSMENT

In general, there are three levels of transportation assessment that may be required in support of development:

1) *Traffic Memo*

The City will require a brief traffic memo in support of a development comparing proposed site generated traffic to current traffic volumes and/or previous TIA assumptions. The intent of this memo is to understand the net change in traffic volumes and determine whether further study is required.

2) *Update Report*

An intermediate level TIA will be required to address development scenarios which may include:

- Land Use Changes, Development Permit Application, Direct Control Zones, and “Further Study” Sites (including minor amendments to NSP/NSP) – The City will require a TIA in support of any development permit application that differs substantially from the assumptions made in previous TIAs at the rezoning or NSP stage, or when a particular site was identified as a “further study” area within the original TIA, or when the intended land use of the site was unclear at the zoning stage and necessitated additional study at the development application stage. This may include cases where noticeable increase

in development density is proposed for residential, commercial, or industrial development, when a land use has unique trip generating characteristics (such as concert venues or recreation centres), or when a major commercial (such as a Walmart, Costco or Superstore) or a mixed-use development is proposed.

- Development/Redevelopment in Established Areas (including greenfield and brownfield redevelopment) – The City will require a TIA in support of higher density development in an established area (which may include the downtown core, mature neighbourhoods, etc.), or major development on underutilized sites (low density, brownfield, or greenfield).
- Central Area Development – The City will require a TIA in support of any development in the central area that increases the number of units by more than 50. Analysis for the central area should include a larger focus on active modes and mode split considerations. The boundaries of the Central Area are defined in Appendix A.

3) *Comprehensive Report*

The City will require a comprehensive TIA in support of all major amendments to area plans (including NSPs and ASPs), new area plans, as well as major rezoning applications and major redevelopments in established areas. Analysis for Transit Oriented Developments and sites adjacent to transit avenues should include a larger focus on active modes and mode split considerations.



1.4 ASSESSMENT CONTENT

In general, each of the above Transportation Impact Assessment reports will need to cover the basic information as indicated in Table I.1. A detailed sample table of contents is provided in Appendix B.

It should be noted that these lists are not exhaustive – additional content may be required on a site-specific basis to deal with unique conditions at each location. The applicant will be required to determine the TIA elements required for each site

analysis based on context, and should discuss requirements with City staff prior to undertaking analysis.

Furthermore, the level of detail for each section differs between the documents based on the complexity of the analysis. That is, a comprehensive report, such as that required for a new NSP, will contain more detail in each section than required for a traffic memo completed for a development application.

TABLE 1.1 TRANSPORTATION IMPACT ASSESSMENT ANALYSIS
EXAMPLES OF REQUIRED CONTENT

	LEVELS OF ASSESSMENT		
	TRAFFIC MEMO	UPDATE	COMPREHENSIVE
Background	→	→	→
Study Scope, Goals, Methodology	→	→	→
Site Location	→	→	→
Existing Land Uses	→	→	→
Existing Transportation Network	→	→	→
Existing Traffic Volumes	→	→	→
Study Horizon (Recommended)	→ <i>(Existing)</i>	→ <i>(Short Term)</i>	→ <i>(Short & Long Term)</i>
Future Adjacent Land Uses & Roadway Network	□	○	→
Proposed Land Use & Site Plan	→	→	→
Access Locations	○	→	→
Trip Generation Rates & Gross Trips	→	→	→
Trip Adjustments (Internal/External, Mode Split, Pass By, Net Trips, etc.)	○	→	→
Trip Distribution, Assignment & Traffic Volumes (Peak Hour & Daily)	○	→	→
Proposed Roadway Cross Sections & Active Modes Network	□	○	→
Transit Considerations	○	→	→
Intersection & Access Analysis	□	→	→
Staging Analysis	□	○	→
Conclusions & Recommendations	→	→	→

LEGEND: → Required □ Not Required ○ May be Required (case by case, at the discretion of the City)

PART 2: ASSESSMENT CONTENT

2.1 INTRODUCTION & OVERVIEW

This part of the guidelines identifies the information that should be included in each section of a Transportation Impact Assessment. Details on how to present the data, including sample figures and tables, are provided in Appendix C.

In general, the TIA should include the following sections:

1.0 Introduction

2.0 Site Context

3.0 Study Context & Proposed Development

4.0 Site Traffic

5.0 Transportation Analysis

6.0 Staging/Short Term Analysis

7.0 Conclusions & Recommendations

8.0 Appendices

A more comprehensive sample table of contents is provided in Appendix B, and includes a list of commonly required sections for Transportation Impact Assessment reports.

Information regarding appendices, focusing on content, is also included towards the end of this part of the guideline.

The details in this guideline are not exhaustive, and are meant to present the common elements required in various levels of transportation assessments submitted to the City. Not every section is required for all Transportation Impact Assessment reports. Similarly, additional sections may be required to discuss site-specific considerations and constraints. As noted, discussions should be held with City of Edmonton staff to define the scope of the study.

2.2 SECTION DETAILS

1.0 Introduction

The introduction provides the necessary background information on the proposed development, including any historical/previous applications and analysis, and should include the following sub-sections:

1.1 Background

Provide history related to the transportation analysis, including the:

- Applicant
- Land owner
- Type of application the analysis is supporting (NSP, rezoning, development application, etc.)
- Brief summary of site history, including previous applications, previous TIAs, etc.

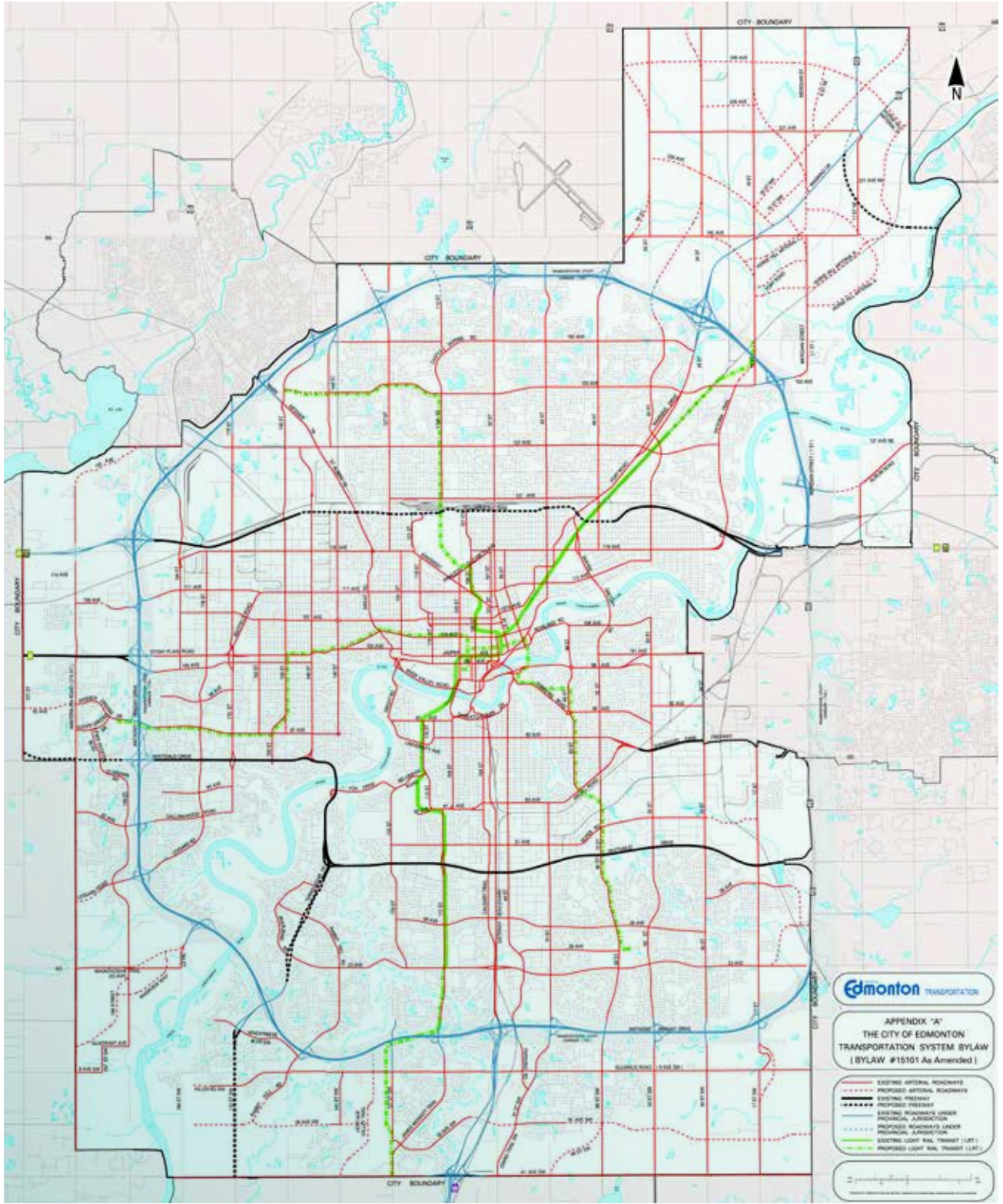
1.2 Study Scope / Goals

Provide an overview of the scope of the study, including:

- Study rationale – why the study is being undertaken
- Goals of the study – what are the aims of the study and what questions are to be answered
- Scope of the study – what does the analysis include

1.3 Study Methodology

For more complicated traffic analyses, provide an overview of the methodology, including the general steps, which was used in completing the analysis.



2.0 Site Context

The site context section includes information regarding the location of the site, adjacent land uses and adjacent transportation infrastructure, and should include the following sub-sections:

2.1 Site Location

Describe the location of the site in the context of the neighbourhood and greater City. This section should include a map that shows:

- For ASPs and NSPs, the location of the neighbourhood within the City
- For rezonings/DAs, the location of the site in the context of the greater neighbourhood

2.2 Existing & Adjacent Land Uses

Describe the existing land use on the current site and in the areas immediately adjacent. Provide land use characteristics and information such as:

- Urban or rural
- Residential, commercial, or industrial
- Single family homes, duplexes, townhomes, low-rise apartments, etc.
- Nearby major traffic generators
- If there are any schools or parks in the immediate area
- Proximity of the site to the North Saskatchewan River Valley (as defined in the North Saskatchewan River Valley Area Redevelopment Plan Bylaw 7188)



2.3 Existing Roadway Network

Describe the existing roadway network adjacent to the site. Include information on:

- Roadway classification (local, collector, arterial, freeway, etc.)
- Number of lanes
- Intersection design (flaring, channelization, etc.)
- Intersection traffic control (signal, stop-controlled, etc.)
- Road surface type
- Cross section type (urban, rural, semi-urban, etc.)
- Pedestrian and cyclist facilities
- On-street parking
- Parking restrictions, loading zones, and bus only lanes
- Posted speed limit
- Existing truck routes
- Existing transit service
- Existing bicycle routes
- Existing pedestrian priority areas
- Existing Mainstreet areas



2.4 Existing Railway Network

Describe the existing heavy rail network (if applicable). Include information on:

- Number of tracks
- Type of track (mainline, spur, siding, etc.)
- Location of roadway crossings
- Existing control devices at roadway crossings (uncontrolled, signed, lights and bells, arms, grade separation, etc.)
- Approximate number of trains utilizing tracks per day
- Any plans by the railway companies for future line expansion



2.5 Existing Transit Services

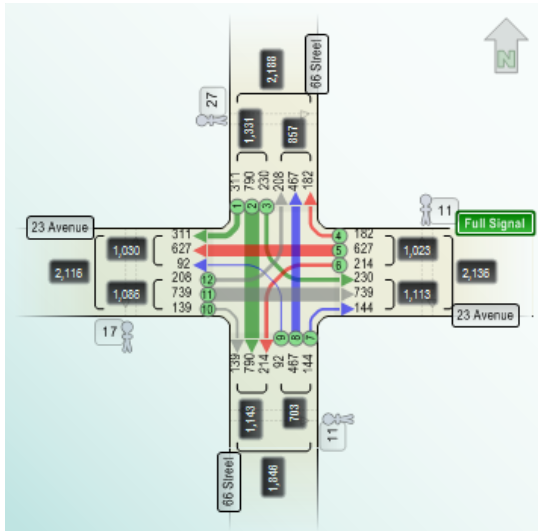
Describe any existing transit service available in the immediate area, including information regarding:

- Location of adjacent transit centres
- Location of existing and planned LRT (where applicable)
- Location of existing bus stops (where necessary)
- Number of routes servicing area (including current route numbers)
- Frequency of bus and/or LRT service in area (identifying whether bus service is regular, peak hour, or specialty service as applicable)

2.6 Existing Traffic Link Volumes

Provide existing daily traffic volumes on existing roadway links where possible, including a 5 year history of traffic volumes to identify any background growth patterns, if applicable.

Historical 5-year data should be presented in tabular form, while most recent volumes should be presented on a figure.



2.7 Existing Intersection Turning Movements

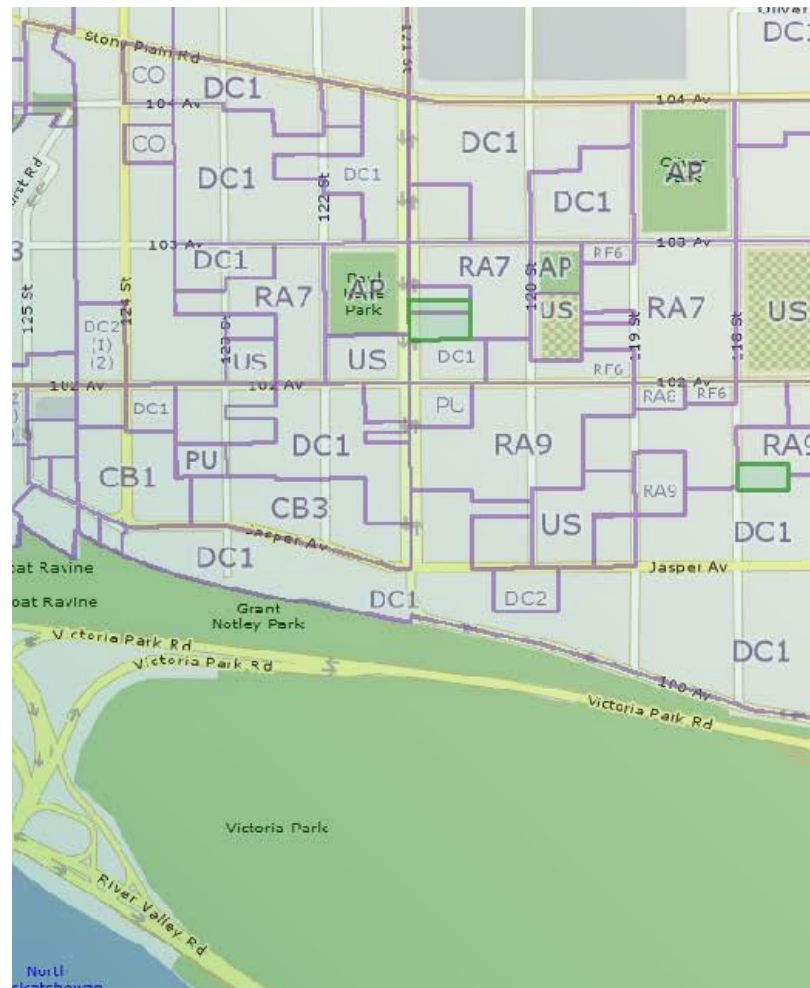
Where applicable, include a table or exhibit summarizing available turning movement count information. The table should include location of the count, source of the count, and date of the count.

3.0 Study Context & Proposed Development

This section identifies the context of the study and outlines the development being analyzed, and should include the following sub-sections:

3.1 Study Horizon

Identifies the analysis horizon year(s) and the rationale.

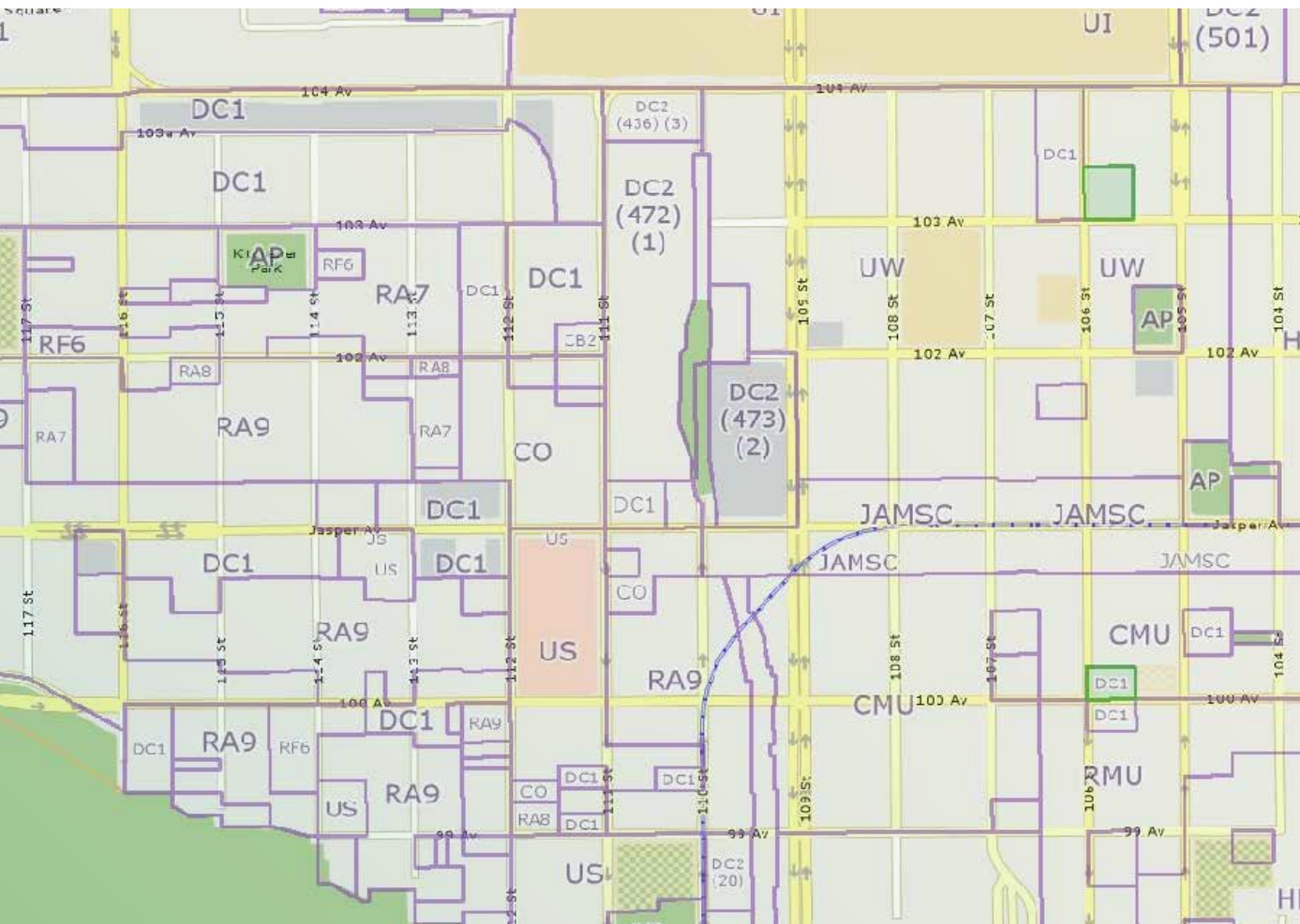


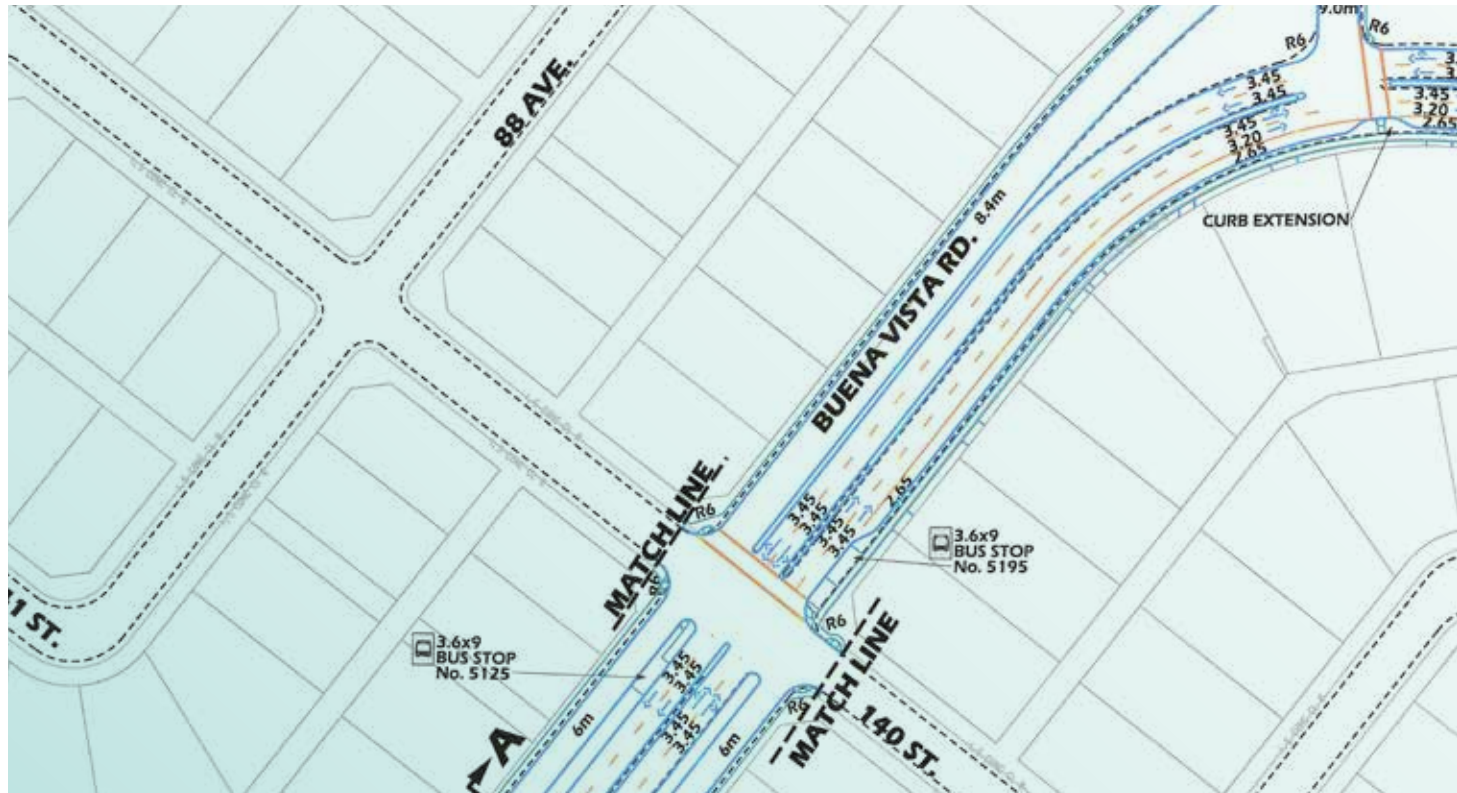
3.2 Currently Approved Land Use & Traffic Characteristics

This section will be generally applicable to TIAs completed in support of amendments to ASP/NSP, rezonings or major development permits. This section identifies the currently approved land uses and traffic characteristics for the site, based on the approved area plans and/or existing zoning, including but not limited to the following:

- A breakdown of existing land uses (residential, commercial, industrial, schools, religious assemblies, recreation centres, etc.), summarized in tabular form
- Table summarizing Land Use Statistics, if applicable

- Gross and Net Trip Generation Summary
 - For each land use, identify the trip generation rate, and the source. Additional discussion on non-residential trip rates may be required. Where available, this data should be sourced from the most recent TIA completed in support of the development. Where the trip generation rates used in the previous TIA are outdated, a comparison of the trips generated using the old trip rates should be made to the trips generated using the latest approved trip generation rates. For organizational purposes, this summary may be included as part of the overall gross and net trip generation discussion in Section 4.2.





3.3 Future Adjacent Land Uses

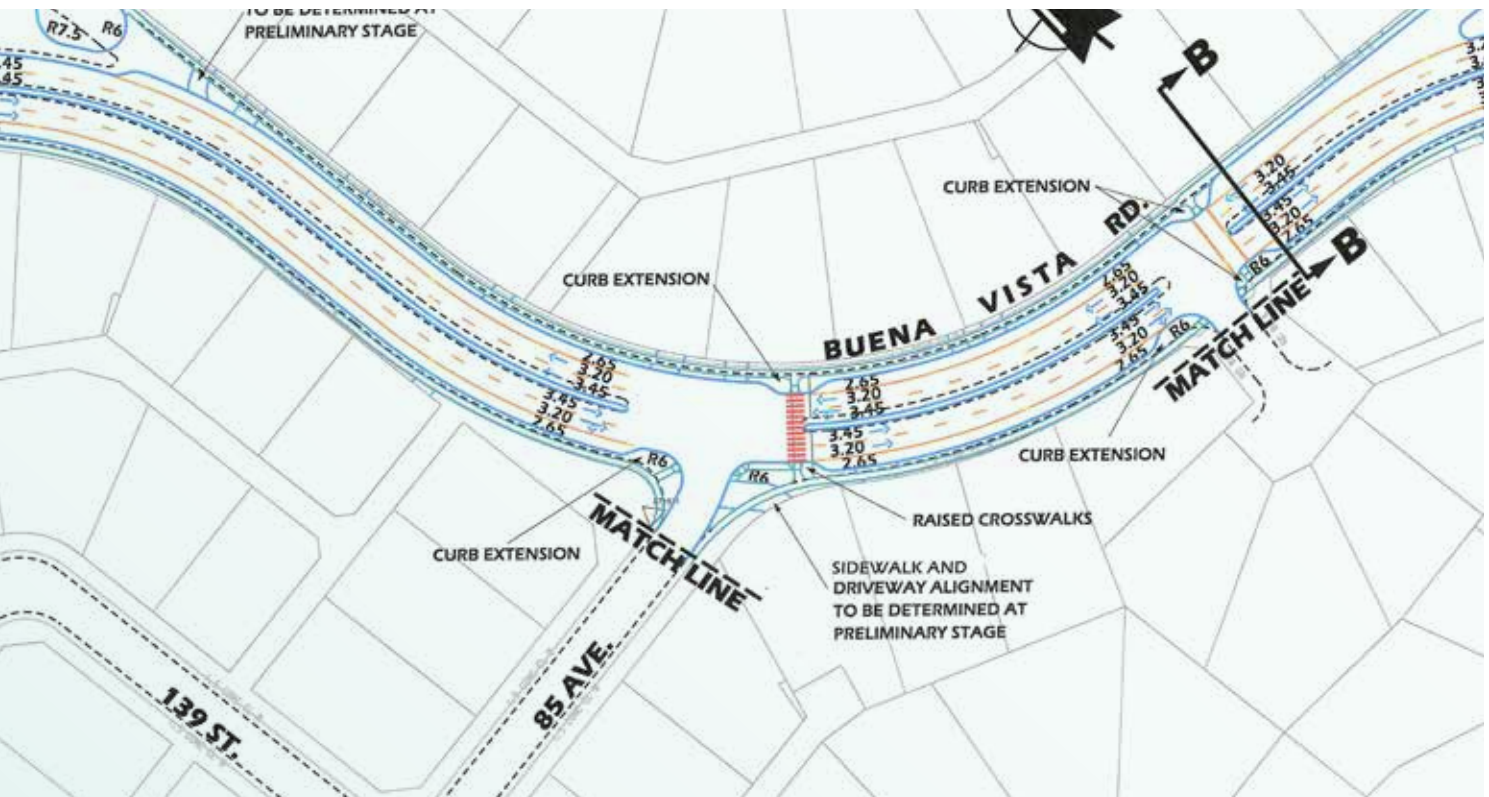
This section identifies any anticipated changes to land uses adjacent to the study area between the present day and study horizon year.

3.4 Future Adjacent Road Network

This section identifies changes to the roadway network that are anticipated to occur between the present day and study horizon year, as well as ultimate roadway configurations in the longer-term.

This should include any upgrades to the roadway infrastructure that is expected to occur (such as widening or grade separation), as well as any changes to the roadway network (such as roadway realignment or the addition of new roadways) and any future transit infrastructure (such as transit centres and LRT extensions and stations).

The future road network should be established in consultation with the City and should conform to any improvements outlined in the TIAs completed for Area Structure Plan documents, Neighbourhood Structure Plan documents, as well as concept and strategic plans.

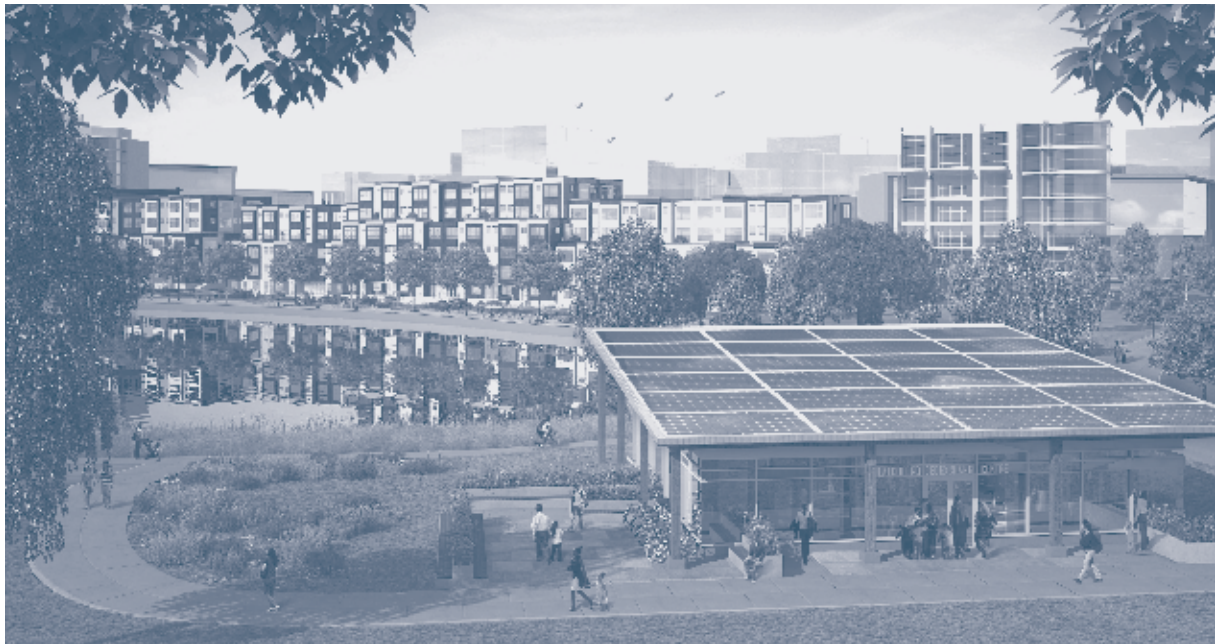


3.5 Background Traffic Volumes

This section determines the background traffic volumes that will be used in the analysis of the proposed development. Future background traffic volumes should be sourced according to the horizon year being used for analysis and the level of assessment – this may include applying growth rates to existing traffic counts, utilization of the City’s traffic model data, and other means.

This section should detail the process that was used to quantify the future background traffic volumes. For example, if background volumes were based on historical growth in traffic for the area, the rationale and methodology used to determine the future volumes should be detailed in this section. If background traffic volumes were based on the City’s traffic model (EMME Model), the methodology used (including any trips removed or added to the network) to quantify the presented volumes should be detailed.

The AM and PM peak hour and daily background traffic volumes should be summarized on figures showing the future roadway network. For major commercial centres, Saturday peak hour traffic should also be analyzed and shown.



3.6 Proposed Land Use/Development

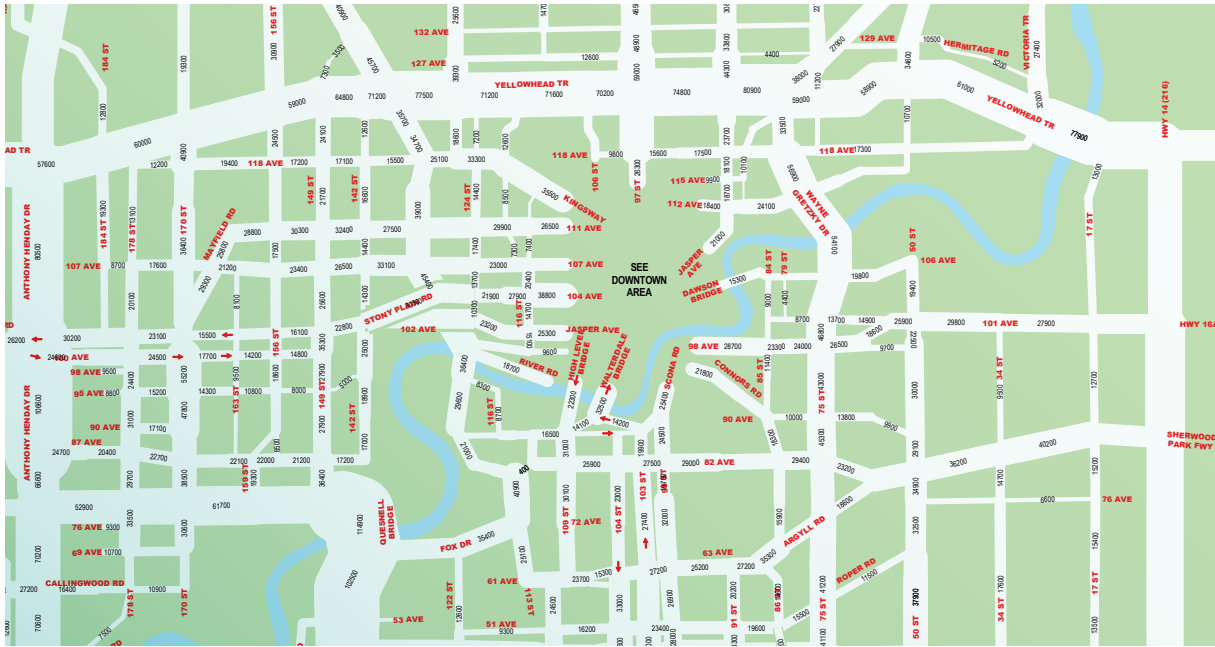
This section details the proposed land use/development for which the impacts are being analyzed. This section should include information regarding:

- Any existing land uses in the study area that are anticipated to be retained
- A land use concept for the proposed development, where applicable
- A site plan for the proposed development, where applicable
- Details regarding the size and staging of the proposed development, including:
 - A breakdown of proposed land uses (residential, commercial, industrial, etc.), summarized in tabular form. For ASP/NSP TIAs, this information should reflect the details contained in the plan documents, and a copy of the land use/development concept figure should also be provided in the report.

- Population statistics, including assumed area, density, units, population density and total population. This information should be summarized in tabular form.

- Commercial and industrial land use areas (if applicable), including site designations, assumed area, FAR (Floor Area Ratio), and corresponding GFA (Gross Floor Area) or employment. Text within the analysis document should detail the location, size, and anticipated development type for each site. This information should be summarized in tabular form.

- Other trip generating land uses (such as schools, religious assemblies, recreation centres, etc.), including site size and statistics related to trip generation (such as facility size, number of students, number of employees, etc.). Text within the analysis document should detail the location, size, and anticipated development type for each site. This information should be summarized in tabular form.



3.7 Proposed Roadway Network

This section details the roadway network proposed to accommodate the proposed development. This can include new roadways, improvements to existing roads, additional improvements to ultimate concept plans, and private roadways required in support of the development.

3.8 Proposed Access Location & Configuration

This section details the proposed access locations to large sites, such as multi-family, commercial, industrial, or institutional uses. Any direct accesses from individual sites to arterial roadways and major collector roadways should be identified. Proposed access strategies for adjacent sites should also be discussed to identify potential upgrades required to the base roadway network to support development. Access locations must meet the requirements of the City's Access Management Guidelines. The City will review access locations based on site context and traffic information.



4.0 Site Generated Traffic

This section details the assumptions, sources, and methodology used to estimate and assign trips to the roadway network, and should include the following sub-sections:

4.1 Trip Generation Rates

For each land use, identify the trip generation rate selected, and the source of data. Additional discussion may be required to justify trip generation rates. The trip generation rates used for analysis should be presented in tabular format at the end of the discussion. Information on acceptable trip generation rate sources is discussed in Part 3.

4.2 Gross Trip Estimates

This section summarizes the total gross trip estimates based on land uses and associated trip generation rates, with data presented in a tabular format. Additional details for large sites with multiple uses can be provided in an appendix.

4.3 Modal Split

This section details the recommended proportion (as a percentage) of trip reduction (if any) applied to gross trips to account for transit or alternate modes, and identifies land uses subject to modal split. Justification and rationale for the trip reductions should also be discussed.

4.4 Pass-by Trip Capture

This section details the pass-by trip capture rates (as a percentage) assumed for each non-residential land use for the AM peak, PM peak, and daily traffic, as applicable. The text should detail the rationale for the pass by trip rates for each site, and a summary should be provided in tabular format or illustrated on an exhibit.

4.5 Internal & External Trips

This section discusses the internal and external trip captures for various non-residential components (including commercial, mixed-use developments, schools, parks, recreation centres, etc.). The rationale and methodology for each site should be detailed in the text, and a summary should be provided in tabular format.



4.6 Net Trips

This section summarizes and presents the net residential and non-residential trips, accounting for the various reductions discussed in the previous sections. The information should be presented in tabular format, with a separate table for residential and non-residential land uses.

4.7 Trip Distribution & Assignment

This section discusses internal and external trip distribution assumptions. The rationale for the internal trip distribution should be identified.

External trip distributions for residential and employment development should be based on the City's latest Origin-Destination Tables. Any deviation from the City's O/D tables should be outlined in this section, and the rationale and methodology for the changes should be outlined. The resulting modified external O/D table should be presented in the body of the document in tabular format and trip distribution percentages for the site should be presented on a figure.

External trip distributions for commercial and educational development should be based on anticipated catchment areas.

4.8 Site Generated Traffic Volume Estimates (AM, PM, Daily)

Site generated traffic volumes for the peak hours and daily volumes should be clearly illustrated on figures. Traffic volumes should be illustrated on the proposed ultimate/future roadway network to be analyzed (as a single line drawing), with peak hour volumes shown by movement at each intersection. Daily volumes should be provided mid-block between key intersections.

4.9 Total Traffic Volume Estimates (AM, PM, Daily)

The total traffic volumes for the AM peak, PM peak, and daily volumes should be summarized on separate figures, one for AM and PM peak, and one for daily volumes. Traffic volumes should be illustrated on the proposed ultimate/future roadway network to be analyzed (as a single line drawing), with peak hour volumes shown by movement at each intersection. Daily volumes should be provided mid-block between key intersections.

5.0 Transportation Analysis

This section details the results of the transportation analysis completed in support of the development. The transportation analysis section should include the following sub-sections:



5.1 Active Modes

This section deals with non-auto modes of transportation, including pedestrians and cyclists. It should identify key destinations and active modes corridors, any gaps within the existing active modes network, as well as potential corridors for development using Complete Streets principles. The discussion should include recommendations regarding the type of facilities based on land use context.

The report should also include identification and discussion of any land uses which are anticipated to generate high pedestrian movements, cyclist trips, or transit ridership (such as “town centre” or “main street” developments, recreation centres, high schools, etc.). The report should include discussion regarding additional measures to accommodate higher active modes user concentrations, as well as any areas which are to be designated as pedestrian priority zones and any associated special signal timing requirements.

For site specific transportation analysis, the discussion should also include examination of potential conflict points between various modes, such as pedestrians, cyclists, and motor vehicles, as well as recommendations regarding mitigation measures to decrease conflicts.

The resulting major pedestrian priority areas, potential Complete Streets, active modes corridors, missing links, as well as key crossings of major roadway and railway corridors should be identified on a map. Formal review of Complete Streets cross sections occurs outside of the transportation analysis review, typically as part of the subdivision process. For information regarding the review process for custom cross sections, please contact City of Edmonton staff.

5.2 Proposed Cross Sections

This section identifies the starting point for roadway cross sections utilized in the analysis, including link volume thresholds for various local, collector, and arterial roadway cross sections. The thresholds utilized should be summarized in tabular form.

This section should also identify the proposed cross section for each key roadway link, based on the volume thresholds, presented either in tabular format or graphically, including potential Complete Streets corridors.

5.3 Truck Routing

This section discusses any proposed/future truck routes, including whether existing truck routes are anticipated to be added, retained, or removed with ultimate development.



5.4 Transit Considerations

This section identifies any transit facilities (existing or planned) that which be considered with the proposed development. This can include location of transit centre and transit centre accesses, park and ride facilities, and future LRT extensions.

Any portions of the development which exceed the walking distance requirements set out in the transit service guidelines should be identified in the text, and graphically on a figure.



5.5 Intersection Analysis Assumptions

This section identifies assumptions and methodology used in the transportation analysis. Details should include the software utilized to complete the analysis (including version number), as well as the methodology used.

The section should also:

- Detail the criteria which were used to determine whether an intersection or movement is considered to be at or over capacity, including threshold v/c and LOS values
- Summarize the inputs that were utilized in the software analysis, including, but not limited to saturation flow rates, minimum lane widths (where they differ from defaults), lost time adjustment factors, peak hour factors, and heavy vehicle percentages
- Define any special notations that are used in the balance of the reporting, including how lanes configurations are identified, any abbreviations or acronyms used, etc.
- Detail any overarching assumptions regarding signal phasing or timing



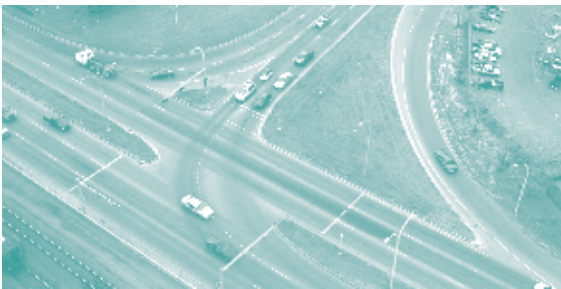
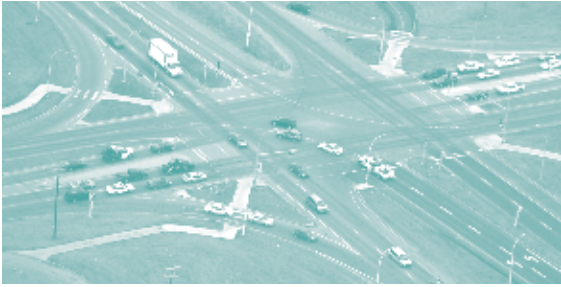
5.6 Intersection & Access Analysis

This section should address the configuration of existing intersection geometry, proposed/ultimate intersection geometry, and access operations.

The use of roundabouts should be explored within the TIA for all non-truck route corridors in new neighbourhood structure plans or where there are no approved concept plans for adjacent corridors.

Roundabouts should be considered when:

- Permitted by geometrics, access spacing and intersection spacing;
- Adjacent land use is envisioned to be street oriented;
- Traffic calming is desired;
- Operations may be improved with a roundabout; and/or,
- Alternate cross sections are proposed



Where roundabouts are not proposed to be utilized when these conditions exist, rationale should be provided for why roundabout treatments were not considered. Each of the major intersections should be presented as separate sub-sections, with each sub-section including information regarding the assumed lane configuration at each approach, a synopsis of the analysis highlighting any key findings (including movements at or over capacity), and any recommended improvements.

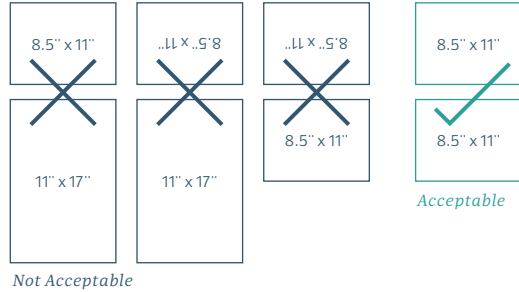
If a particular intersection is at or exceeding capacity, recommendations should be made regarding potential improvements. Any recommended configurations should be tested, with discussions and analysis summaries provided in the report.

Should it not be possible to solve capacity issues due to constraints (such as insufficient right of way), the transportation analysis should examine methods for reducing traffic generated by the development, which may include revising the mix of land uses, revising the intensity of land uses, examining trip distribution, exploring TDM measures, evaluating transit opportunities, etc. Discussions should be held with City staff to verify assumptions and approaches to dealing with trip reductions in these situations. When comparing intersection operations pre and post-development, tables and discussion should be provided for the existing intersection (based on current counts and configurations), future intersection (based on total post-development traffic), and improved intersection (if geometric improvements are necessary to accommodate development traffic).

The results for each intersection should be summarized in tabular form. Sample tables are provided for signalized intersections, unsignalized intersections, and collector and local road intersections in Appendix C.

Where multiple minor intersections (collector/collector, collector/major local, etc.) are being analyzed in NSP and ASP TIAs, the presentation format can be condensed to save space in the document, as shown in Appendix C. Text should be included before the table to identify any operational constraints, or any improvements required to accommodate development above and beyond the standard roadway cross section and intersection treatment.

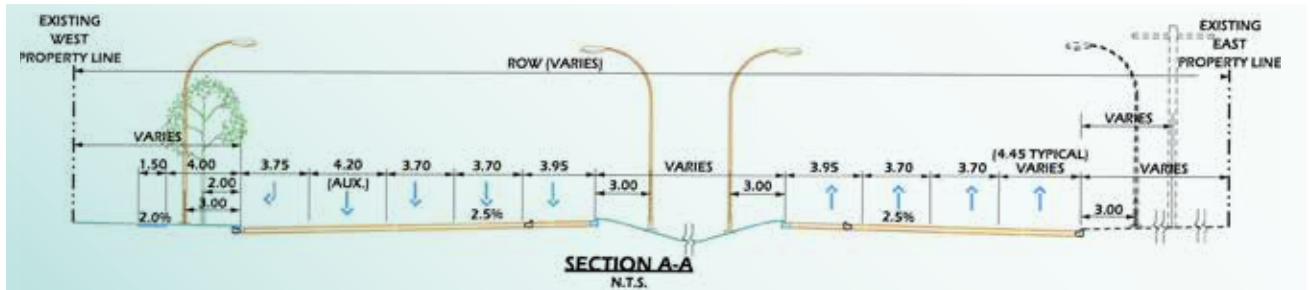
ACCEPTABLE PAGE LAYOUT



The summary analysis for multiple minor intersections can be combined on a single sheet, and sheets can be double sided. However, data should be presented on 8.5 x 11 pages (no 11x17 pull outs) and oriented such that the tables flow from one page to the next. Headers for all columns are to be provided at the top of each sheet.

5.7 Recommended Cross Section & Intersection and Access Treatment Summary

This section graphically summarizes the recommended roadway cross section requirements, as well as the recommended intersection lane configurations and control types, as shown in Appendix C. This information should be presented in graphical form on a figure overlaid with the site plan/development concept. Separate figures may be required for cross section and intersection treatments for minor and major roads in ASP/NSP analysis to present the data in a clear and readable manner.



6.0 Staging/Short Term Analysis

In some cases, the City may require that staging analysis be completed in support of a particular development. The scope of the staging analysis should be discussed with City of Edmonton staff. Typically, this analysis is requested to determine roadway requirements for the first stage of development, to determine intersection operations at a key interim horizon, or to identify development thresholds for major infrastructure upgrades (such as the widening of arterial roads or construction/upgrade of interchanges).



6.1 First Stage Development Analysis

Staging analysis is required to determine the roadway upgrades necessary for the first stage of development, as well as the maximum amount of development which can occur before subsequent roadway upgrades are required.



6.2 Interim Horizon Analysis

Staging analysis may be required for an interim horizon which corresponds to a major milestone in the development. This analysis may include partial build-outs, or the construction of major infrastructure (such as interchanges or LRT services) which does not necessarily coincide with full build-out of the development. In some cases, this may include analysis of the maximum amount of development which can occur prior to the construction of planned infrastructure (such as how much development can occur before LRT is constructed).

6.3 Infrastructure Thresholds

Staging analysis may be required to determine development thresholds which require upgrades to adjacent infrastructure. This may include investigating level of development triggering the need for a grade separation, or when upgrades will be required to an existing interchange. The aim is to identify the approximate level of development at which major infrastructure investments may be required to alleviate traffic congestion.



7.0 Conclusions & Recommendations

This section summarizes the findings and key recommendations of the study. It should serve as a quick reference for the future to determine specific conditions which will be attached to a particular development. The conclusions and recommendations section of the analysis document should include the following sub-sections:



7.1 Synopsis

For comprehensive analysis, this section provides an overview of the work that was completed. It should include a summary of the proposed development, including location, land uses, populations, and special facilities, and an overview of the analysis and key findings.

7.2 Conclusions

This section provides a conclusion of the analysis, including identifying whether intersections operate within the City's level of service guidelines and whether any intersections or links will operate under congested conditions.



7.3 Recommendations

This section summarizes the key recommendations of the TIA in point form. This includes information on:

- A summary of recommended roadway cross sections, including any non-standard cross section requirements
- Any roadways requiring parking bans
- Any special intersection treatments
- Any planning studies required in support of a development
- Any recommendations regarding access location and configuration
- Any roadway upgrade requirements
- Any staged upgrade requirements

7.4 Areas of Further Study

This section should outline any subsequent analysis that will be required with future development. This may include:

- Configuration of accesses to commercial sites which may require additional review once tenant mixes are established
- Situations where tenant mixes include major traffic generators which were not assumed in the original analysis (such as Walmart, Costco and Superstore)
- Flagging of intersections that will require further analysis with adjacent development
- Identifying areas where future development is uncertain due to current ownership (such as lands owned by the Province or non-participating owners)

For traffic memos, this section may include a recommendation that more detailed analysis is required to support the proposed development.

8.0 Appendices

The TIA should also include appendices of all relevant reference documents. These appendices should include all supporting information which was used in completing the analysis, including (but not limited to):

- EMME Model Plots
- Relevant sections of previous TIA documents used in support of the analysis
- ASP and NSP land use figures and statistics tables (if not shown directly in the body of the report)
- Rezoning and development application site plans (if not shown directly in the body of the report)
- Detailed trip generation estimates (if additional calculations were completed that are not shown directly in the body of the report)
- Assumed development for parcels (if there are parcels which may redevelop from uses assumed in the NSP)
- Origin-destination tables, if modified from the standard City tables
- Traffic count summaries (if completed by Consultant, copies of City of Edmonton traffic counts are not required to be provided as an appendix)
- Any additional justification/rationale/support used for analysis (such as white papers, best practice, excerpts from other jurisdictional guidelines, etc.)
- Synchro intersection summaries, which should at minimum include information regarding signal phasing, queue lengths, delays, LOS, v/c, traffic volumes, and lane configuration, where electronic Synchro files are not provided



9.0 Electronic & Paper Files

All submitted Transportation Impact Assessments should be provided to the City of Edmonton in PDF electronic format.

Where applicable, electronic copies of all final Synchro analysis files should also be provided.

Electronic files can be submitted to the City either via email, web transfer, or USB drive.

The City will identify whether paper copies of the documents are required, and how many copies shall be submitted. Typically, for comprehensive TIAs, a minimum of three bound hard copies are required for all submissions to facilitate review.

Final copies of the report must be signed and stamped by a Professional Engineer registered to practice in Alberta.



PART 3: ASSESSMENT METHODOLOGY

3.1 INTRODUCTION & OVERVIEW

This part of the guideline details the basic analysis methodology that should be utilized in all traffic analyses completed in support of development within City of Edmonton.

3.2 FUTURE ADDITIONS

While this document provides some general guidance regarding the following elements, please note that future sections may be added to provide additional details and clarifications regarding:

- Mixed-use development
- Mode splits
- Multi-modal assessments
- Traffic Demand Management (TDM)
- Transit Oriented Development (TOD)
- Level of Service (LOC) & Volume to Capacity ratios (v/c)
- Area Redevelopment Plans (ARPs)



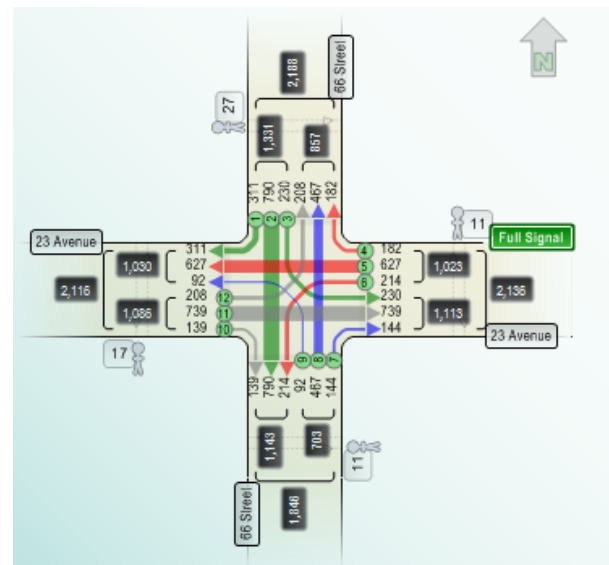


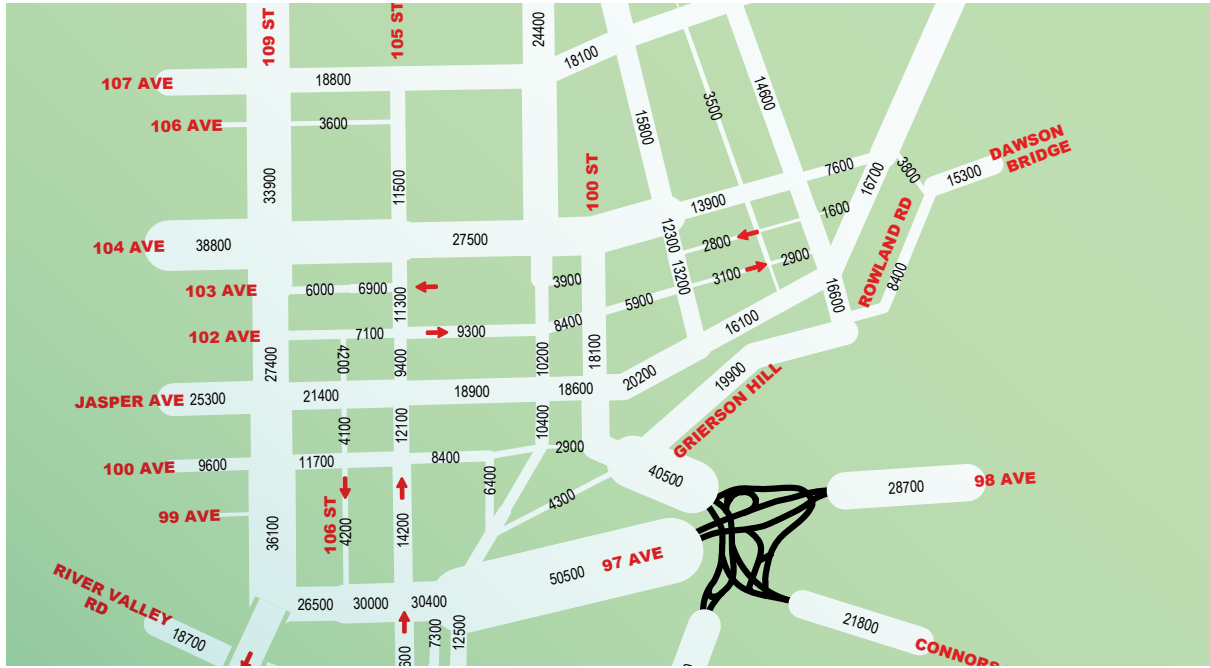
3.3 TRIP GENERATION RATE SOURCES

Trip generation rates should first be selected from the City of Edmonton’s custom trip generation rates that have been compiled for sites within the City. A copy of the City’s trip generation rates is available in Appendix D.

Should no City-specific trip generation rates exist for a particular land use, trip generation rates from the latest edition of the ITE Trip Generation Manual should be used. For ITE land use codes with limited site observations, discussions should be held with City of Edmonton Staff to determine applicability to a particular development.

In some circumstances, the City may permit the use of custom, site specific trip generation rates based on similar projects in the Edmonton region, as well as development of trip rates utilizing first principles. These cases must be discussed with City of Edmonton staff prior to proceeding with the TIA.





3.4 ANALYSIS SOFTWARE

Intersection analysis should be completed using the HCM 2010 method for signalized and unsignalized intersections. In order to be able to verify the findings of the TIA, the City prefers that all analysis be completed using Synchro Studio 9.

Electronic files should be submitted in Synchro Studio 9.0 format or Synchro Studio 7.0 format, unless otherwise discussed with City staff.

Roundabout analysis should be completed using SIDRA.

Additional analysis utilizing other microsimulation tools, such as VISSIM, may also be completed, particularly for major developments adjacent to current and future LRT corridors.



3.5 EXISTING TRAFFIC COUNTS (TURNING MOVEMENTS & MID-BLOCK VOLUMES)

The City of Edmonton conducts traffic counts for all major intersections and mid-block locations, typically on a 2 to 3 year cycle. Some traffic data is available online on the City’s website at:

edmonton.ca/transportation/traffic_reports/traffic-volumes-turning-movements.aspx

Additional turning movement and mid-block count data may also be available. Please contact City of Edmonton staff to determine whether additional count data is available.

Where traffic counts do not exist for key intersections required for analysis, or where available traffic count information is out of date, the applicant will be required to complete peak hour and/or daily traffic counts as part of the TIA.



3.6 TRAFFIC FLOW MAPS (AADT MAPS & TABLES)

Historic traffic flow maps and tables are available on the City's website at:

edmonton.ca/transportation/traffic_reports/traffic-reports-flow-maps.aspx

3.7 REGIONAL TRAVEL MODEL DATA

The City actively maintains a regional travel model in EMME to forecast longer term traffic demand. The model is updated regularly to incorporate land uses approved under ASPs/NSPs within the City and incorporate changes at the regional level on an as needed basis. This model presents a high-level overview of anticipated traffic volumes along key roadway links throughout the City. Use of the EMME model data may not be appropriate for all traffic analyses.

The City can provide standard EMME model plots for the study area typically representing the future 30 year horizon. The information includes daily link volumes, AM/PM link volumes, AM/PM link v/c, truck traffic, number of lanes, zonal employment and zonal population.

Select zone analysis (gate analysis) may also be provided, depending on the level of assessment and analysis requirement.

Please contact City of Edmonton staff for additional information and to discuss applicability to traffic analysis for a particular site.

3.8 ORIGIN/DESTINATION (O/D) TABLES

The City actively maintains origin/destination tables based on the regional household travel survey and EMME model to assist in trip distribution and assignment. For a copy of the latest O/D tables, contact City of Edmonton staff.

3.9 SYNCHRO SETTINGS

The following recommended setting should be observed in the Synchro analysis:

TABLE 3.1 RECOMMENDED SYNCHRO SETTINGS

SETTING	RECOMMENDED VALUE
% trucks	As per EMME plot package or traffic counts, if available. 3% otherwise.
Saturation flow rate:	
Suburban (outside of inner ring road), Whitemud Drive, Yellowhead Trail	1,900 pcu/hr/ln
Inner Ring, Low Geometric Standard (Below TAC Standards)	1,750 pcu/hr/ln
Inner Ring, High Geometric Standard (Meeting TAC Standards)	1,850 pcu/hr/ln
Minimum Lane Width	3.6 m (unless lanes under 3.3 metres are being considered, in which case use actual lane width)
Grade	0% (unless dealing with steep slopes > 5%)
Total Lost Time Adjustment Factor	0.5 ¹
Peak Hour Factor	1.0 ¹
Lane Utilization Factor	1.0 ¹
Link Speed	As per posted speed (50 km/h for local & collector, 60 km/h for arterials, 70 km/h for highway penetrators)
Pedestrian Walk Time & Don't Walk Time	To be calculated based on number of lanes and a pedestrian speed of 1.1 m/sec
Pedestrian Walk Time & Don't Walk Time	To be calculated based on number of lanes and a pedestrian speed of 1.1 m/sec

Notes: ¹ These values may be modified for specific circumstances.

3.10 CURRENT V/C & LOS REQUIREMENTS

Subject to further review in the future, current operational standards for intersections within the City of Edmonton are as follows:

- Short-Term (10 – 15 years)
Operations: $v/c < 0.85$, $LOS \leq D$
- Longer-Term (30 – 40 years)
Operations: $v/c < 0.95$, $LOS \leq E$

These standards shall apply to all greenfield TIAs. Deviation from these requirements may be permitted for analysis in support of development on a case-by-case basis.

3.11 APPROVED CONCEPT PLANS

The City maintains a repository of active/ approved concept plans for arterial roads. The City can provide copies of the latest concept plans (in PDF and DGN format) as requested. Where available, concept plan road configurations should be used as the basis for the future roadway configuration in analysis.

3.12 EXISTING SIGNAL TIMING

Timing plans for existing signals may be available through the City. Please contact City of Edmonton staff to obtain a copy of existing timing plans.

3.13 SIGNAL PHASING

All dual lefts with opposing traffic (regardless of roadway classification or opposing traffic volume) should be analyzed using protected-only phasing, as per the City's current signal timing processes.

All dual rights should be analyzed as no right-turn on red, as per the City's current signal timing processes.

3.14 MINIMUM PEDESTRIAN CROSSING TIMES

By default, minimum pedestrian crossing times should be observed at all intersections.

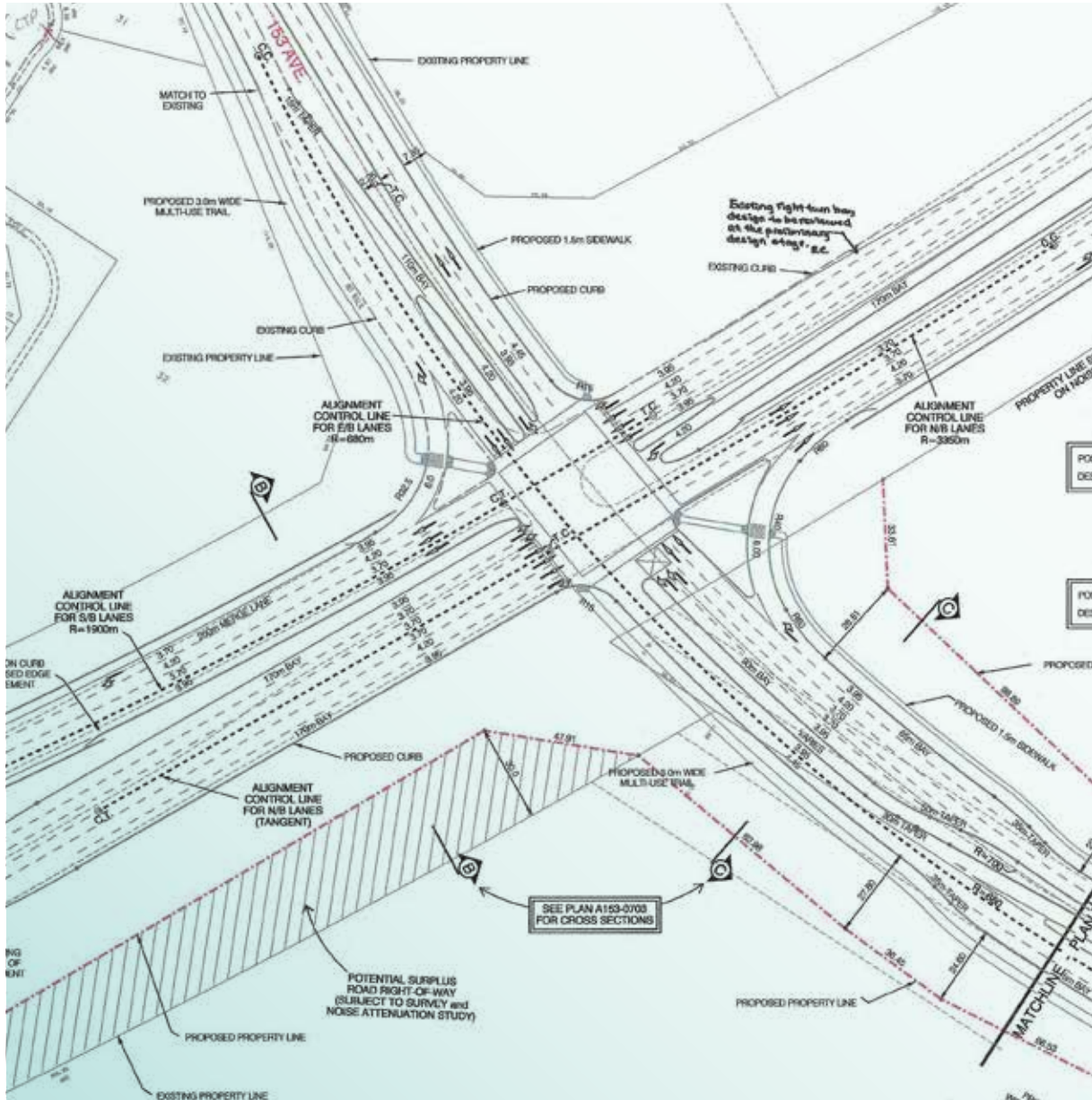
Locations where pedestrian actuation is required to accommodate projected traffic volumes should be clearly identified in the TIA. In locations that have been identified as “pedestrian priority crossings”, minimum pedestrian crossing times must be accommodated within the Synchro analysis at all times.

3.15 MODE SPLIT

In general, subject to further review, a 5% mode split (transit reduction) can be assumed for developments. A higher mode split may be used in situations where a development qualifies as a Transit Oriented Development (TOD) as outlined in the City's TOD Guidelines, or where it can be demonstrated as appropriate.

The use of mode splits exceeding 5% must be reviewed with the City. A detailed explanation of any larger mode split, including justification and rationale, must be included as part of the TIA.





3.16 TRAFFIC VOLUME THRESHOLDS

Traffic volume thresholds for various roadways shall be established in consultation with the City, and should take in to consideration the development context on a case by case basis.

The Transportation Association of Canada (TAC) Geometry Design Guide “Characteristics of Urban Roads” table should be used as the basis for daily volume thresholds. Table 3.2 provides a high level overview of daily link volumes based on TAC which can serve as a starting point for establishing core lane requirements for traffic analysis. The TIA shall determine whether additional core, auxiliary, or turning lanes will be required to facilitate acceptable operations. Actual volumes which can be accommodated on a given road will depend on a number of factors, including, but not limited to, parking, driveway and access locations, intersection spacing, intersection controls, bus frequency, and railway crossings. Rational shall be provided wherever design volumes exceed these thresholds, or if modified thresholds are being utilized.

TABLE 3.2 GENERAL VOLUME THRESHOLDS IN VEHICLES PER DAY (VPD)

ROADWAY CROSS SECTION	APPLICABLE DAILY VOLUME
9.0 m Local Road	up to 1,000 vpd
Two Lane Collector	5,000 vpd typical (up to 10,000 vpd with mitigation) ¹
Four Lane Collector	8,000 vpd typical (up to 15,000 vpd with mitigation) ¹
Two Lane Undivided Arterial	up to 12,000 vpd
Four Lane Undivided Arterial	up to 20,000 vpd
Four Lane Divided Arterial	up to 40,000 vpd
Six Lane Divided Arterial	up to 60,000 vpd

Notes: ¹Mitigation measures may include parking restrictions, limitation and/or removal of front drive access, intersection spacing, and access control.

APPENDIX B

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2.0 Site Context	4.9 Total Traffic Volume Estimates (AM, PM, Daily)
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2.2 Proposed Development	5.1 Complete Streets and Active Modes
2.3 Existing and Adjacent Land Uses	5.2 Proposed Cross Sections
2.4 Existing Roadway Network	5.3 Truck Routing
2.5 Existing Railway Network	5.4 Transit Considerations
2.6 Existing Transit Service	5.5 Intersection Analysis Assumptions
2.7 Existing Traffic Volumes	5.6 Intersection Analysis
2.8 Existing Intersection Turning Movements	5.7 Recommended Cross Section & Intersection and Access Treatment Summary
3.0 Study Context	6.0 Staging/Short Term Analysis
3.1 Study Horizon	6.1 First Stage Development Analysis
3.2 Future Adjacent Land Uses	6.2 Interim Horizon Analysis
3.3 Future Adjacent Road Network	6.3 Infrastructure Thresholds
3.4 Future Background Traffic Volumes	7.0 Conclusions & Recommendations
3.5 Proposed Land Use/Development	7.1 Synopsis
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3.7 Proposed Access Location & Configuration	7.3 Recommendations
4.0 Site Traffic	7.4 Areas of Further Study
4.1 Trip Generation Rates	8.0 Appendices
4.2 Gross Trip Estimates	
4.3 Transit Trip Reductions (Mode Split)	
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APPENDIX C

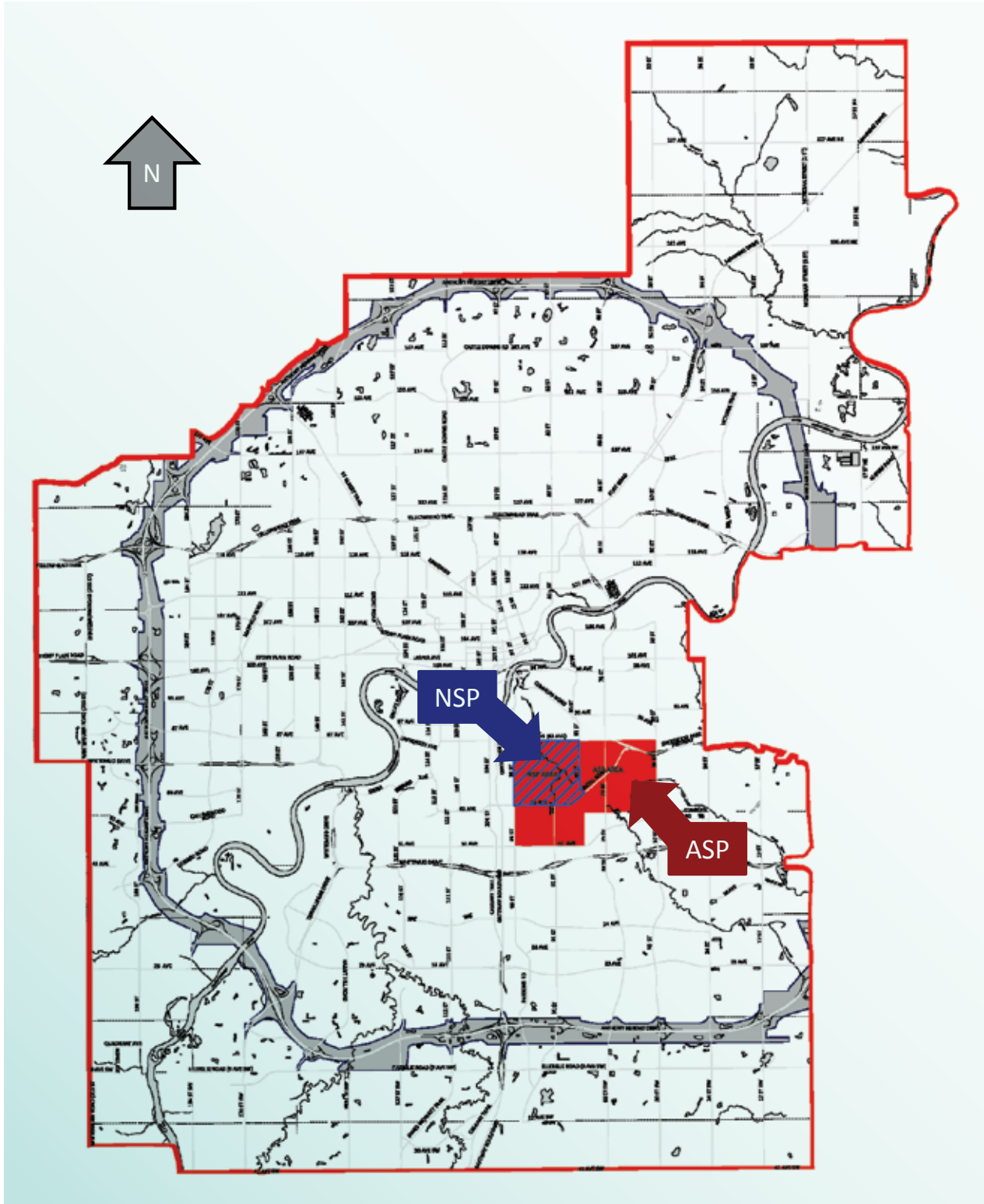
C.1 DATA PRESENTATION FORMATS

Figures shown and tables in this appendix are for content reference purposes only. Applicants have the ability to utilize different designs (such as colour schemes, etc.) at their own discretion as long as the information is provided in a readable manner. Applicants are encouraged to utilize large figures for clarity (including full page figures where applicable). Notes, numbers, text, and labels on final report figures should be sufficiently large to be readable when the report is printed. 11 x 17 pull-out pages are permitted for maps and figures, but should not be utilized for tables.

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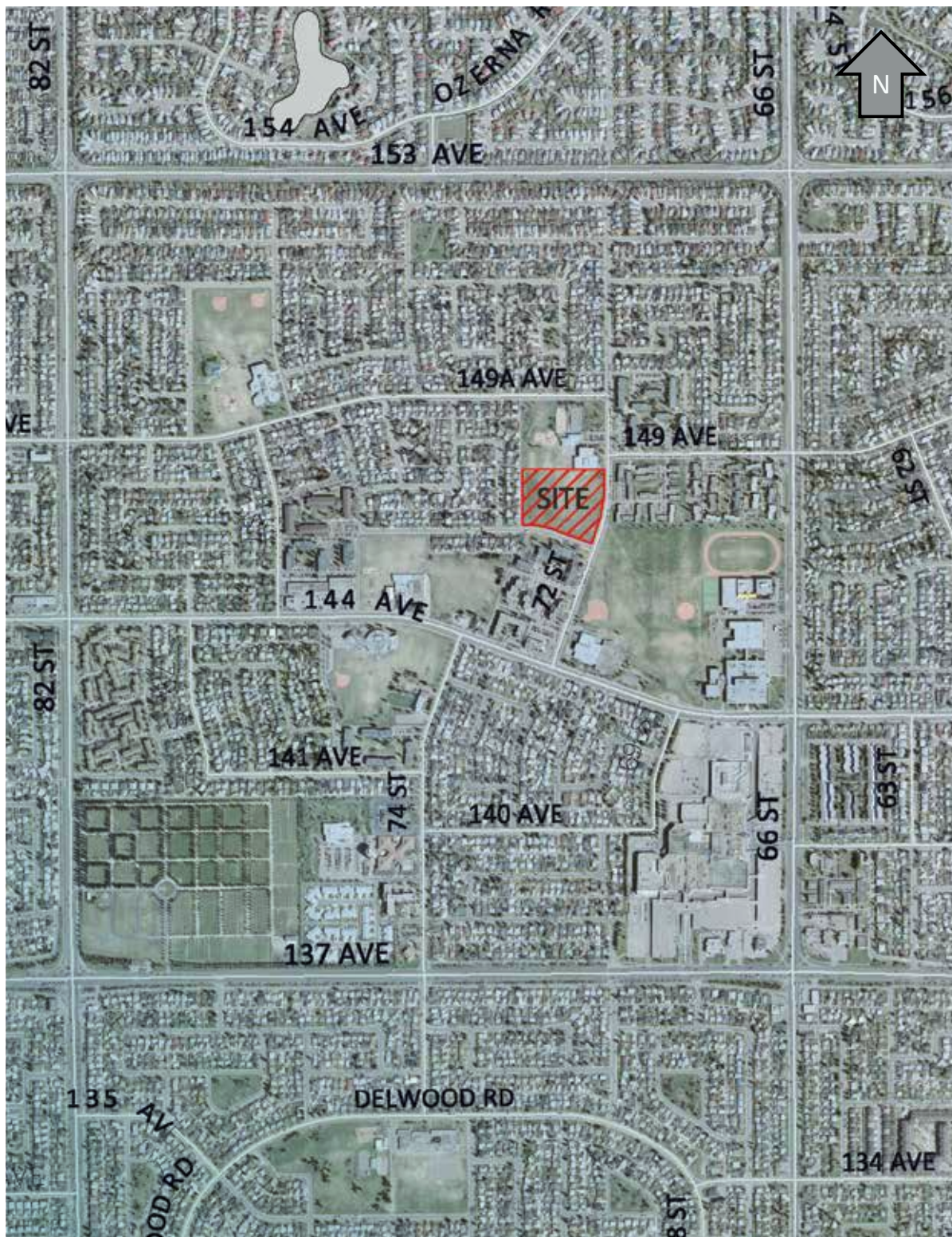
C.2 SAMPLE SITE LOCATION MAP – ASP/NSP

Applies to: section 2.1



C.3 SAMPLE SITE LOCATION MAP – REZONING/DA

Applies to: Section 2.1



C.4 SAMPLE HISTORICAL AADT VOLUMES TABLE

Applies to: Section 2.6

ROADWAY	2011	2012	2013	2014	CURRENT
Road A West of Road B	10,000		9,800	10,100	10,500

C.5 SAMPLE DAILY TRAFFIC FIGURE

Applies to:

Section 2.6 (Background Traffic)

Section 4.8 (Site Generated Traffic – do not include year)

Section 4.9 (Total Traffic – do not include year)



C.6 SAMPLE EXISTING TURNING MOVEMENT COUNTS

Applies to: Section 2.7

LOCATION	DATE	COUNT COMPLETED BY
Road A and Road C	September 1, 2013	City of Edmonton
Road A and Road C	October 1, 2015	Consultant X

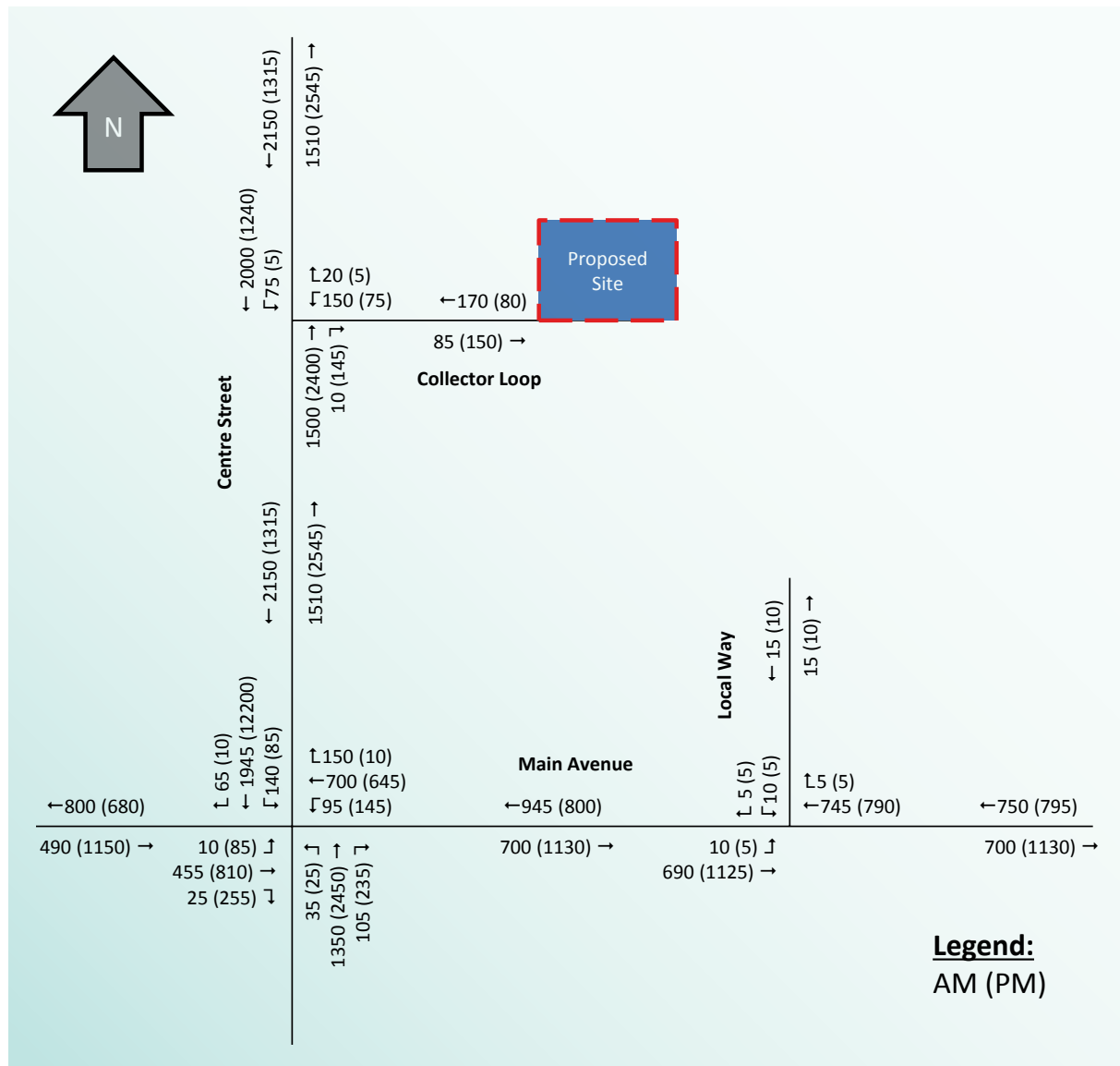
C.7 SAMPLE PEAK HOUR TRAFFIC FIGURE

Applies to:

Section 3.7 (Background Traffic)

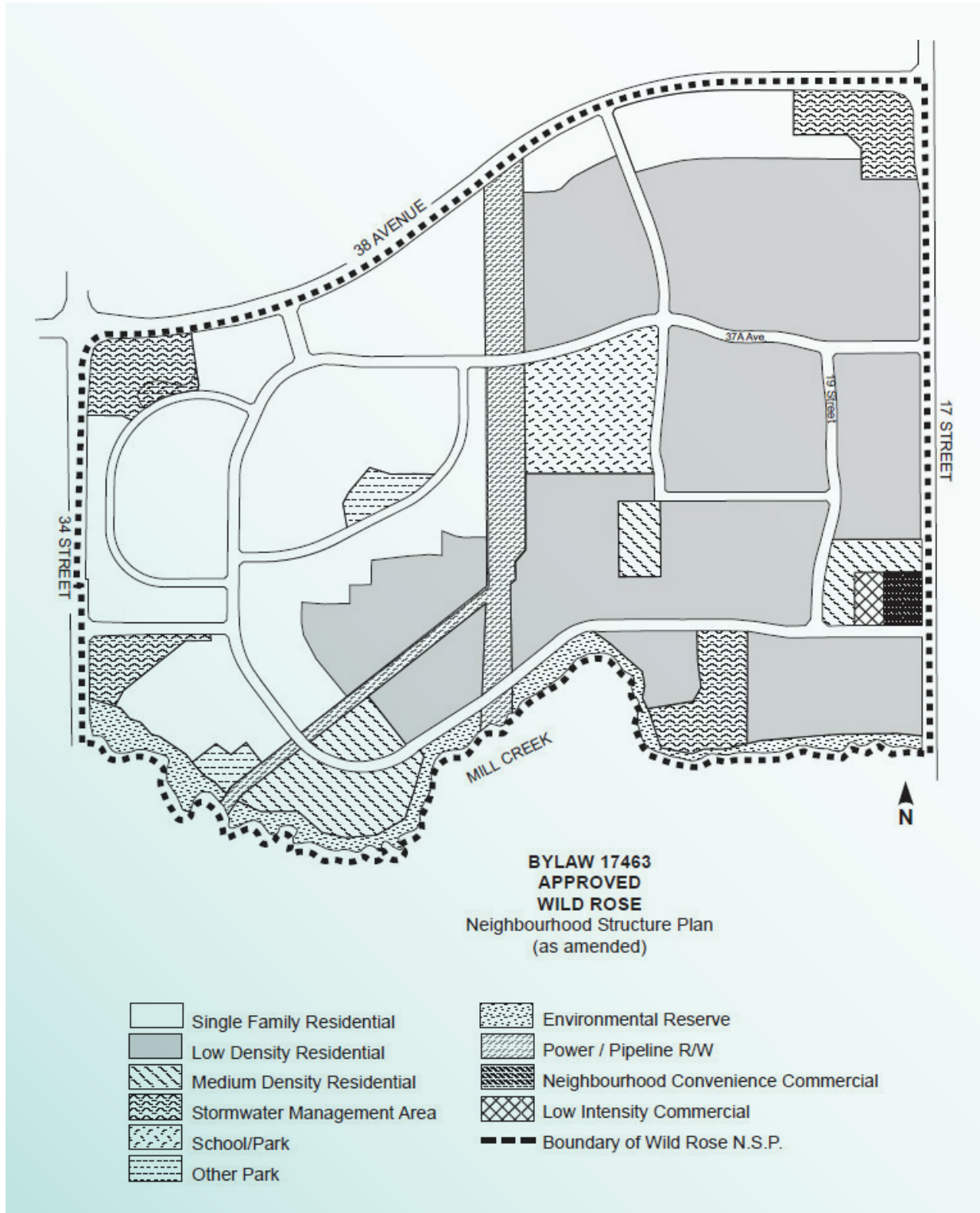
Section 4.8 (Site Generated Traffic)

Section 4.9 (Total Traffic)



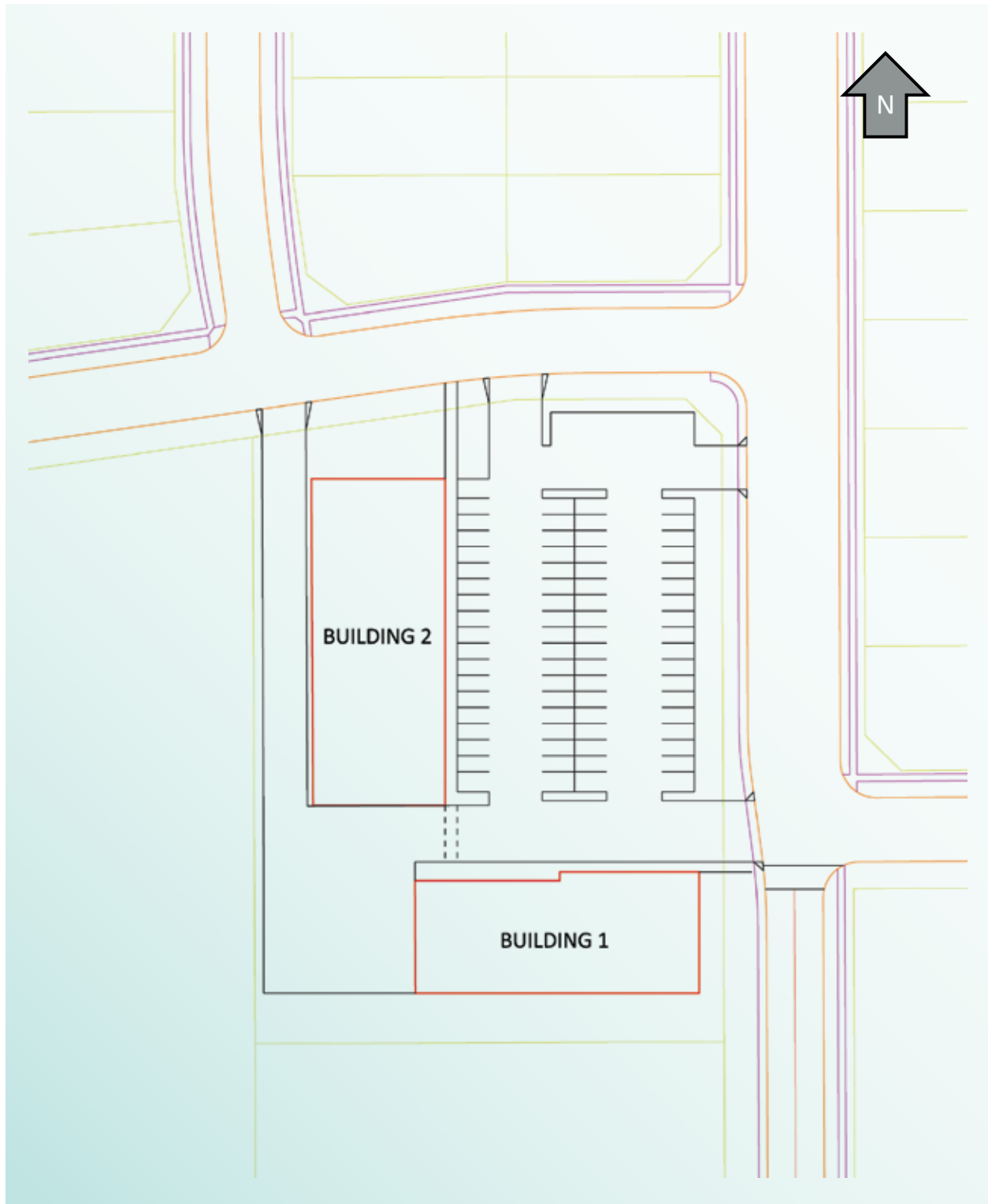
C.8 SAMPLE DEVELOPMENT CONCEPT FIGURE

Applies to: Section 3.8



C.9 SAMPLE PROPOSED SITE PLAN FIGURE

Applies to: Section 3.8



C.10 SAMPLE PROPOSED LAND USE STATISTICS TABLE*Applies to: Section 3.8*

LAND USE	AREA (HA)
Gross Area	A
Non-Developable Uses (Environmental Reserve, Pipelines, Arterial ROW, etc.)	B
Gross Developable Area	$C = A - B$
Existing Land Uses	D
Commercial & Industrial Land Uses	E
Municipal Reserves	F
Transportation Circulation	G
Municipal Services (Fire Hall, Transit Centre, Police Station, etc.)	H
Storm Water Management	I
Total Non-Residential	$J = D + E + F + G + H + I$
Net Residential	$K = C - J$

C.11 SAMPLE PROPOSED POPULATION STATISTICS TABLE*Applies to: Section 3.8*

HOUSING UNIT TYPE	AREA (HA)	DENSITY (UNITS/HA)	UNITS (DU)	POPULATION DENSITY (PEOPLE/DU)	POPULATION (PEOPLE)
Existing Residential	AA.AA	CC	EE	G.GG	I,III
Single Family	B.BB	DD	FF	H.HH	J,JJJ
...
Total	XX.XX		YY		Z,ZZZ

C.12 SAMPLE PROPOSED COMMERCIAL/INDUSTRIAL LAND USES TABLE*Applies to: Section 3.8*

SITE ID	AREA (HA)	ASSUMED FAR ¹	GFA1 (SQ. FT.)
C1	A.AA	C.CC	EE,EEE
I1	B.BB	D.DD	FFF,FFF
...
Total	X.XX		YYY,YYY

Notes: ¹FAR may also be replaced with Employees/ha or Students/ha. In these cases, GFA should be replaced with Employees or Students, as needed.

C.13 SAMPLE PROPOSED OTHER TRIP GENERATING LAND USES TABLE*Applies to: Section 3.8*

LAND USE	SIZE
School (Elementary, High School, Post-Secondary, Vocational, etc.)	students
Recreation Centre	rinks/pools
...	...

C.14 SAMPLE TRIP GENERATION RATES TABLE*Applies to: Section 4.1*

SITE/LAND USE	SOURCE	AM PEAK HOUR	PM PEAK HOUR	DAILY
C1	ITE LUC	A trips/unit	C trips/unit	E trips/unit
R1	CoE	B trips/unit	D trips/unit	F trips/unit
...

C.15 SAMPLE GROSS TRIP GENERATION TABLE*Applies to: Section 4.2*

LAND USE	INTENSITY (TOTAL)	AM PEAK HOUR		PM PEAK HOUR		DAILY	
		IN	OUT	IN	OUT	IN	OUT
Non-Residential Uses	-	-	-	-	-	-	-
Total Non-Residential	-	-	-	-	-	-	-
Residential Uses	-	-	-	-	-	-	-
Total Residential Uses	-	-	-	-	-	-	-
Gross Site Generated Traffic	-	-	-	-	-	-	-

C.16 SAMPLE PASS BY TRIP CAPTURE TABLE*Applies to: Section 4.4*

NON-RESIDENTIAL LAND USE	AM PEAK HOUR	PM PEAK HOUR	DAILY
C1	AA%	CC%	EE%
I1	BB%	DD%	FF%
...

C.17 SAMPLE INTERNAL & EXTERNAL TRIPS TABLE

Applies to: Section 4.5

NON-RESIDENTIAL LAND USE	INTERNAL	EXTERNAL
C1	AA%	CC%
I1	BB%	DD%
...

C.18 SAMPLE NET NON-RESIDENTIAL TRIPS TABLE

Applies to: Section 4.6

TRIP COMPONENT	AM PEAK HOUR		PM PEAK HOUR		DAILY	
	IN	OUT	IN	OUT	IN	OUT
Total Gross Non-Residential Trips	-	-	-	-	-	-
Total Non-Auto Trips	-	-	-	-	-	-
Total Pass-By Trip	-	-	-	-	-	-
Total Internal Trips	-	-	-	-	-	-
Net External Trips	-	-	-	-	-	-

C.19 SAMPLE NET RESIDENTIAL TRIPS TABLE

Applies to: Section 4.6

TRIP COMPONENT	AM PEAK HOUR		PM PEAK HOUR		DAILY	
	IN	OUT	IN	OUT	IN	OUT
Total Gross Residential Trips	-	-	-	-	-	-
Total Non-Auto Trips	-	-	-	-	-	-
Total Internal Trips	-	-	-	-	-	-
Net External Trips	-	-	-	-	-	-
% Internal By Direction (in/out)	-	-	-	-	-	-
% Internal Trips	-	-	-	-	-	-
Total External Trips	-	-	-	-	-	-

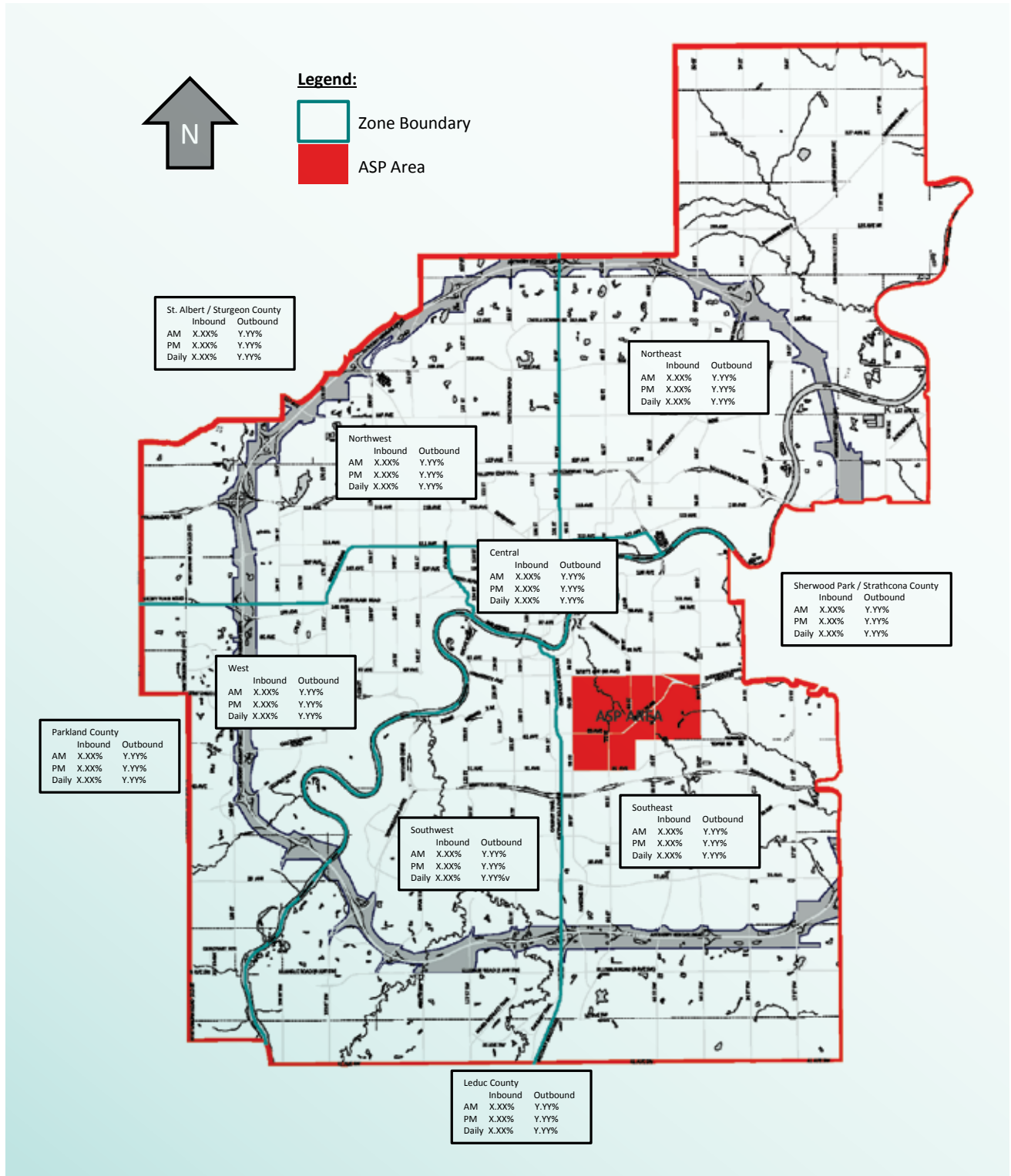
C.20 SAMPLE ADJUSTED ORIGIN-DESTINATION TABLES

Applies to: Section 4.7

SECTOR	AUTO MODE SPLIT REDUCTION FACTOR	AM / PM PEAK HOUR			
		INBOUND	INBOUND ADJUSTED	OUTBOUND	OUTBOUND ADJUSTED
Downtown	15%	3.4%	2.9%	1.5%	1.3%
University	15%	1.1%	0.9%	0.8%	0.7%
Downtown Fringe	10%	3.6%	3.2%	2.2%	1.9%
...

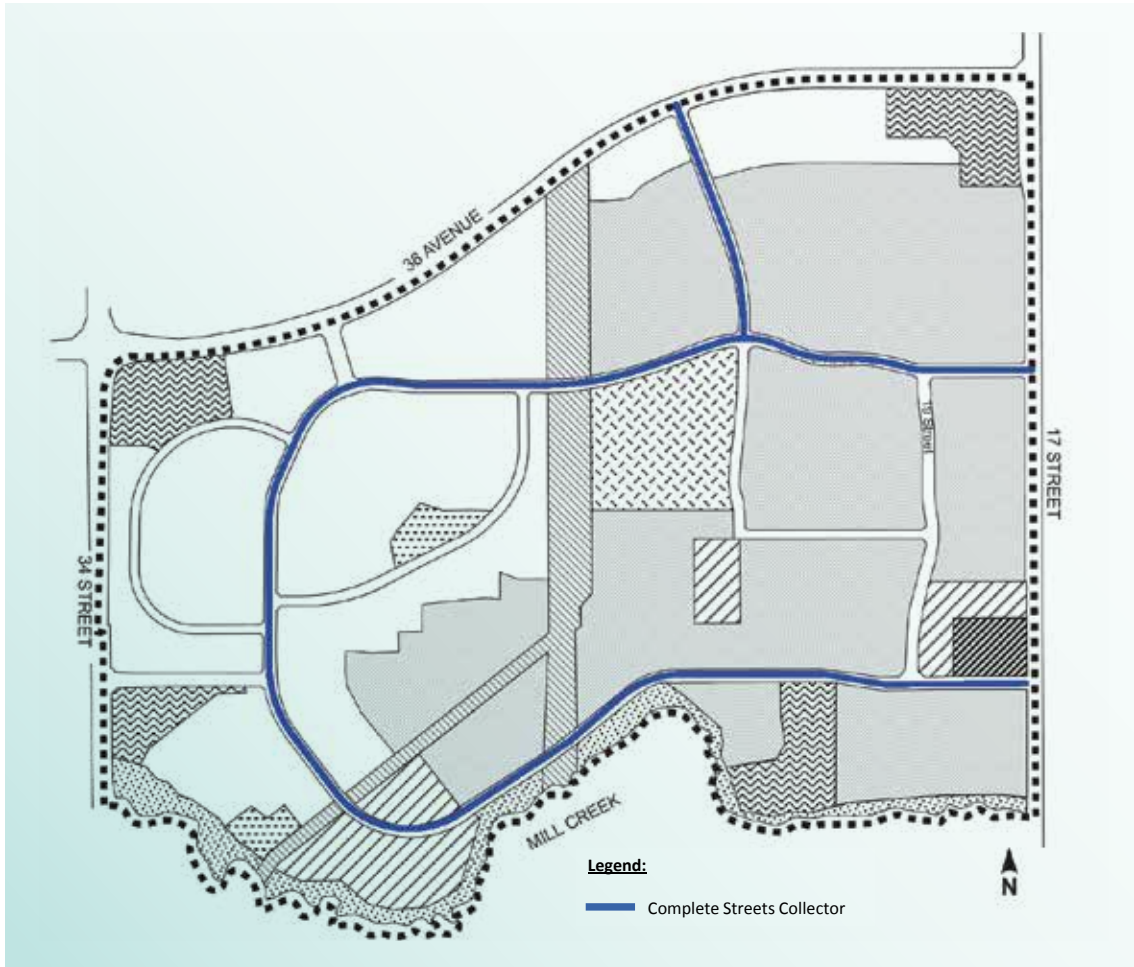
C.21 SAMPLE EXTERNAL TRIP DISTRIBUTION FIGURE

Applies to: Section 4.7



C.22 SAMPLE COMPLETE STREETS CORRIDOR FIGURE

Applies to: Section 5.1



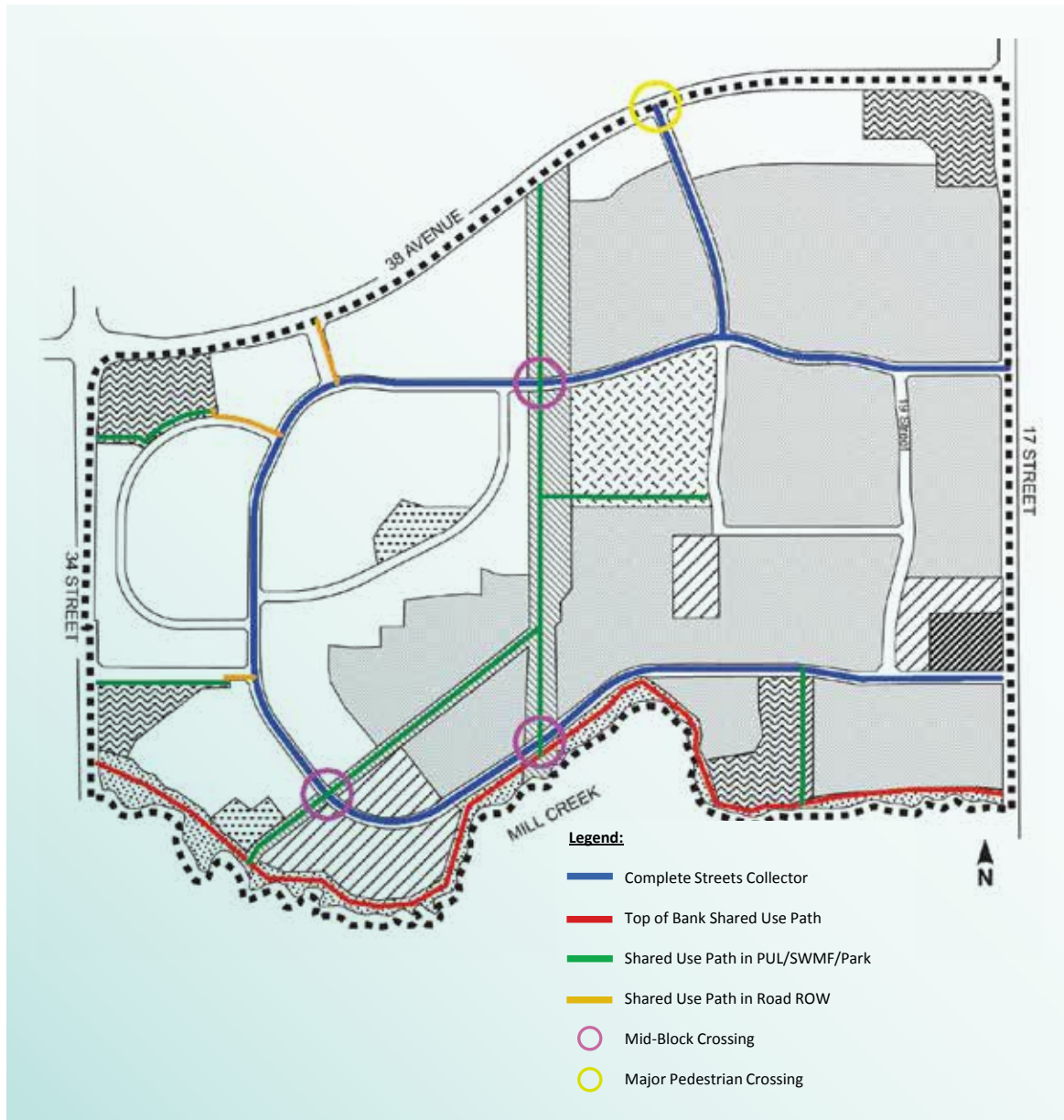
C.23 SAMPLE COMPLETE STREETS CROSS SECTION FIGURE

Applies to: Section 5.1



C.24 SAMPLE ACTIVE MODES NETWORK FIGURE

Applies to: Section 5.2



C.25 SAMPLE ASSUMED VOLUME THRESHOLDS TABLE

Applies to: Section 5.3

ROADWAY CROSS-SECTION	PROJECTED VOLUME RANGE
Local Road	up to A,AAA vpd
11.5m Collector	up to B,BBB vpd
Four Lane Undivided Arterial	C,CCC to CC,CCC vpd
...	...

C.26 SAMPLE INITIAL PROPOSED ROADWAY CROSS SECTIONS TABLE

Applies to: Section 5.3

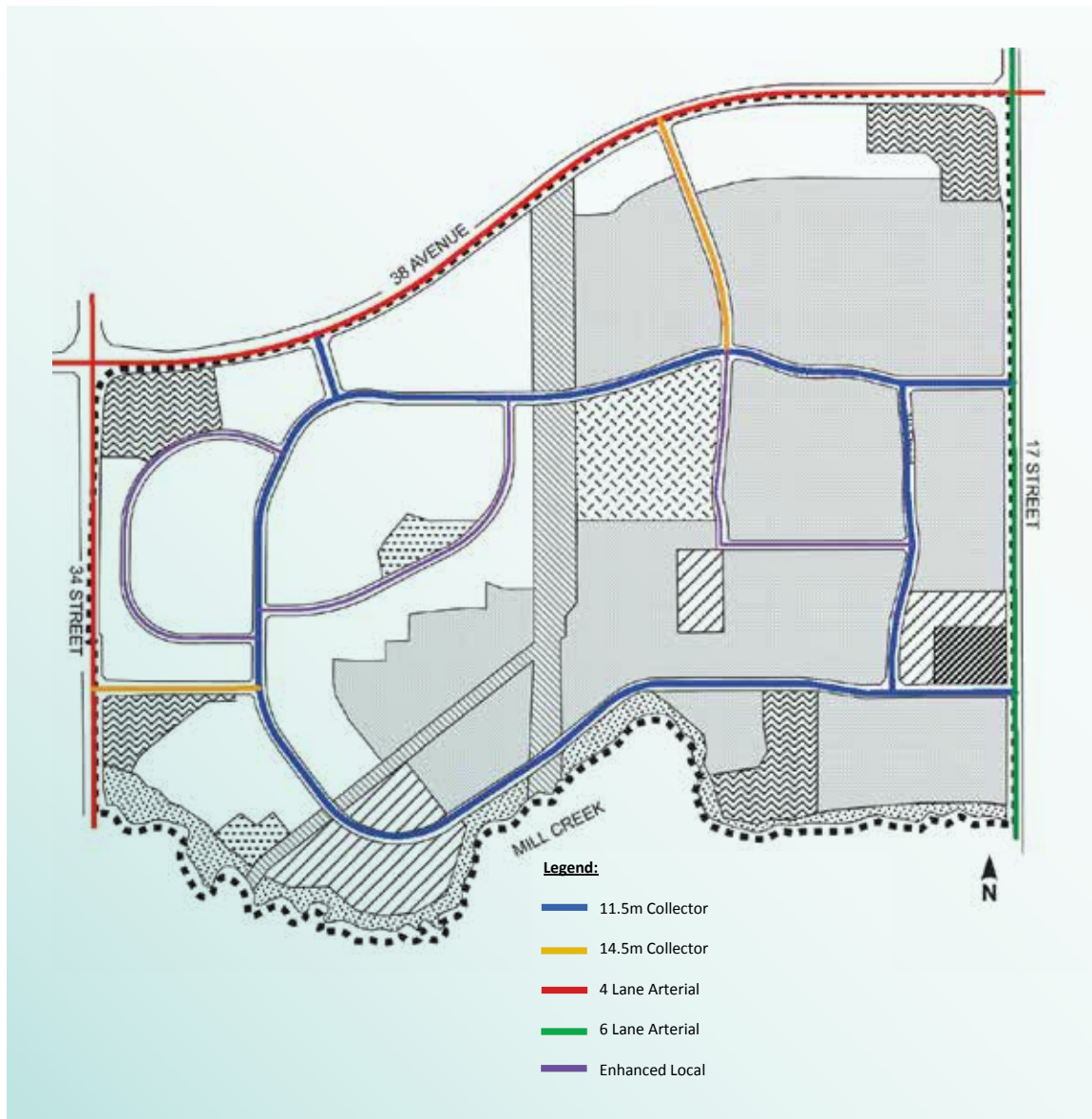
ROAD LINK	FROM	TO	MAX. DAILY VOLUME	PROPOSED CROSS SECTION
A Street	C Road	D Road	XX,XXX vpd	NNNN
B Avenue	E Road	F Road	YY,YYY vpd	MMMM
...

C.27 SAMPLE ROADWAY CROSS SECTION FIGURE

Applies to:

Section 5.3 (Initial Proposed Cross Sections)

Section 5.8 (Recommended Cross Sections)



C.28 SAMPLE SIGNALIZED INTERSECTION ANALYSIS SUMMARY TABLE

Applies to: Section 5.7

Movement	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND		
	L	T	R	L	T	R	L	T	R	L	T	R
<i>AM Peak Hour – Horizon Year Total – Signalized (cycle time, special phasing for movements)</i>												
Geometry	L / T / R			LT / R			L / L / T / T / R			L / T / T / TR		
Volume (vph)												
v/c												
Delay (s)												
LOS												
95 th Queue (m)												
INTERSECTION DELAY						INTERSECTION LOS						
<i>PM Peak Hour – Horizon Year Total – Signalized (cycle time, special phasing for movements)</i>												
Geometry	L / T / R			LT / R			L / L / T / T / R			L / T / T / TR		
Volume (vph)												
v/c												
Delay (s)												
LOS												
95 th Queue (m)												
INTERSECTION DELAY						INTERSECTION LOS						

C.29 SAMPLE UNSIGNALIZED INTERSECTION ANALYSIS SUMMARY TABLE

Applies to: Section 5.7

Movement	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND		
	L	T	R	L	T	R	L	T	R	L	T	R
<i>AM Peak Hour – Horizon Year Total – Unsignalized (stop controlled movements)</i>												
Geometry	L / T / R			LT / R			L / L / T / T / R			L / T / T / TR		
Volume (vph)												
v/c												
Delay (s)												
LOS												
95 th Queue (m)												
INTERSECTION DELAY						INTERSECTION LOS						
<i>PM Peak Hour – Horizon Year Total – Unsignalized (stop controlled movements)</i>												
Geometry	L / T / R			LT / R			L / L / T / T / R			L / T / T / TR		
Volume (vph)												
v/c												
Delay (s)												
LOS												
95 th Queue (m)												
INTERSECTION DELAY						INTERSECTION LOS						

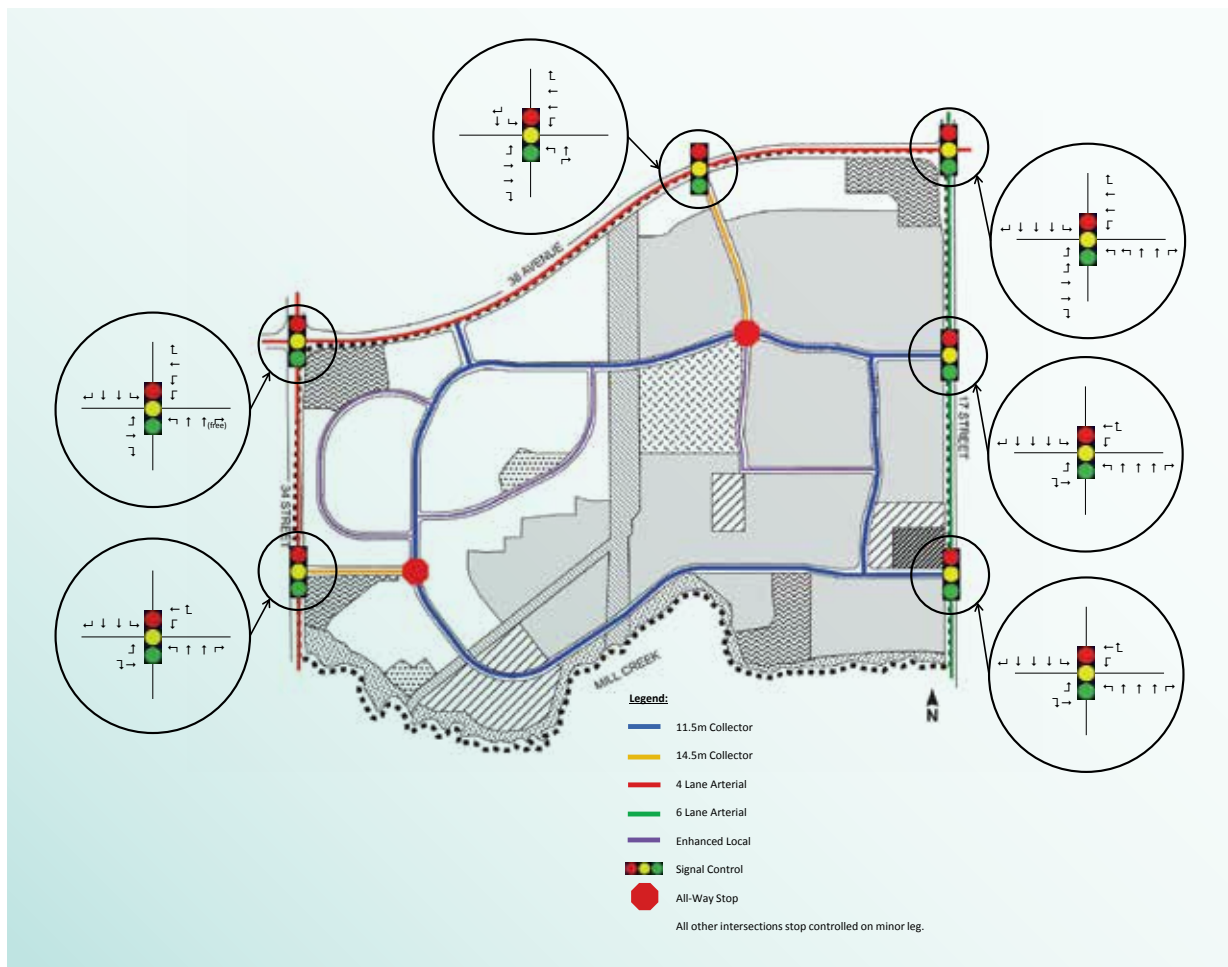
C.30 SAMPLE SIGNALIZED INTERSECTION ANALYSIS SUMMARY TABLE

Applies to: Section 5.7

INTERSECTION NUMBER	INTER-SECTION	APPROACH MOVEMENT	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			OVERALL	
			L	T		L	T	R	L	T		L	T		DELAY	LOS
#	Road A & Road B	<i>AM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														
		<i>PM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														
#	Road B & Road C	<i>AM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														
		<i>PM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														
#	Road C & Road D	<i>AM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														
		<i>PM Peak Hour - Horizon Year - Intersection Control & Details</i>														
		Geometry	LT / TR			L / T / T / R			L / TR			LT / R				
		Volume (vph)														
		V/C Ratio														
		Delay(v)														
		LOS														
		95 th Queue (m)														

C.31 SAMPLE RECOMMENDED INTERSECTION CONTROL FIGURE

Applies to: Section 5.8



APPENDIX D

D.1 CITY OF EDMONTON 2013 TRIP GENERATION RATES – RESIDENTIAL LAND USES

LAND USE	TIME PERIOD	RATE	IN/OUT SPLIT	NOTES
Low Density Residential	AM Peak Hour	0.69 trips/du	19%/81%	Measured
	PM Peak Hour	0.79 trips/du	67%/33%	Measured
	Daily	7.92 trips/du	50%/50%	Measured
RF5 – Row Housing	AM Peak Hour	0.46 trips/du	21%/79%	ITE LUC 221
	PM Peak Hour	0.58 trips/du	65%/35%	ITE LUC 221
	Daily	6.59 trips/du	50%/50%	ITE LUC 221
RA7 & RA8 – Apartment Housing	AM Peak Hour	0.34 trips/du	17%/83%	Measured
	PM Peak Hour	0.40 trips/du	63%/37%	Measured
	Daily	5.81 trips/du	50%/50%	ITE LUC 230
Non-specific Medium Density Residential	AM Peak Hour	0.44 trips/du	17%/83%	ITE LUC 230
	PM Peak Hour	0.62 trips/du	65%/35%	ITE LUC 220
	Daily	5.81 trips/du	50%/50%	ITE LUC 230

The low density residential rates summarized above should be used as base rates, which may be adjusted to better reflect the specific scenario being analyzed including the potential changes in traffic generation during the life cycle of neighbourhoods and potential changes in private vehicle usage with global improvements to transit and active modes infrastructure.

D.1 CITY OF EDMONTON 2013 TRIP GENERATION RATES – COMMERCIAL LAND USES

LAND USE	TIME PERIOD	RATE	IN/OUT SPLIT	NOTES
CNC Sites	AM Peak Hour	5.62 trips/1,000 SF	55%/45%	CNC Weighted Avg.
	PM Peak Hour	$Y = [425.54 \ln(x) - 1140.3] / (x)$ trips/1,000 SF	48%/52%	CNC & CSC Fitted Curve
CSC Sites 50,000 SF to 108,000 SF	AM Peak Hour	4.02 trips/1,000 SF	53%/47%	CSC Weighted Avg. > 50,000 SF
	PM Peak Hour	$Y = [425.54 \ln(x) - 1140.3] / (x)$ trips/1,000 SF	48%/52%	CNC & CSC Fitted Curve
	Saturday Peak Hour	$Y = \exp[0.65 * \ln(x) + 3.76] / (x)$ trips/1,000 SF	50%/50%	ITE Fitted Curve
Commercial Sites < 22,000 SF and > 108,000 SF	AM Peak Hour	$Y = \exp[0.59 * \ln(x) + 2.32] / (x)$ trips/1,000 SF	67%/33%	ITE Fitted Curve
	PM Peak Hour	$Y = \exp[0.67 * \ln(x) + 3.37] / (x)$ trips/1,000 SF	50%/50%	
	Saturday Peak Hour	$Y = \exp[0.65 * \ln(x) + 3.76] / (x)$ trips/1,000 SF	51%/49%	
Gas Bar with Convenience Store	AM Peak Hour	12.36 trips/FP	51%/49%	Weighted Avg.
	PM Peak Hour	17.23 trips/FP	49%/51%	
Gas Bar with Convenience Store & Tim Hortons	AM Peak Hour	51.43 trips/1,000 SF	51%/49%	Weighted Avg.
	PM Peak Hour	27.10 trips/1,000 SF	48%/52%	
Bank with Drive-Through	AM Peak Hour	5.25 trips/1,000 SF	62%/38%	Weighted Avg.
	PM Peak Hour	10.68 trips/1,000 SF	46%/54%	
Fast Food with Drive-Through	AM Peak Hour	20.27 trips/1,000 SF	51%/49%	Weighted Avg.
	PM Peak Hour	13.89 trips/1,000 SF	45%/55%	
Tim Hortons	AM Peak Hour	137.64 trips/1,000 SF	49%/51%	Weighted Avg.
	PM Peak Hour	51.86 trips/1,000 SF	50%/50%	

The Commercial trip generation rates summarized in these tables meet the standards for the establishment of trip generation rates as outlined in ITE Trip Generation, and are recommended for use in the Edmonton context.

Additional rates for commercial developments should be sourced from the appropriate corresponding ITE LUC.

Questions or comments on the rates or their application should be directed to the City of Edmonton's City Planning Branch.

APPENDIX E

E.1 GLOSSARY OF TERMS

ARP	Area Redevelopment Plan
ASP	Area Structure Plan
DA	Development Application
LOS	Level of Service
LRT	Light rail transit
NASP	Neighbourhood Area Structure Plan
NSP	Neighbourhood Structure Plan
O/D	Origin / destination
TAC	Transportation Association of Canada
TDM	Traffic Demand Management
TIA	Traffic Impact Assessment
TOD	Transit Oriented Development
V/C	Volume to capacity ratio

