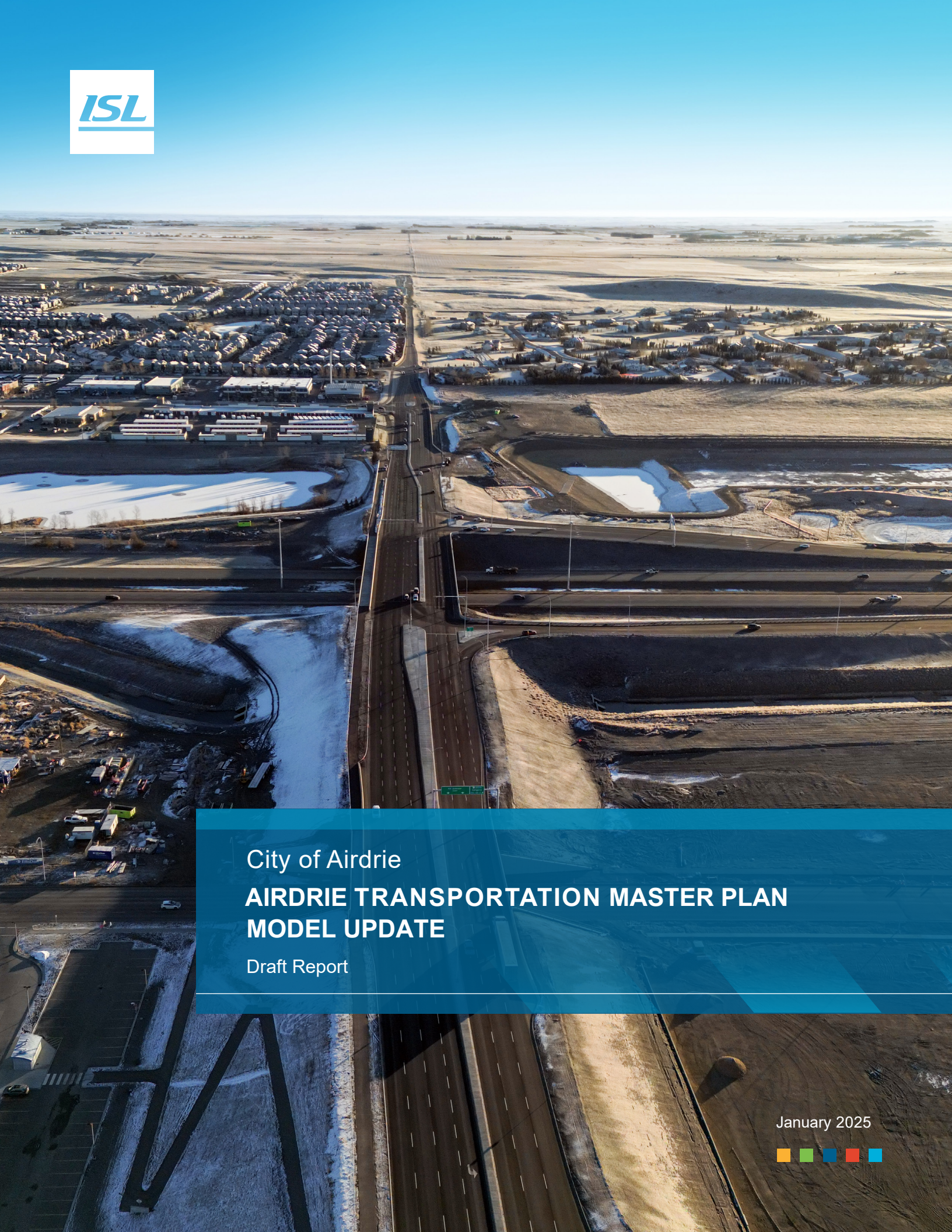

City of Airdrie

AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

Draft Report

January 2025

ISL Engineering and Land Services Ltd. is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

At ISL, your identity is part of our identity. Diversity, Equity, and Inclusion (DEI) speaks to our core values and provides space for our teams to bring their authentic selves to work. ISL believes DEI creates the best outcomes for our clients while sustaining a happy and thriving work environment that allows for career development opportunities for all staff. ISL is committed to a focused effort on continuous improvement and development of a respectful and safe workplace.

Executive Summary

The focal point of this TMP update for the City of Airdrie was to update the VISUM models and enhance the previous TMP to include additional studies and approved plans for the post-2012-annexation areas, as well as the redevelopment plans for the downtown that have been confirmed since the prior TMP in 2020. This was primarily a technical and programming update, and did not update or revisit other aspects of the TMP such as policy, active modes, transit, or stakeholder engagement.

Based on the analysis results, recommended upgrades, timelines and opinions of probably cost for the road network upgrades are determined and summarized in this TMP update. This report provides the steps, methodologies and model inputs used to develop the travel demand models and will aid the City of Airdrie with budget planning and programming for the infrastructure improvements of the future horizons. An overview of the analysis, findings, recommendations and Class 5 (order of magnitude) opinions of probable cost from the existing and four future horizons are summarized below. The detailed upgrades (i.e. signalization, roundabout, dual left turns, etc.) are not listed below and are listed in Section 4.0 and shown in Exhibits 6.1 to 6.4 of the main report.

Existing:

- Statistics: 80,649 population and 20,494 jobs (retail, non-retail, industrial and school).
- Travel demand model and intersection operation analysis (Synchro and Sidra) recommended improvements: No immediate improvements are required to support the population on the existing roadway network. Also, no improvements are required to the CPKC railway crossings at the existing horizon.

110K Population:

- Statistics: 110,000 population and 28,440 jobs.
- Travel demand model and intersection operation analysis recommended improvements:
  - Veterans Blvd: 3 WB lanes between Main St to Highland Park Blvd
  - 40 Avenue: 4 lane bridge over Dry Creek, 4 lanes between Windstone Way SW to 8 Street
  - 8 Street: 4 lanes between Hillcrest Way SW to 56 Avenue
  - New roads or road extensions near developments: 40 Avenue (east and west), 56 Avenue (west), 24 Street (south), Kingsview Road south

144K Population:

- Statistics: 144,000 population and 39,200 jobs.
- Travel demand model and intersection operation analysis recommended improvements:
  - TWP Rd 273: 2 lane bridge over Nose Creek
  - Veterans Blvd: 4 lanes between East Lake Boulevard to RR 291; 6 lanes between 8 Street to East Lake Boulevard (includes QEII bridge, Nose Creek bridge and grade separated CPKC railway crossing)
  - Yankee Valley Boulevard: 6 lanes between Chinook Winds Dr to QEII (includes grade separated CPKC railway crossing) and between Kingsview Blvd to Kings Heights Gate SE; 4 lanes between Kings Heights Gate to RR291

- 40 Avenue: 4 lanes between 24 Street to 8 Street; 6 lanes at 8 Street; 4/5 lanes from Kingsview Blvd to Kings Heights Way
- 8 Street: 6 lanes between Hillcrest Avenue to 56 Avenue
- RR292: Realign road and build 2 lanes between Yankee Valley Boulevard to 40 Avenue
- New roads or road extensions near developments: TWP Rd 273 (west), 40 Avenue (east and west), 56 Avenue (west), 24 Street (north), 8 Street (north)

- Sensitivity Test of Veterans Boulevard Gateway Commercial: The conversion to a RILO access with signalization operates better as compared to the current Veterans Blvd / Gateway RIRO access. This is consistent with the findings of the Veterans Blvd FPS.
- Sensitivity Tests of CPKC Crossing:
  - Timing of Widening / Grade Separation: The YVB widening and CPKC railway grade separation will first be triggered at about 132K population.
  - Closure Scenarios: The 6 lanes widening and CPKC railway grade separation is required on Veterans Blvd by the 135K population horizon and on YVB by the 132K population horizon. As such, there is opportunity for both projects to be coordinated to best advantage within the 130Ks population.
  - Lane Reduction Scenario: Based on 110K population horizon sensitivity analysis results, reducing YVB to two lanes operation during construction will increase traffic and cause over capacity on Veterans Blvd, 1 Avenue, Railway Avenue and 40 Avenue.
  - At a future design stage, all-day traffic assessment could help confirm the time-of-day for congestion conditions for YVB and Veterans Blvd closures / lane reductions, and to give decision-makers information needed to assess and accept the related risk.

203K Population:

- Statistics: 203,000 population and 71,840 jobs.
- Travel demand model and intersection operation analysis recommended improvements:
  - East Airdrie Bypass (Stoney Trail to Crossfield) with interchanges at TWP Rd 274, Veterans Blvd, YVB, 56 Avenue)
  - TWP Rd 274: New Diamond Interchange at QEII
  - TWP Rd 273: 4 lanes (New intersection west of 8 Street to QEII Flyover), flyover at QEII, 6 lanes Nose Creek Bridge, 6 lanes bridge over CPKC Railway Crossing
  - Veterans Blvd: 6 lanes (new intersection west of 24 St to 8 Street, Hamilton Boulevard to Highland Park Gate); 4 lanes (RR13 to new intersection west of 24 St)
  - Yankee Valley Boulevard: 6 lanes (24 St), 4 lanes (RR13 to 24 St, Kings Heights Gate to East Airdrie bypass)
  - 40 Avenue: 6 lanes (24 St)
  - RR13: 4 lanes (40 Ave to 56 Ave)
  - 24 Street: 4 lanes (south end)
  - RR292 (Realigned): 4 lanes (new development access north of YVB to 40 Ave)
  - RR292: 4 lanes (40 Ave to 56 Ave)
  - New roads or road extensions near developments: TWP Rd 274 (east and west), 40 Avenue (east), 56 Avenue (east), 24 Street (north), 8 Street (north), Main Street (north), RR292 (north)

Ultimate Population:

- Statistics: 265,000 population and 92,660 jobs.
- Travel demand model and intersection operation analysis recommended improvements:
  - TWP Rd 274: 4 lanes (24 Street to RR292, including QEII interchange)
  - TWP Rd 273: 6 lanes (24 St to access east of flyover, flyover); 4 lanes (Access west of 24 Street to 24 Street, access east of flyover to RR291)
  - Veterans Blvd: 6 lanes (Highland Park Gate to RR292), 2 WB lanes at East Airdrie bypass interchange
  - 1 Avenue: 4 lanes (Woodside Drive to Woodside Gate, for signal only)
  - Yankee Valley Boulevard: 6 lanes (new development access to Bayside Gate, Kings Heights Gate to Airport Access); 2 WB lanes at East Airdrie bypass interchange
  - 40 Avenue: 4 lanes (RR13 to development access, Kings Heights Way to RR292)
  - 56 Avenue: 6 lanes (8 St to QEII); 4 lanes (RR13 to new development access); 3 WB lanes (QEII to Kingsview Blvd)
  - RR13: 4 lanes (north and south of Veterans Blvd)
  - 24 Street: 4 lanes (TWP Rd 273 to new development access)
  - Main Street: 4 lanes (TWP Rd 274 to North of Stonegate Drive)
  - RR292: 4 lanes (TWP Rd 273 to Highland Park Lane)
  - RR291: 4 lanes (TWP Rd 273 to YVB)
  - RR292 (Realignment): 4 lanes (south of Veterans Boulevard to north of YVB)
  - New roads or road extensions near developments: RR292 alignment (north and south of Veterans Blvd)
- Sensitivity Analysis of TWP Rd 274 and/or 56 Avenue Further Widening: It is concluded that benefits to the major east-west corridors are minimal for the further widening of TWP Rd 274. However, the benefits to the major east-west corridors are more significant for the further widening of 56 Avenue.

Class 5 (Order of Magnitude) Opinions of Probable Cost (In 2024 Dollars):

- 110K: $85 Million
- 144K: $254 Million
- 203K: $467 Million
- Ultimate: $307 Million
- Grand Total: $1.11 Billion
- Average Annual Investment (Over 65 Years): $17.1 Million

Roundabout Policy:

- ISL recommends the following guiding questions and factors should be considered when evaluating the appropriate intersection type in Airdrie: Traffic operations, adjacent land use, access management, on-street parking, property impact, users, schools, design vehicle, bus routes, cost, transition (road classifications / land use), collisions, consistency.

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1.0 Introduction

1.1 Background

ISL Engineering and Land Services Ltd. (ISL) was retained by the City of Airdrie to update the VISUM model and programming recommendations from the City's "The 140K Plan: 2020 Transportation Master Plan (TMP) Update", previously completed by Stantec Consulting in 2020. Over the past four years, the City of Airdrie has grown by over 14 percent from a population of 70,564 in 2019 to 80,649 in 2023. In 2023, they City of Airdrie Census (2023) projected a forecasted population of 84,752 in 2024. Airdrie continues to experience one of the highest municipal growth rates in Canada and is currently the fastest growing city in Alberta. As of 2023, the average residents per dwelling unit has also grown to 2.81, an increase of 0.11 residents per dwelling unit from the 2019 rate of 2.70 residents per dwelling unit.

1.2 Purpose of Study

The purpose of the update was to ensure that the growth assumptions, findings and recommendations in the TMP align with the Utility Master Plan (UMP), which was prepared concurrently with this update by ISL, as well as the previous planning documents, including: previous TMPs, Community Area Structure Plans (CASP), Neighbourhood Structure Plans (NSP), Area Structure Plans (ASP), Traffic Impact Assessments (TIA), etc. The coordination of study assumptions, horizons and recommendations will be of important benefit to the City in ensuring that development plans are consistent with and tied to necessary infrastructure upgrades.

ISL reviewed the 2020 TMP VISUM model and suggested several modeling enhancements and land use / demographic updates to the City as attached in Appendix A. These suggested enhancements were also discussed with the City at a meeting held on April 14, 2023. Throughout the project, ISL worked with the City to confirm further enhancements and updates. The following are the enhancements and updates that were undertaken to the 2020 model:

- ISL recommended that the most effective update strategy is to build new models for the Existing, 110K, 144K and 203K horizons;
- Update the Ultimate horizon to align with City growth assumptions in the 12K Plan, recent CASPs and NSPs;
- Complete trip generation studies to capture the latest residential, industrial and retail trip generation rates;
- Consider trip generation based on additional land uses, including single-family residential, multi-family residential, retail, and industrial land uses;
- Provide more refined Transportation Analysis Zones (TAZ) that better differentiate separate land uses, recognize transportation barriers, and distribute traffic via relevant neighborhood access points;
- Reduce the geographic extent of the model to only include the City proper and very-proximate neighboring areas;
- Calibrate the model based on intersection turning movement counts, and use link volumes to calibrate only if turning movement counts are not available;
- Apply actual intersection layouts in VISUM instead of generic intersection types; and
- Update land use densities for planned communities based on recently-approved planning documents.

In summary, this TMP update is considered primarily a technical modelling and programming exercise, and does not comprehensively revisit the 2020 TMP as a whole. The following components are specifically excluded from the scope of this update, and users of this report should continue to refer to the 2020 TMP for these broader requirements:

- Policy recommendations including integration with other City and Regional policies (both statutory and non-statutory);
- Complete Streets guidelines or other design standard updates;
- Active modes priorities or projects;
- Rapid transit or transit network priorities or projects;
- Community or stakeholder engagement.

1.3 Scope of Work

1.3.1 Primary Objectives of the TMP Update

- Review completed planning documents (previous TMPs, CASPs, NSPs, TIAs, etc.) and background information to determine the existing and future population for employment, household, and determine land use for each TAZ;
- Apply the latest roadway network characteristics, road classifications and capacities, node attributes, and lane configurations into the model;
- TAZs within the City limits were created based on features such as major roads, Nose Creek and other bodies of water, the Canadian Pacific Kansas City (CPKC) railway, commercial area boundaries, and neighborhood boundaries. The starting point for this process was the more granular TAZ system that was used in the City's models prior to the 2020 TMP;
- External gate locations were created at locations just outside of the City's future boundary;
- Obtained the City's 2019, 2021, and 2022 PM peak hour intersection turning movement counts and link counts. Obtained Alberta Transportation and Economic Corridor's (TEC) traffic counts at QEII / Yankee Valley Boulevard and QEII / Veterans Blvd. ISL also conducted 12 additional PM peak hour (4-6 PM) traffic counts. The City's, TEC's and ISL's counts together covered the major intersections and external gates as required to set up the Existing model. The existing ATEC and City counts and ISL's additional count locations are shown in **Appendix B**);
- Conduct trip generation studies to develop custom trip generation rates for residential (single family and multi-family), retail and non-retail land uses. The trip generation study locations, which consisted of 9 traffic counts, are shown in **Appendix C**. The updated 2023 counts will allow the trip generation to reflect current local demand and post COVID-19 pandemic travel patterns;
- External gate data was obtained from the 2028 and 2039 horizon years of the regional South/East Calgary Regional Transportation Study (S&ECRTS) traffic model, which incorporated and reflects regional updates from the prior North Calgary Regional Transportation Study (NCRTS). These models are maintained by The City of Calgary. For this TMP update, the S&ECRTS 2028 and 2039 horizons model data was assumed to correspond to the 110K and 144K horizons of the Airdrie TMP.
- As there are no additional horizons modelled in the S&ECRTS / NCRTS series, the following was undertaken to estimate the external gate volumes of the 203K and Ultimate horizons:
  - Calculate the yearly external gate volumes difference between the 144K and 110K (2039-2028 = 11 years) S&ECRTS models;

- The 203K and Ultimate horizons were assumed to occur in 2065 and 2090, respectively, in the S&ECRTS / NCRTS models;
- The yearly growth will be multiplied by 26 (2065 – 2039 = 26 years) to get the growth between 144K (2039 in S&ECRTS / NCRTS models) and 203K (2065 in S&ECRTS / NCRTS models). This growth is applied to the 144K external gate volumes to estimate the 203K external gate volumes;
- Similar methodology was used to get the growth between 203K and Ultimate;
- Final adjustments to the future external gate volumes to ensure the future external gate volumes are proportional to the land use assumptions (e.g. similar to the external gate trip ratios for the existing condition);

- To capture the latest travel patterns in and through the City, ISL engaged **StreetLight Data** to collect essential origin-destination travel demand metrics to build the origin-destination (O-D) matrices and the internal City / external bypass traffic trip distributions of the model. This O-D data is important for VISUM model building and for differentiating future traffic growth related to the City and highway / external traffic growth on Highway 2, Highway 567 and Township Road 270 / Big Hill Springs Road;
- ISL followed a traditional 4-step modelling process. Trip distribution was based on a gravity model, and traffic assignment considered road capacity constraints and achieved network equilibrium using volume-delay function. In all future scenarios, vehicular trip generation was adjusted to account for a proportionate shift toward the City's strategic targets for other mode shares (7% walk, 6% transit, 2% bike, etc.);
- Develop an existing PM peak travel demand model of the City using existing land uses, population (80,649) and employment. The existing scenario model is calibrated to existing weekday traffic link counts and turning movement counts within the City (see regression plots in Appendix D);
- A future travel demand model is developed for the 110K Population, 144K Population, 203K Population and Ultimate (265K Population) horizons to assess future growth of the City;
- Compile the future land uses, population and employment for the 110K, 144K, 203K and Ultimate horizons;
- Forecast the traffic volumes from the 2023, 110K, 144K, 203K and Ultimate horizons travel demand models;
- Undertake roadway capacity and intersection analysis of major roadways and intersections at all future horizons and determine the potential timing of any related improvements that may be warranted; and
- Provide updated Class 5 "order of magnitude" cost estimates for existing road upgrades and future road construction for the purposes of updating the City's transportation off-site levies.

1.3.2 Analysis

- Apply the future road network to support development and growth at the future horizons. This was based on current UMP, CASPs, NSPs, functional planning studies and/or the 2020 TMP. For the 2065 and/or Ultimate horizons, the requirement for the east Airdrie bypass and additional QEII interchanges were also confirmed;
- Undertake traffic analysis of the major intersections with signals and/or roundabout configurations, where appropriate, to determine the option that best fits the future intersection needs. Additional roundabout configurations were undertaken in greenfield locations or at existing locations with no right-of-way (ROW) constraints;

- For greenfield locations or at existing locations with no ROW constraints, compare the future traffic analysis results between signals and roundabout configurations and recommend the intersection configuration that performs the best;
- Prepare Class 5 (per-km and per-intersection cost basis) cost estimates and update the Transportation Infrastructure Investment Program (TIIP) capital plan project list for the four future horizons;
- Three sensitivity analyses between the 110K and 144K population horizons were conducted in VISUM for the Yankee Valley Boulevard (YVB) CPKC railway crossing grade separation. All analysis assumed the QEII / 40 Ave Interchange is completed, which is now the existing case:
  1. Verify the timeline for the construction of the 6 lanes and grade separated YVB CPKC railway crossing;
  2. Verify the network impacts if YVB is closed for construction of the grade separation;
  3. Verify if two lane operations (one lane each direction) on YVB could accommodate the required detour traffic during construction and the timeline until the network reaches unacceptable levels of traffic.
- A sensitivity analysis at the 144K population horizon was conducted for the west Gateway Commercial right in – right out (RIRO) access on Veterans Boulevard. A southbound left turn and a signal was implemented at the location of the west Gateway commercial RIRO access and analyzed. Results at Main Street / Veterans Blvd and the west Gateway commercial access were compared, with the west Gateway access as a RIRO and as a signalized left out.
- A sensitivity analysis at the Ultimate population horizon was conducted to verify if the widening of future TWP Rd 274 and/or 56 Avenue could relief some of the heavy traffic demand on Veterans Blvd, Yankee Valley Blvd and 40 Avenue.

1.3.3 Roundabouts

- Update the 2020 TMP's Roundabout Policy to include:
  - A review and summary of papers or guidelines related to the safety of roundabouts for all users and modes (bikes, pedestrians including vulnerable users such as children and disabled persons, proximity to schools);
  - Site selection criteria for roundabouts versus other treatments (stop control, signals). Variables may include: proximity to schools, expected users, adjacent land use, accommodation of on-street parking, past collision data, design vehicle, property impacts, etc.;
  - From the above, guiding questions and factors for the City to use when evaluating roundabouts versus other intersection treatments.

2.0 Land Use and Modelling

Existing and Long-Term forecasting for the TMP Update were completed with a travel demand model that ties directly to existing and future land use for Airdrie and provides a rational basis on which to assess future transportation requirements. The travel demand model developed for the TMP will also provide an effective foundation for Airdrie's ongoing use including evolution of land use plans, infrastructure planning, roadway planning, traffic studies, supporting development applications, and other design purposes. The following sections provide a summary of the land use assumptions that form the basis for recommendations in this report.

2.1 Existing Land Use and Modelling

In Airdrie, the majority of the developed area is located along all the existing arterials, as well as QEII and with the downtown core established along Main Street and 1 Avenue. The downtown area is well established with mixed land use of residential, commercial (retail) and non-retail (office/institutional) uses. In addition, major commercial land uses are found in the Gateway, Sierra Springs, and Kings Heights areas. Furthermore, industrial land uses are primarily located in the SE and NE quadrants of the city. Lastly, the vast majority of school employment is spread throughout various residential neighborhoods.

2.1.1 Transportation Zone Setup

For modelling purposes, Airdrie and the surrounding area were subdivided into various transportation analysis zones (TAZ), as shown in Exhibit 2.1. The zone boundaries generally follow road boundaries and reflect natural and man-made divisions such as major roads, the CPKC railway tracks, Nose Creek and other bodies of water, section lines, and separate land use types. Generally, the zone system provides a good breakout of the areas within Airdrie's boundaries, and provides a reasonably fine definition of land uses and zone connections to the road network for transportation modelling. The proposed model for Airdrie consists of 216 internal zones, with 174 zones within Airdrie (orange zones in Exhibit 2.1) and 42 zones within Rocky View County (yellow zones in Exhibit 2.1), which aid with considering the impact of major highway connections (e.g. east Airdrie bypass, and new QEII interchanges) beyond the existing municipal boundary.

95 of the 174 zones within Airdrie are located in the Pre-2012 Annexation area. A unique zone number of up to 4 digits are assigned for each of these 95 zones. The remaining 79 of the 174 zones within Airdrie are located in the Post-2012 Annexation area (the "12,000 Acres") and all of these zones have a 4 digit number (previous zone numbers in the 2020 TMP), followed by an underscore and a sub number (e.g. 3459_1). In general, each of these 79 Post-Annexation zones are approximately a quarter section (0.665 km^2) in size, which are smaller compared to the zone size used in the 2020 TMP model.

QEII and many major roadways within the City (i.e. 8 Street, 24 Street, Highway 567 / Veterans Blvd and Township Road 270 / Yankee Valley Blvd) provide connections beyond the City. Vehicles that travel on these connection roads to/from outside the City are known as external trips. There are three external trip types, as follows:

- External to internal trips, which originate outside the City but have a destination inside Airdrie, such as shoppers coming from the surrounding area;
- Internal to external trips, which originate in Airdrie but have a destination outside the City, such as Airdrie commuters travelling to work in Calgary;

- External to external trips, which have origins and destinations outside Airdrie but pass through on the City's transportation network, such as vehicles travelling between Calgary and Edmonton on QEII.

With the external trips, the interaction between residential and employment zones within Airdrie and similar land uses in the external zones is a key consideration. To provide a reasonable snapshot of transportation requirements and their impact on roadways within Airdrie, the transportation demand model was developed with 27 external gates (10,000 series zones shown in green in Exhibit 2.1). External gates are used in the model to represent traffic passing into and out of Airdrie's transportation system from regional destinations (Table 2.1).

Table 2.1: External Gates

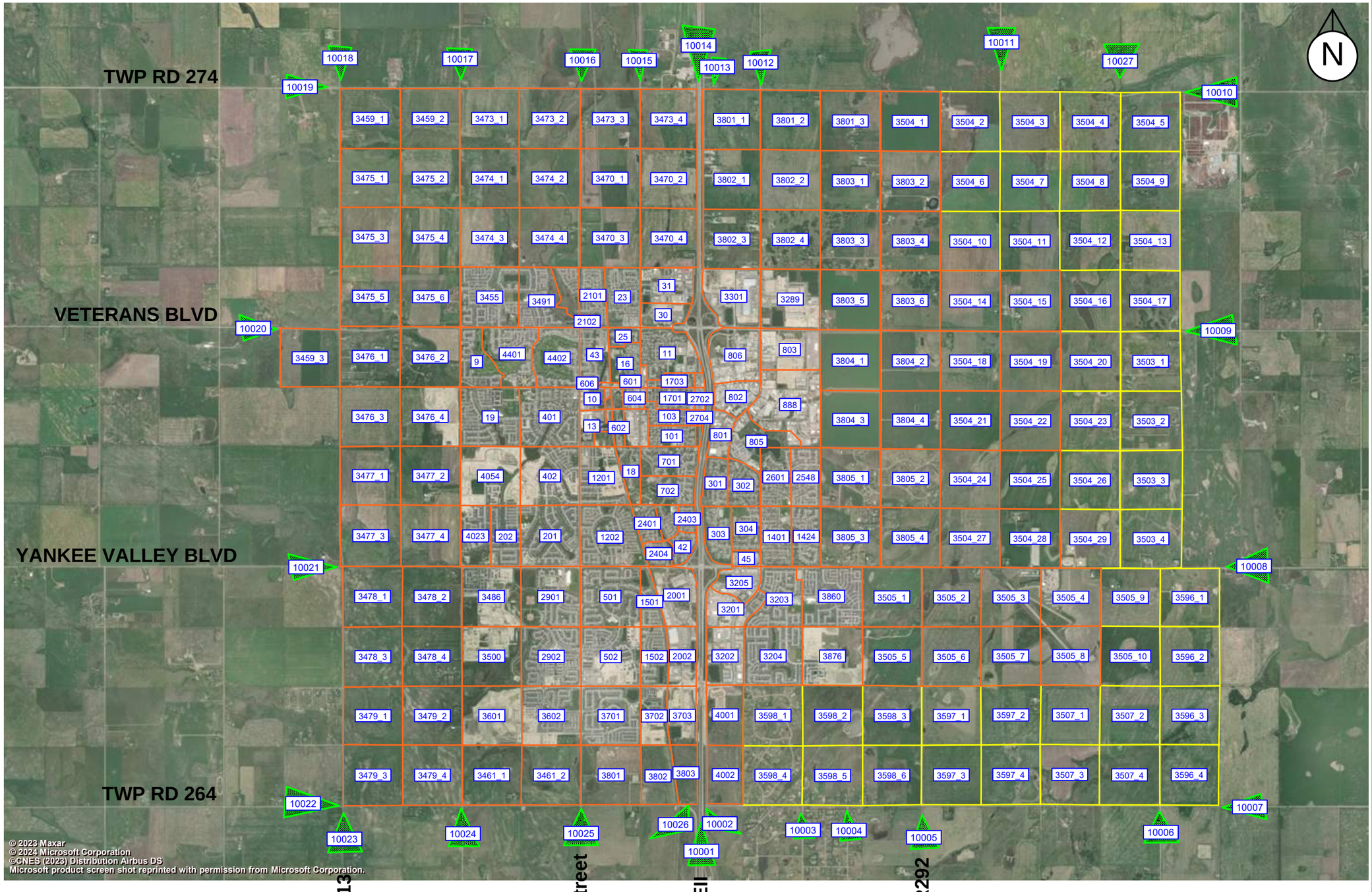
External Gate	Roadway	External Gate	Roadway
10001	QEII (South)	10015	Main St / Dickson Stevenson Tr (North)
10002	Range Road (RR) 294 (South)	10016	Future 8 St Extent (North)
10003	RR 293 (South)	10017	RR 12 / 24 St (North)
10004	Butte Hills Way (South)	10018	RR 13 (North)
10005	RR 292 (South)	10019	TWP RD 274 (West)
10006	RR 290 (South)	10020	Hwy 567 / VET (West)
10007	Township Road (TWP RD) 264 (East)	10021	TWP RD 270 / YVB (West)
10008	TWP RD 270 / YVB (East)	10022	TWP RD 264 (West)
10009	Hwy 567 / VET (East)	10023	RR 13 (South)
10010	TWP RD 274 (East)	10024	RR 12 / 24 St (South)
10011	RR 290 (North)	10025	RR11 / 8 St (South)
10012	RR 292 (North)	10026	Balzac Blvd (South)
10013	RR 293 (North)	10027	Future East Airdrie Bypass (North)
10014	QEII (North)		

2.1.2 Existing Population and Employment

To determine the existing population, household and employment data for each of the TAZ, ISL integrated the above traffic zone system with data and information from the following sources:

- City of Airdrie ArcGIS Land Use Basemap
- City of Airdrie Land Use Bylaw
- City of Airdrie Municipal Census 2019 & 2023
- 2016 and 2021 Statistics Canada Federal Census Data
- Alberta Employment Data for the City of Airdrie

Based on the City's 2023 Municipal Census, a total of 80,649 people are residents of Airdrie. Also, based on the City's GIS data and Land Use Bylaw, there are 10,843 multi-family homes and 17,900 single-family homes in the City. The total number of households are 28,743 units and the population per household ratio is approximately 2.81. From Airdrie's 2023 Municipal Census, there are a number of different units and ratios for the population and household in each community. The data was used as the starting point and additional population and households data was added to the growing and/or new communities (units were obtained from the ArcGIS / land use data) until the population totaled 80,649 people and the total residential unit count totaled 28,743. These adjusted figures were then distributed into the TAZ system based on the ArcGIS data / land uses of the City. The final figures are summarized in the Tables in Appendix E and the graphics in Exhibit 2.2.



Legend

Traffic Zones

Code

- External
- Zones in RVC
- Internal

EXHIBIT 2.1
TRANSPORTATION ANALYSIS ZONES (TAZ)
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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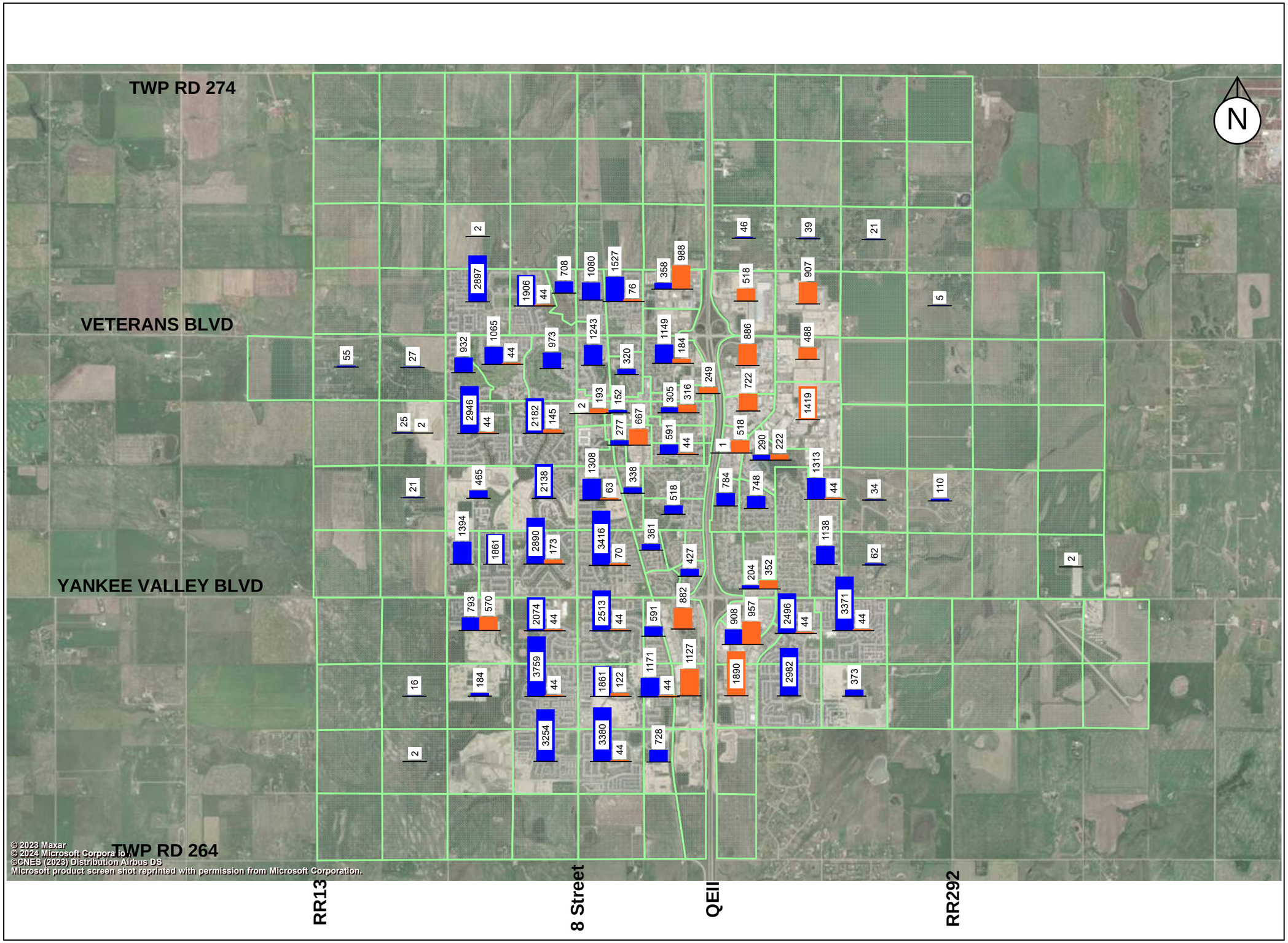

Legend

2023 Horizon Zone Data

- POPULATION
- EMPLOYMENT

EXHIBIT 2.2
2023 HORIZON ZONE DATA
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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For the existing employment population of Airdrie, as per Government of Alberta website (https://regionaldashboard.alberta.ca/region/airdrie/labour-force/#/bymunicipality), the total number of people in the labour force is 41,330 with 36,730 employed (89%) and 4,600 unemployed (11%) in 2021. From 2016 to 2021, the calculated growth in new jobs per year was 1,035. By applying the 1,035 jobs growth per year to the 2021 labour force of 41,320, the calculated labour force in 2023 is 43,400 (41,330 + 2,070). Also, by applying the employed and employed percentages from 2021 labour force to 2023 labour force, the calculated 2023 number of employed and unemployed people is 38,844 and 4,556, respectively. Also, as per the Statistics Canada 2016 Federal census, 33.6% (8,315 jobs in 2016) of Airdrie residents work within the City and 66.4% work outside of Airdrie (Airdrie residents that employed elsewhere – not considered as Airdrie employment). In addition, 63.7% (8,315 jobs in 2016, equivalent to 33.6% of Airdrie residents, work within the City as per the 2016 Federal census above) of Airdrie residents work within the City and 36.3% come to work in Airdrie from other municipalities (non-Airdrie residents that employed in Airdrie – considered as Airdrie employment, 4,745 jobs in 2016). As such, applying the 33.6% (2016 Federal census) of Airdrie residents work within the City to the 38,844 employed in 2023, the Airdrie residents work within the City was 13,052 jobs (63.7% of the Airdrie residents work within the City). Also, with the 36.3% come to work in Airdrie from other municipalities applied, the non-Airdrie residents that employed in Airdrie was 7,442 jobs in 2023. Therefore, the total employment within the City was calculated to be 20,494 in 2023 and is about 25% of the 2023 population level. These 20,494 total jobs were further subdivided into four job segments for modelling purposes. Based on the City's employment data, the employment percentages for the four job segments in Airdrie are summarized as follow:

- School – 19.1% (assumed 75% of the 19.1% to be office/non-retail work for Rocky View School head office, therefore the actual percentage for school employment is 4.8%)
- Non-Retail – 21.6% (assumed 75% of the 19.1% of school to be office/non-retail work for Rocky View School head office, therefore the actual percentage for non-retail employment is 35.9%)
- Retail – 26.2%
- Industrial – 33.2%

With the above job segment percentages, the City is estimated to have the following number of jobs for each job segment within the City in 2023.

- School – 977
- Non-Retail – 7,345
- Retail – 5,376
- Industrial – 6,796
- **Total Employment** = 20,494

Similar to the population and household figures, the adjusted employment figures were distributed into the TAZ system based on the ArcGIS data / land uses of the City. The figure numbers are summarized in the Tables attached in Appendix E and shown graphically in Exhibit 2.2.

Both the existing population and employment data were confirmed with the City prior to use in the model.

2.1.3 Existing Roadway Classification

For modelling purposes, the existing road classifications and related roadway capacities were based on the practical function of each roadway, while considering the local context. The modelled road classifications for Airdrie's existing transportation network are shown graphically in Exhibit 2.3.

2.2 Future Land Use and Modelling

For this TMP update, the future land uses for the pre-2012-Annexation areas were based on the existing land use classification of the area as determined in Section 2.1. The future land uses for the post-2012-Annexation areas were based on CASPs and NSPs where available, which provides an overall framework for development of the post-2012-Annexation lands. Development areas were further refined based on the ROW widening locations and extents provided by the City as well as planned and potential regional park areas. The future land use concept that was used to determine growth areas and associated populations is shown in Exhibit 2.4.

Post-annexation development timelines were developed as part of the City's concurrent Off-Site Levy Review project and are shown in Exhibit 2.5. The timelines assumes that an average of 180 acres (73 hectares) of gross development area is absorbed each year. It should be noted that the years associated with this timeline are when a quarter section is estimated to begin development, so does not represent full build-out immediate in that timeframe.

2.3 Growth Areas

Growth in the City of Airdrie is classified as either greenfield development or densification. Densification is predominantly expected to occur in the downtown area, while greenfield development will occur in both the pre-annexation and post-annexation boundaries. The pre-annexation boundary is expected to have a residential population of approximately 103,000 while the entire build-out of the City, including both the pre-annexation and post-annexation boundaries, is anticipated to have a residential population of approximately 265,000.

As per the UMP Renewal project currently undertaken by ISL, the above population estimates are significantly higher than those estimated in the original 2016 UMP, given the higher densities that have been approved in recent Community Area Structure Plans (CASPs) and Neighbourhood Structure Plans (NSPs), as well as the densification planned for the City's downtown area. Exhibits of the approved CASPs and NSPs in the City of Airdrie are included in Exhibits 2.6 and 2.7, respectively.

The pre-annexation growth areas are based on the land use type and lot size / number of lots from the City's ArcGIS data. The residential population for individual zones were based on the population/household ratio for each neighbourhood obtained from the 2023 Municipal Census (Airdrie, 2023). Where the development area was not at the individual zone level, populations were based on the NSP population information by subtracting the existing populations within the CASP or NSP boundary and assigning the remaining population on a proportional area basis. This was then scaled to both the population/household ratio for each neighbourhood obtained from the 2023 Municipal Census and compared to the population/household as outlined in the CASP or NSP. Employment populations were based on the 35 jobs/ha target density provided by the City for future employment areas. Also, a school with a rate of 44 jobs / school assumed for each of the greenfield quarter sections where residential land use is predominant. Additionally, half of the institutional parcel in the community of Southwinds were assumed to be lands for the future SW Airdrie Recreation Centre, with the remaining area allocated to the future high school. Each high school, one in Southwinds and two in the west institutional quarter section (TAZ 3459_3), were assumed to have a school employment of 125 jobs, as confirmed with the City. Furthermore, a recreation centre is assumed in the west institutional quarter section in TAZ 3459_3.

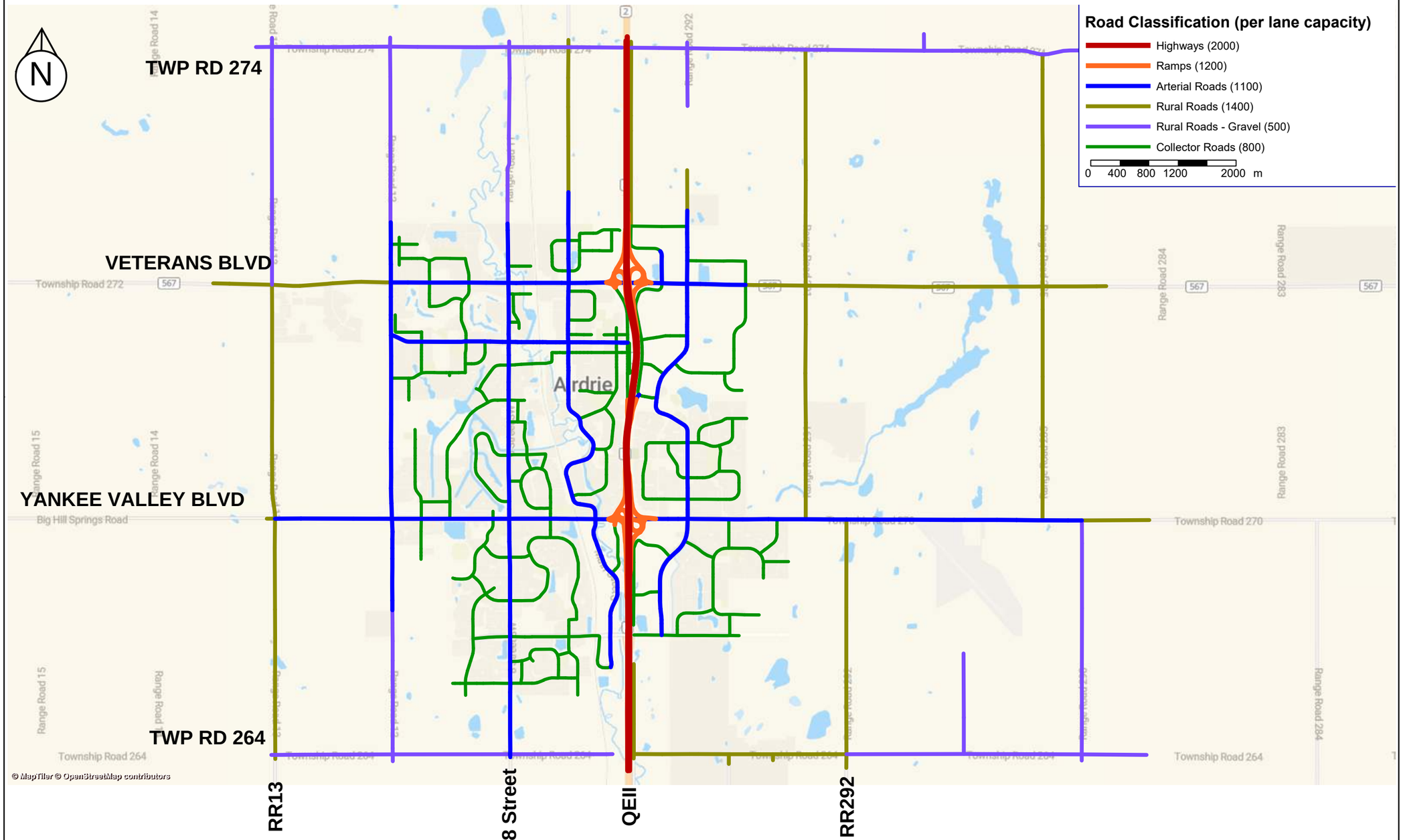

EXHIBIT 2.3
EXISTING ROAD CLASSIFICATION
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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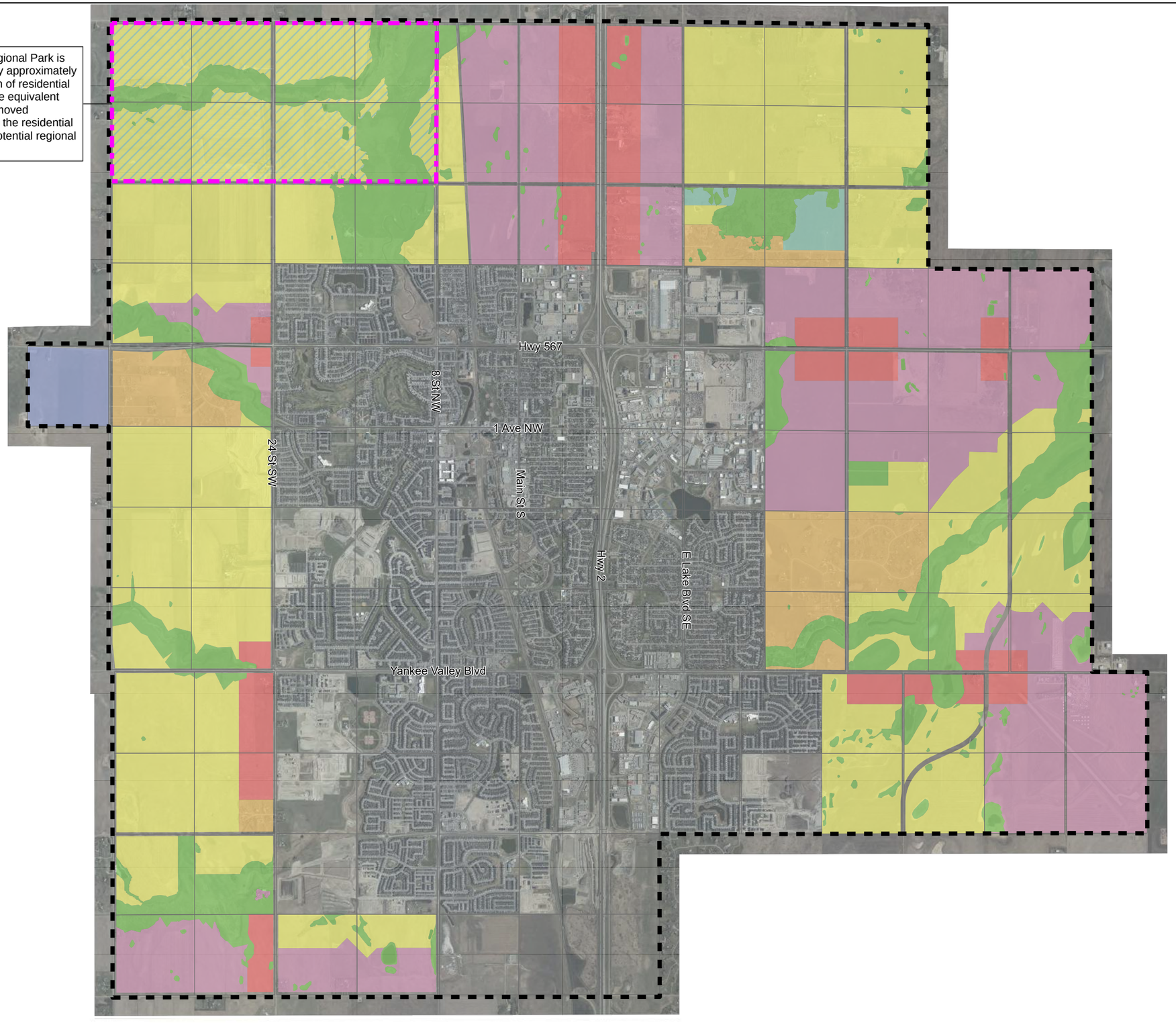
The Northwest Regional Park is assumed to occupy approximately one quarter section of residential land. Therefore, the equivalent population was removed proportionally from the residential areas within this potential regional park boundary.



N

Legend

City Boundary

Land Use

- Residential
- Residential (Potential Regional Park)
- Country Residential
- Commercial Overlay
- Employment
- Industrial
- Institutional
- Regional Park
- Open Space

0 500 1,000 2,000 Metres

1:40,000 CANA83 3TM114

EXHIBIT 2.4
FUTURE LAND USE
AIRDRIE T RANSPORTATION MASTER PLAN MODEL UPDATE

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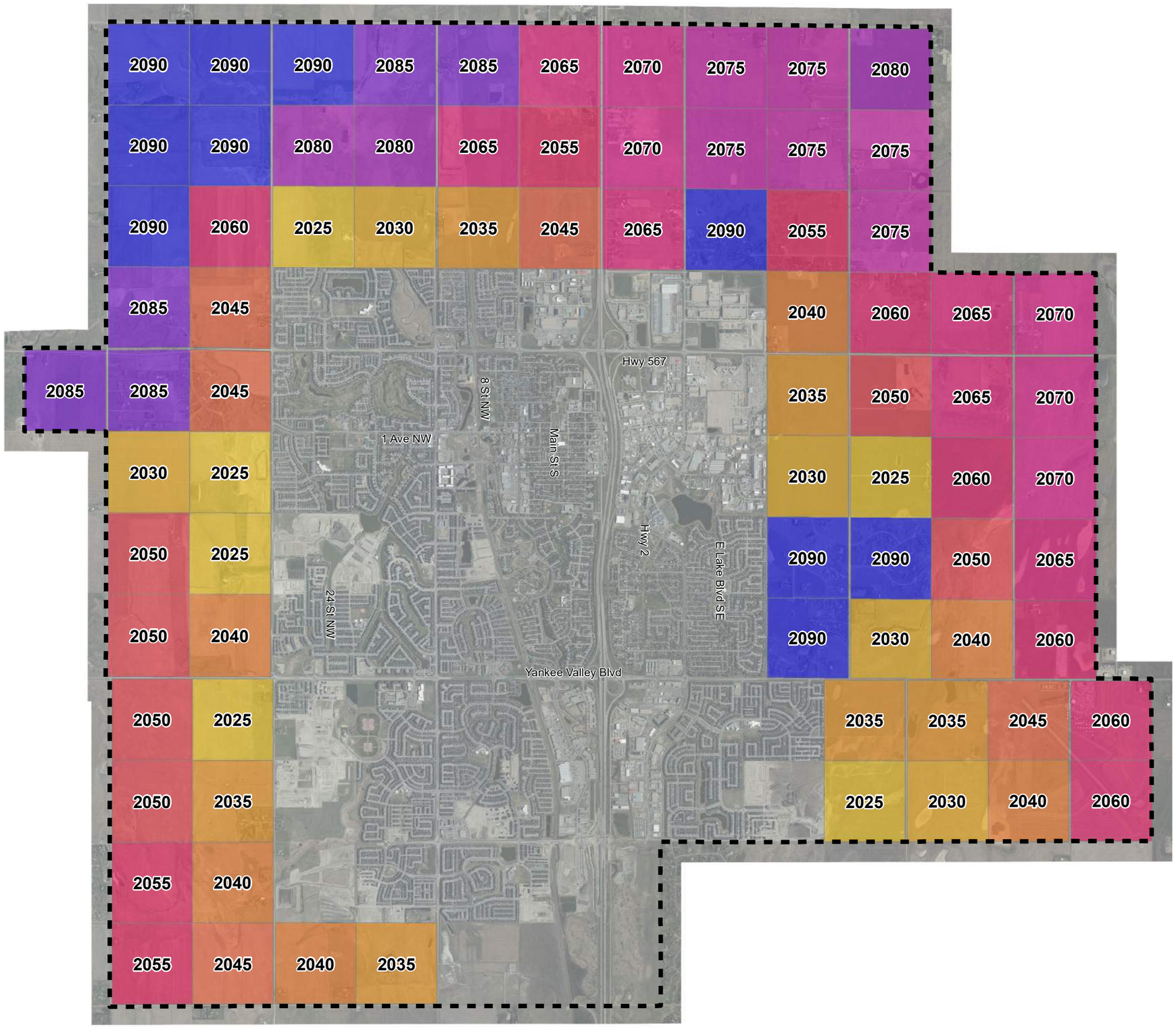
Date: 2024-05-30 Document: Q:\Projects\28211_Airdrie_UMP_Update\25_GIS\251_Figures\2_Reporting\Figure 2.5_Future Land Use.mxd



N

Legend

City Boundary

Quarter Section Development Timelines

- 2025
- 2030
- 2035
- 2040
- 2045
- 2050
- 2055
- 2060
- 2065
- 2070
- 2075
- 2080
- 2085
- 2090

0 500 1,000 2,000 Metres

1:40,000 CANA83 3TM114

EXHIBIT 2.5
DEVELOPMENT TIMELINES
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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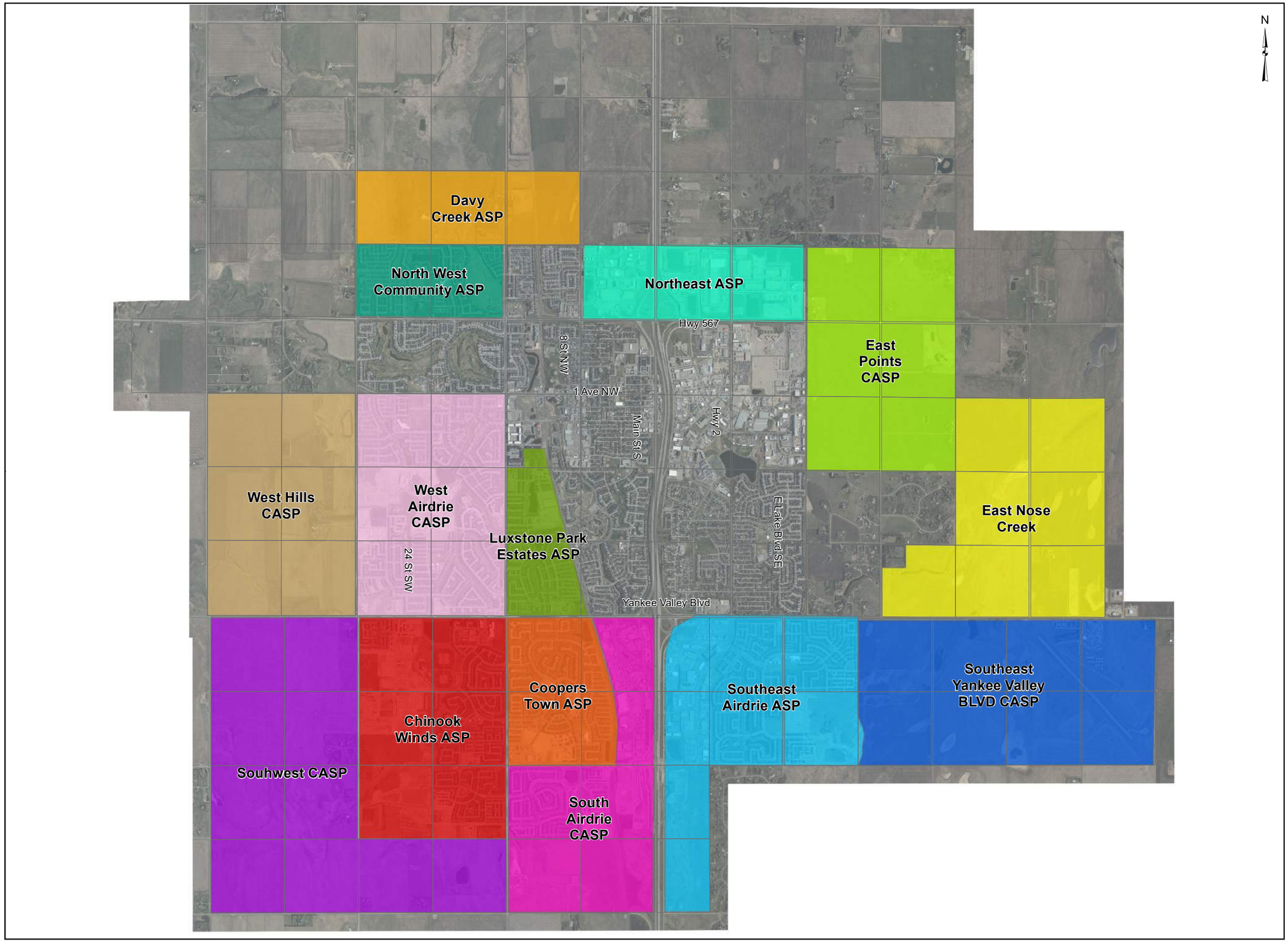
Date: 2024-05-30 Document: Q:\Projects\28211_Airdrie_UMP_Update\25_GIS\251_Figures\2_Reporting\Figure 2.6_Development Timeline.mxd



Legend

City Boundary

Legal

Community Area Structure Plan

- Chinook Winds
- Coopers Town
- Davy Creek
- East Nose Creek
- East Points CASP
- Luxstone Park Estates
- North West Community
- Northeast
- Southeast Airdrie
- Southeast Yankee Valley BLVD CASP
- Souhwest CASP
- South Airdrie
- West Airdrie
- West Hills CASP

0 500 1,000 2,000 Metres

1:40,000 CANA83 3TM114

EXHIBIT 2.6
COMMUNITY AREA STRUCTURE PLAN BOUNDARIES
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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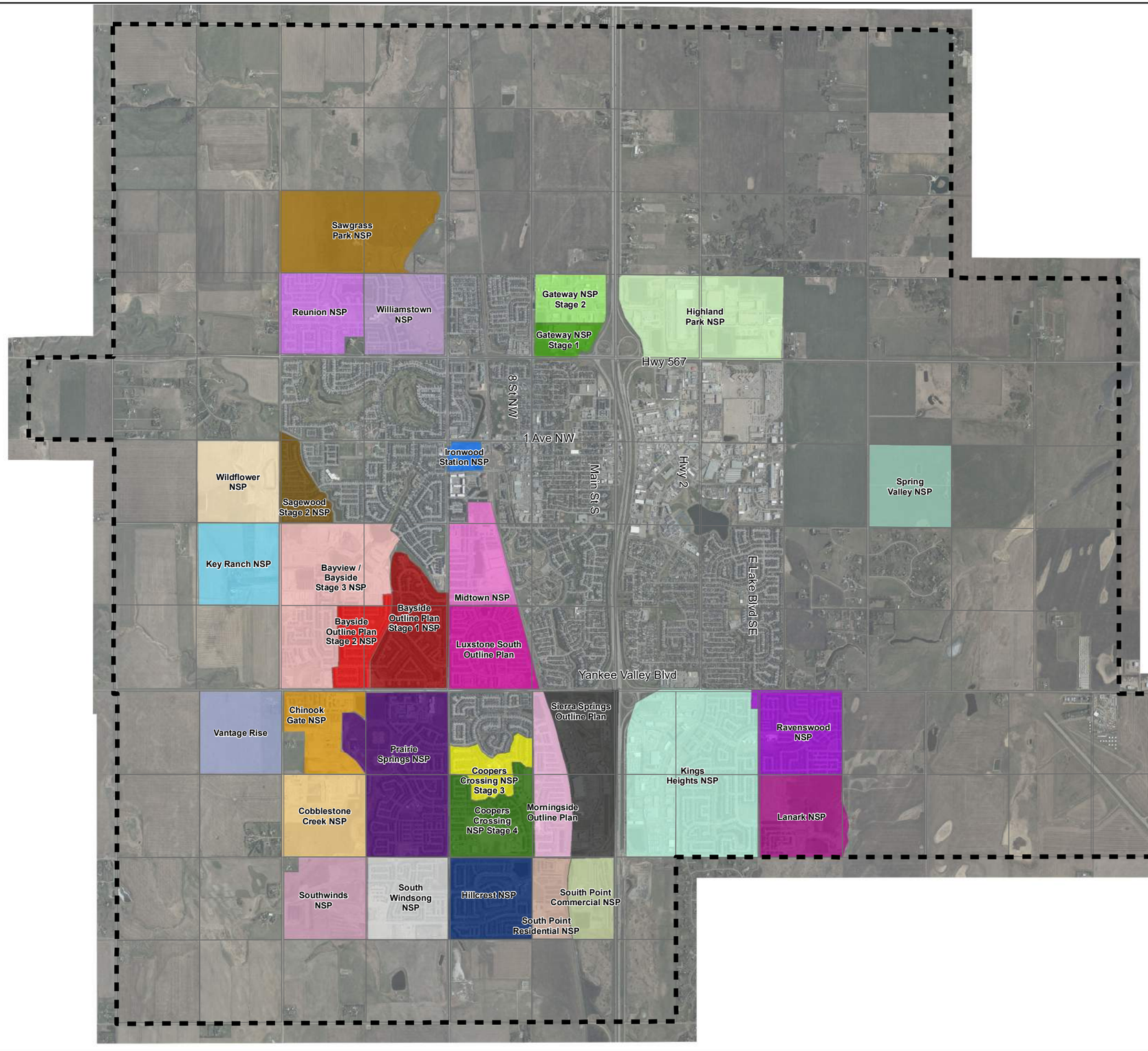
Date: 2024-05-30 Document: Q:\Projects\28211_Airdrie_UMP_Update\25_GIS\251_Figures\2_Reporting\Figure 2.7_CASP Boundaries.mxd



Legend

City Boundary

Legal

Neighbourhood Structure Plan

- Bayside Outline Plan Stage 1 NSP
- Bayside Outline Plan Stage 2 NSP
- Bayview / Bayside Stage 3 NSP
- Chinook Gate NSP
- Cobblestone Creek NSP
- Coopers Crossing NSP Stage 3
- Coopers Crossing NSP Stage 4
- Gateway NSP Stage 1
- Gateway NSP Stage 2
- Highland Park NSP
- Hillcrest NSP
- Ironwood Station NSP
- Key Ranch NSP
- Kings Heights NSP
- Lanark NSP
- Luxstone South Outline Plan
- Midtown NSP
- Morningside Outline Plan
- Prairie Springs NSP
- Ravenswood NSP
- Reunion NSP
- Sagewood Stage 2 NSP
- Sawgrass Park NSP
- Sierra Springs Outline Plan
- Souith Point Commercial NSP
- South Point Residential NSP
- South Windsong NSP
- Southwinds NSP
- Spring Valley NSP
- Vantage Rise
- Wildflower NSP
- Williamstown NSP

0 500 1,000 2,000 Metres

1:40,000 CANA83 3TM114

EXHIBIT 2.7
NEIGHBOURHOOD STRUCTURE PLAN BOUNDARIES
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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Date: 2024-05-30 Document: Q:\Projects\28211_Airdrie_UMP_Update\25_GIS\251_Figures\2_Reporting\Figure 2.8_NSP Boundaries.mxd

Densification within the pre-annexation area is based on the "Our Core Strategy: Airdrie's Downtown Revitalization Plan" (Airdrie, 2022). From this document, an anticipated combined residential and employment population of 7,000 people and jobs is projected. With an unknown population / employment split from the plan, the projected 7,000 people and jobs was assumed to be split evenly between residential and employment population growth (3,500 residents and 3,500 jobs).

The residential and employment populations for the post-annexation growth areas are based on the relevant CASPs or NSPs, where applicable. Where an NSP exists for portions of a CASP, the overall CASP population was maintained and allocated proportionally over the remaining CASP development area not included in the NSP(s). Where a CASP does not exist, the overall population and employment density target rates provided by the City were applied for both residential and employment areas. This was done on a net developable area basis, which removes open space and regional park areas as well as road ROW from the gross developable area. It should be noted that for the potential Northwest Regional Park, it was assumed that it occupies approximately one quarter section of residential land. Therefore, this equivalent population was removed proportionally from the residential areas within this potential regional park area.

In areas where a CASP or NSP was not available, residential populations are based on the population / household ratio of 2.81 obtained from the 2023 Municipal Census as well as the following density rates depending on the anticipated development year of the area:

- 2025-2045: 8 Units Per Acre (UPA)
- 2050-Ultimate: 9 UPA

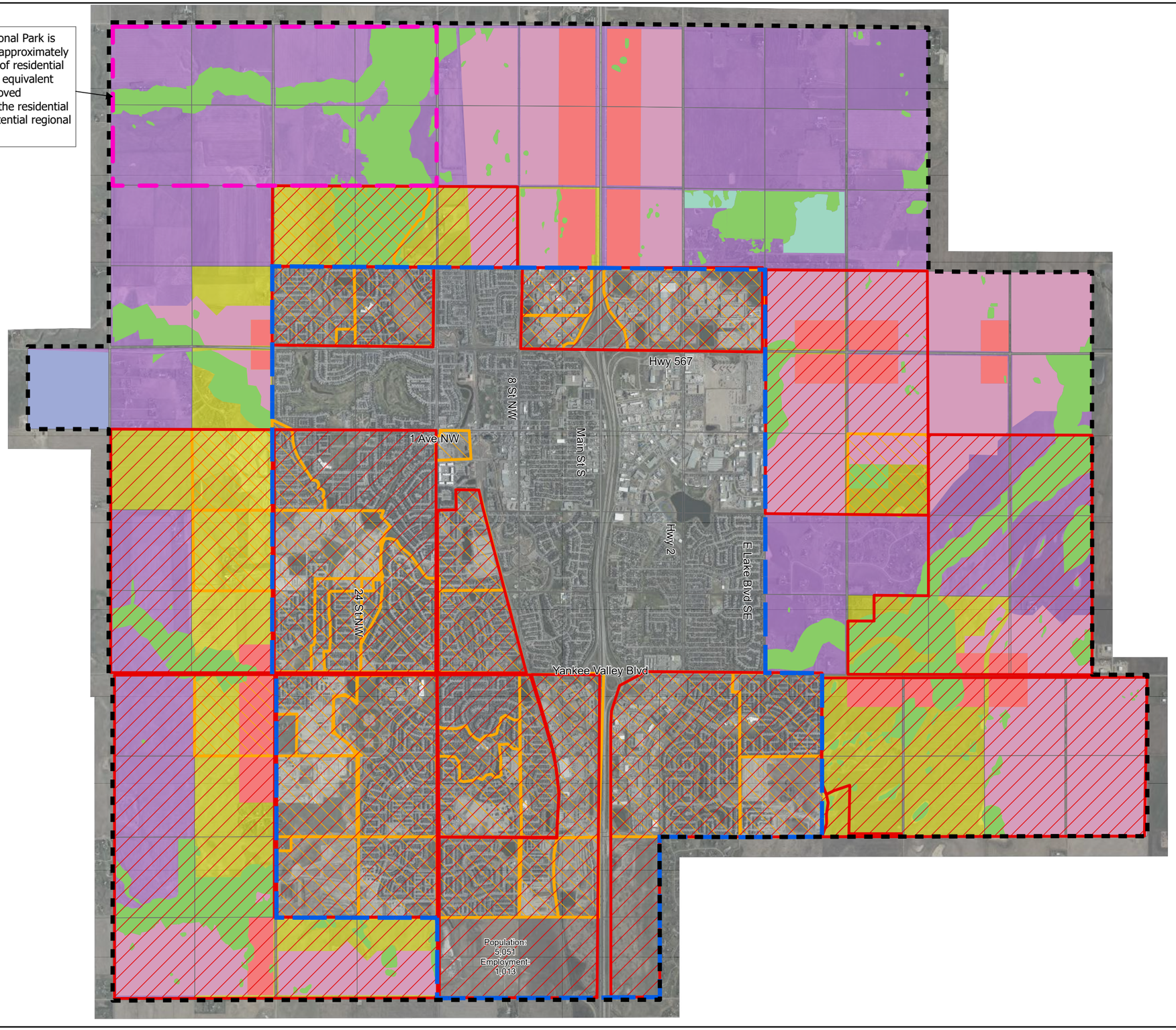
These rates are consistent with the 12K Plan (IBI Group, 2018) document, which assumes a density of 8 UPA for the first 30 years of growth and 9 UPA for the next 20 years of growth, at five-year increments.

Employment populations were based on the CASP or NSP where applicable, or on 35 jobs/ha target provided by the City, if there was no CASP or NSP. It should be noted that the employment calculations included home-based jobs in this TMP Update. **Exhibit 2.8** shows all the CASP and NSP boundaries, as well as the residential unit density for each of the TAZ in the post-annexation area. Note that the residential unit density rate (8 or 9 UPA) for each of the TAZ is determined based on the anticipated development timelines as mentioned above.

Based on above growth review and the alignment with Off-Site Levy project, ISL and the City arrived at the following population and employment levels for each growth horizon:

- 110K Population: Residential population of 110,000 people and employment of 28,440 jobs
- 144K Population: Residential population of 144,000 people and employment of 39,200 jobs
- 203K Population: Residential population of 203,000 people and employment of 71,840 jobs
- Ultimate: Residential population of 265,000 people and employment of 92,660 jobs

The Northwest Regional Park is assumed to occupy approximately one quarter section of residential land. Therefore, the equivalent population was removed proportionally from the residential areas within this potential regional park boundary.



N

Legend

- City Boundary
- Pre-Annexation Boundary
- Legal
- CASP Boundaries
- NSP Boundaries

Non-residential Land Use

- Commercial Overlay
- Employment
- Institutional
- Regional Park
- Open Space

Residential Unit Density

- 8 UPA Area
- 9 UPA Area

0 500 1,000 2,000 Metres

1:40,000 CANA83 3TM114

EXHIBIT 2.8
POPULATION CONSIDERATIONS
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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Detailed residential and employment population calculations are summarized in **Tables 2.2 and 2.3**, respectively, based on the following additional assumptions:

- The 110K population pre-annexation area populations are 85% of the ultimate pre-annexation area populations.
- The 110K population post-annexation area populations are based on 30% build-out of the post-annexation quarter sections coming on-line by 2025.
- The 110K population downtown revitalization populations are 50% of the total downtown revitalization populations.
- The 144K population post-annexation area populations are based on 40% build-out of the post-annexation quarter sections coming on-line by 2035, and 100% build-out of the quarter sections coming on-line by 2025 or 2030.
- The 203K population post-annexation populations are 100% build-out of the post-annexation quarter sections coming on-line between 2025 to 2060.
- Trips generated by the NE regional park, NW regional park and the two new recreation centres were added to the Ultimate Horizon. These trips are not shown as employment or population in the TMP but were included in the model. Note that the recreation centre located in Southwinds is assumed to be developed by the 110K population horizon.
- The employment shown in Table 2.3 includes 23.8 % of the Airdrie population working from Home (Home Based Employment) as per the City's 2019 Census data.

Table 2.2: Residential Population Summary

Development Area	Horizon			
	110K Population	144K Population	203K Population	Ultimate
Existing (2023)	80,649	80,649	80,649	80,649
Pre-Annexation Areas*	20,607	22,269	22,269	22,269
Downtown Revitalization	1,750	3,500	3,500	3,500
Post-Annexation Areas	6,040	37,299	96,495	158,722
Total	**109,046**	**143,716**	**202,913**	**265,139**

*Pre-Annexation Areas excluded the Downtown Revitalization

Table 2.3: Employment (Jobs) Summary

Development Area	Horizon			
	110K Population	144K Population	203K Population	Ultimate
Existing (2023)	20,483	20,483	20,483	20,483
Pre-Annexation Areas*	5,519	8,621	8,621	8,627
Downtown Revitalization	1,750	3,500	3,500	3,500
Post-Annexation Areas	688	6,598	39,235	60,049
Total	**28,440**	**39,202**	**71,839**	**92,659**

*Pre-Annexation Areas excluded the Downtown Revitalization

Similar to the existing residential population and employment figures, the future residential population and employment from Tables 2.2 and 2.3 were distributed into the TAZ system based on the ArcGIS data / land uses of the City. The residential population and employment of each zone for the four future horizons are summarized in the Tables attached in Appendix E and are shown graphically in Exhibits 2.9 to 2.12.

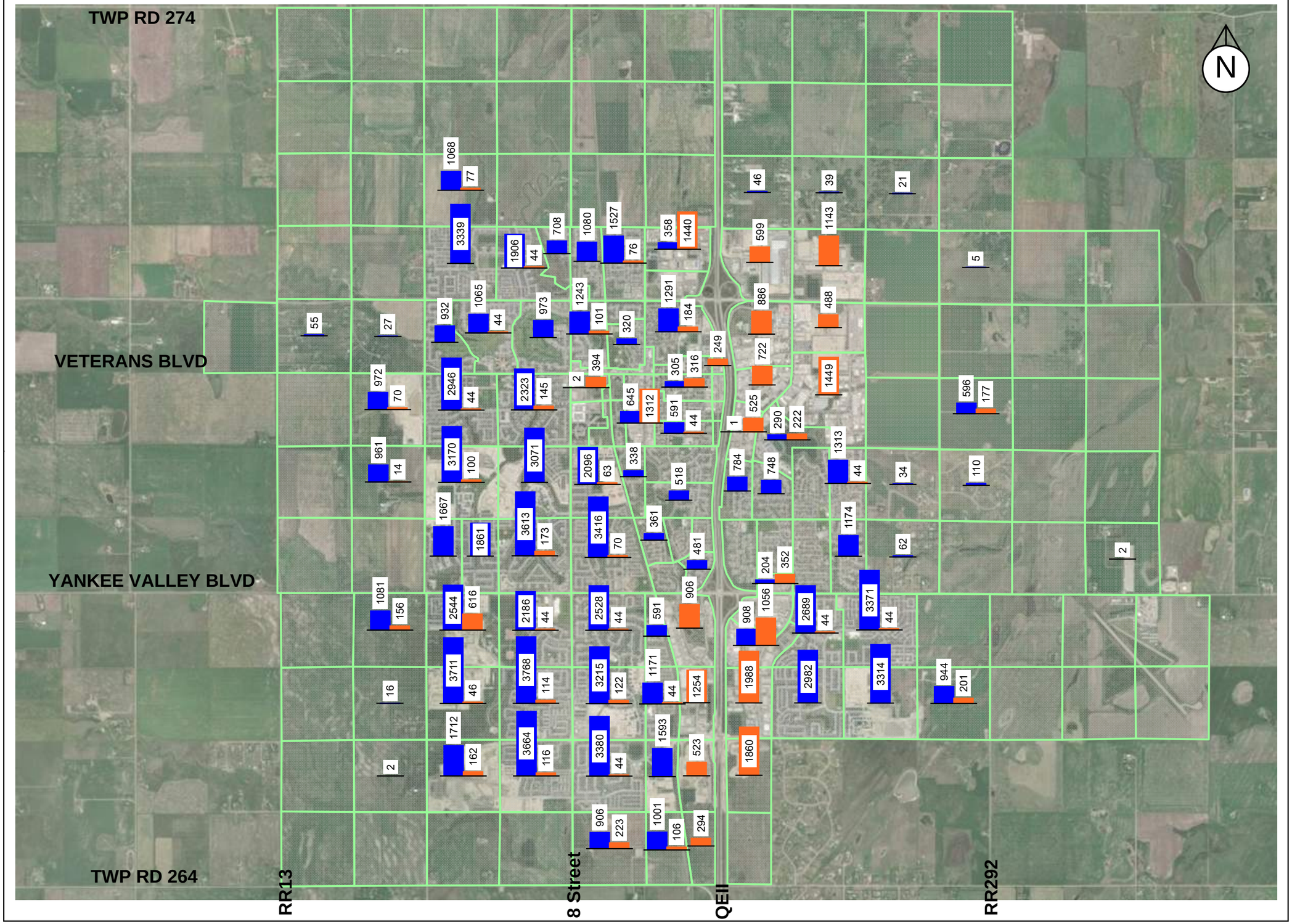
The overall future population and employment levels and build-out assumptions for each zone were reviewed and confirmed by the City prior to use in the model.

2.4 Future Horizons External Gate Volumes

As discussed in the scope of work, external gate volumes were obtained from the 2028 and 2039 horizon models from the South/East Calgary Regional Transportation Study (S&ECRTS), which incorporated and reflects regional updates from the prior North Calgary Regional Transportation Study (NCRTS). For this TMP update, the S&ECRTS / NCRTS 2028 and 2039 horizons model data was assumed to correspond to the 110K and 144K horizons of the Airdrie TMP. As there are no additional horizons modelled in the S&ECRTS / NCRTS series, the following steps were undertaken to estimate the external gate volumes at the 203K and Ultimate horizons:

- Calculate the yearly external gate volumes difference between the 144K and 110K (2039-2028 = 11 years) S&ECRTS models.
- The 203K and Ultimate horizons were assumed to occur in 2065 and 2090, respectively, in the S&ECRTS / NCRTS models;
- The yearly growth was multiplied by 26 (2065 - 2039 = 26 years) to get the growth between 144K (2039 in S&ECRTS / NCRTS models) and 203K (2065 in S&ECRTS / NCRTS models). This growth is applied to the 144K external gate volumes to estimate the 203K external gate volumes;
- Similar methodology was used to get the growth between 203K and Ultimate.
- Made final adjustments to the future external gate volumes to ensure the future external gate volumes are proportional to the land use assumptions (e.g. similar to the external gate trip ratios for the existing condition)

The 2028 and 2039 horizon of the S&ECRTS traffic model outputs are attached in Appendix F.



Legend

110K Population Horizon Zone Data

Population

Employment

EXHIBIT 2.9
110K POPULATION HORIZON
POPULATION AND EMPLOYMENT
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TWP RD 274

VETERANS BLVD

YANKEE VALLEY BLVD

TWP RD 264

RR13

8 Street

QEII

RR292

N

Legend

144K Population Horizon Zone Data

Population

Employment

EXHIBIT 2.10
144K POPULATION HORIZON
POPULATION AND EMPLOYMENT
AIRDRIE TRANSPORTATION MASTER
PLAN MODEL UPDATE

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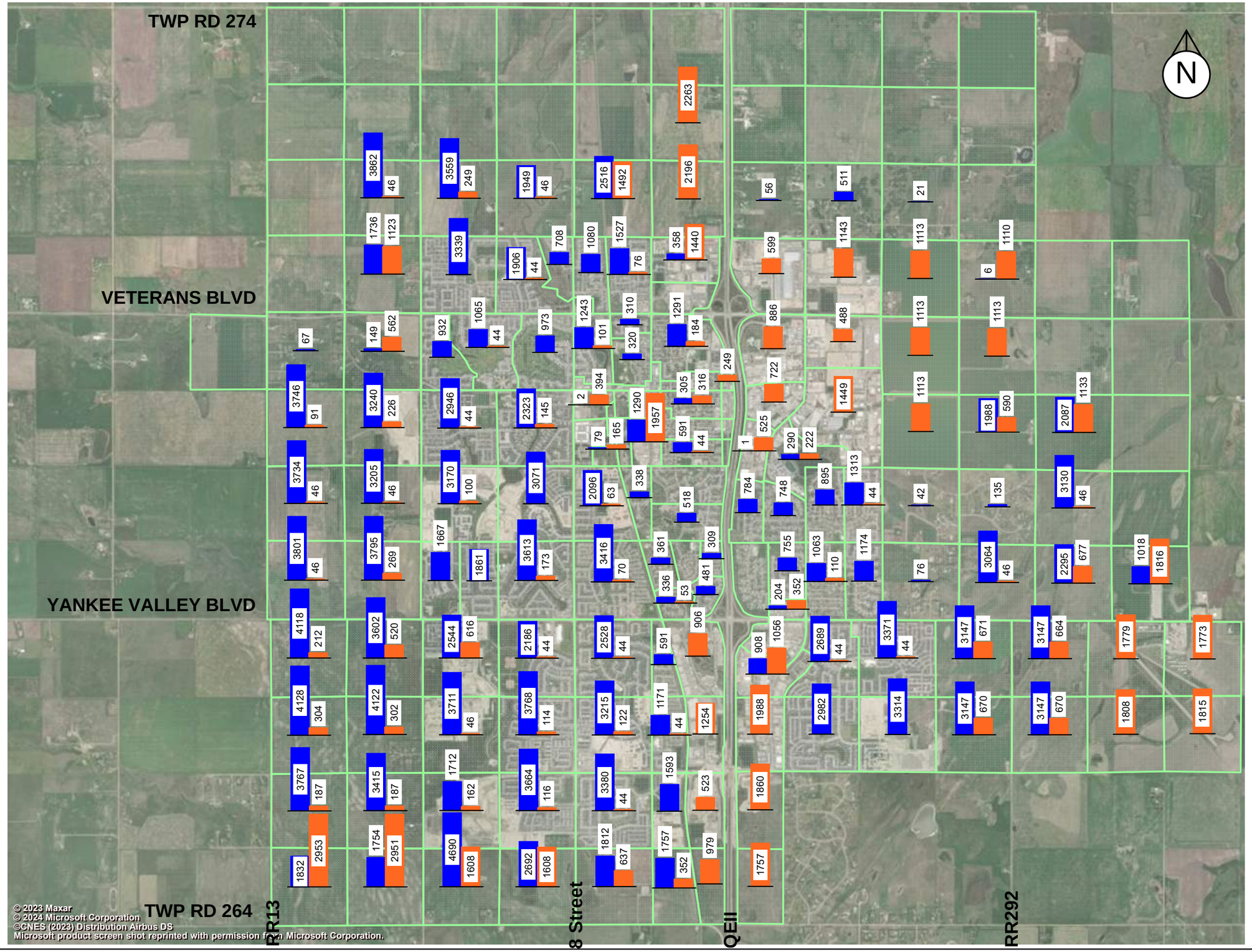

Legend

203K Population Horizon Zone Data

Population

Employment

EXHIBIT 2.11
203K POPULATION HORIZON
POPULATION AND EMPLOYMENT
AIRDRIE TRANSPORTATION MASTER
PLAN MODEL UPDATE

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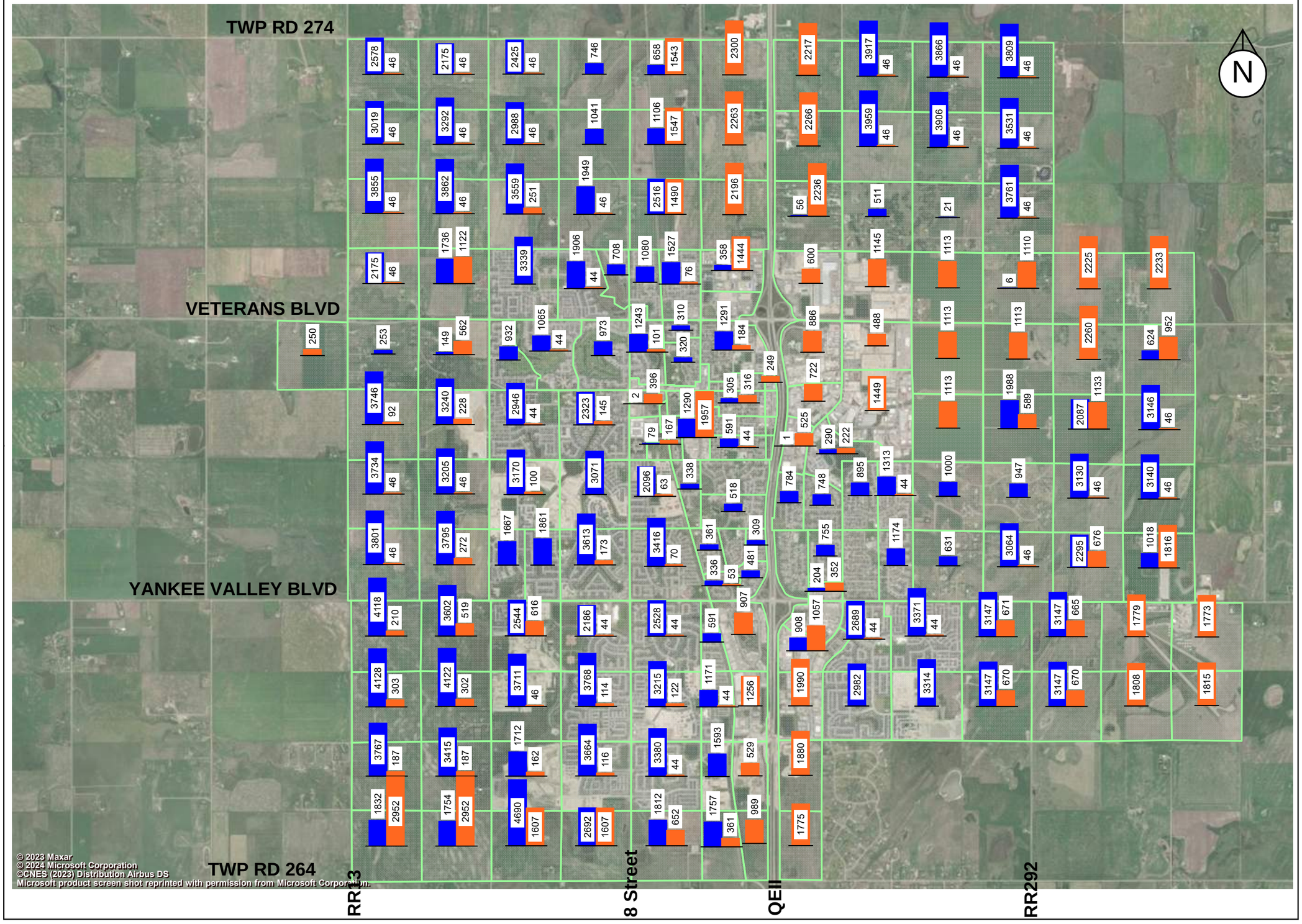

Legend

Ultimate Population Horizon Zone Data

Population

Employment

EXHIBIT 2.12
ULTIMATE HORIZON POPULATION AND EMPLOYMENT
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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3.0 Travel Demand Model and Calibration

The development of a travel demand model for the TMP provides significant benefit as it evaluates travel pattern changes as they relate to changes in land use and regional and local transportation network links. This is valuable to Airdrie as any potential change to the road network, including provincial projects on QEII or the future east Airdrie bypass, could significantly alter traffic patterns within Airdrie, and it is helpful to understand what transportation infrastructure may be required to accommodate these changes in addition to the normal outward expansion of the roadway network through planned future development areas.

3.1 Travel Demand Modelling Process

The travel demand model development and the analysis undertaken in this study used the VISUM 2023 transportation planning software suite developed by PTV Group. This GIS-based travel forecasting model is a state-of-the-art transportation planning tool that can efficiently estimate changes in travel patterns and utilization of transportation systems in response to changes in land use, population, employment, and transportation infrastructure. It integrates mapping, land use planning, development projections, future traffic demand, and transportation networks to produce realistic traffic forecasts that can be interpreted easily and presented in effective visual format. It is also a commonly used modelling platform for municipalities in Alberta.

Three steps from the traditional four-step travel demand modelling process were used for this study, as shown in Figure 3.1 and summarized as follows:

- **Trip Generation** – residential, retail, non-retail, school and industrial land uses are used to determine the number of peak hour trips being generated for the study area;
- **Trip Distribution** – zone-to-zone trip distribution is based on the road network impedance (i.e., travel time) and travel pattern data from StreetLight Data (refer to Section 3.1.1 on StreetLight Data). From the trip distribution, a zone-to-zone origin-destination (OD) trip estimation matrix is developed;
- **Mode Split** – the OD trip matrix is split into various travel modes, such as passenger vehicle, trucks, walking, biking and transit. As confirmed with the City in the proposal stage, only passenger vehicle trips were modelled and no additional mode split analysis was conducted for this study;
- **Trip Assignment** – the estimated OD trip matrix is assigned onto the established road network to derive link volumes for the existing and future traffic scenarios.

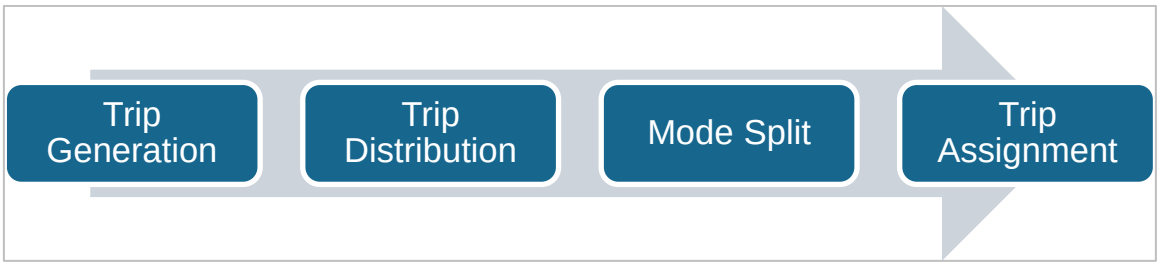

Figure 3.1: Traditional Four-Step Travel Demand Modelling Process

The existing travel demand model captures the existing travel patterns, including trip generation, trip distribution, trip assignment, and pass-by traffic (external to external traffic) through Airdrie. With a model calibrated to existing conditions (further discussed in Section 3.3), these characteristics can then be applied to the growth areas of Airdrie to forecast the future traffic volumes. The future transportation demand model provides Airdrie with a scalable, flexible platform that can be readily adapted over time to include additional scenarios or transportation complexity as Airdrie grows. The flow chart in Figure 3.2 is a general representation of process to develop the base year model for this study.

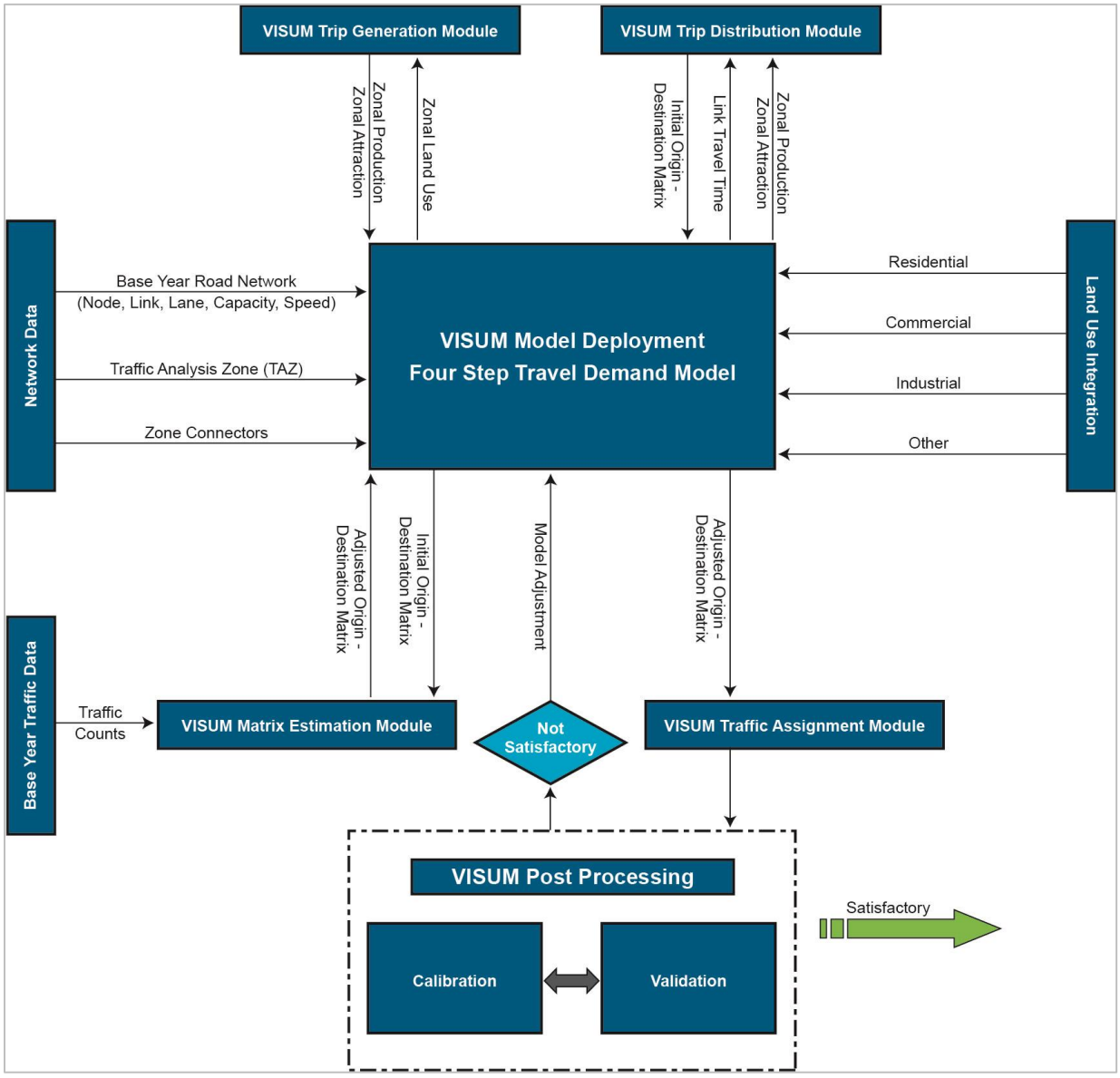

Figure 3.2: General Representation of Base Year Model Development

3.1.1 StreetLight Data

Traditionally when updating an old travel demand model or developing a new travel demand model, a household travel survey was conducted to understand the existing travel patterns of a representative sample of City residents. The data was then used for the trip distribution component of the travel demand model.

Instead of undertaking an extensive household travel survey, which is costly and time-consuming, ISL utilized travel pattern data from StreetLight Data in this TMP. StreetLight Data is a data analysis company that processes mobility data from smart phones and navigation devices (Big Data) to generate aggregated travel pattern analytics. This approach has become more common in recent years and is generally replacing the traditional travel surveys as the technology becomes more refined.

Typical travel patterns from March 2020 to April 2022 (latest data available in StreetLight at the time of this study) have been altered by the COVID-19 pandemic due to increased work-from-home activity, periodic school closures, and disruption of typical tourist and business activity. As such, StreetLight Data during this time period is not considered as a valid data set to calibrate the model. Therefore, pre-COVID StreetLight Data in 2019 was used for the analysis and would be more reflective of post-COVID conditions (which in the context of Airdrie, has been observed to have largely returned to the pre-pandemic “norm”).

For this TMP, StreetLight Data’s pre-COVID external-to-external traffic demand of all external gates listed in Table 2.1 and internal-to-external / external-to-internal traffic demand were used for the development and calibration of the travel demand model. This data is important for VISUM model building and differentiating future traffic volumes related to the City versus the wider region.

3.2 Roadway Capacity

Roadway capacities within the VISUM model are based on their functional classification, shown in Exhibit 2.3. Link capacities used in the TMP model are summarized in Table 3.1. The link capacities are generally conservative, in that they are based on the capacity of a single traffic lane, multiplied out to the total number of lanes on the road in a given scenario.

Table 3.1: Road Classifications

Road Classification	Capacity (Veh/hr/lane)
Highway	2,000
Interchange Ramp	1,200
Arterial	1,100
Rural Road	1,400
Rural Road - Gravel	500
Collector	800
Local	400

Model outputs for scenario planning are based on the volume-to-capacity (v/c) ratio of each roadway, with ranges defined in Table 3.2. Given the conservative ranges for the link capacities, the macro-level planning is targeted toward achieving a capacity band ranging from 85% to 100% of link capacity. For example, the link capacities do not provide for channelized turn bays at intersections, which in practice will increase total capacity through a traffic signal on an arterial. The acceptance of certain higher-volume links in some cases has either been proven via more detailed micro-level analysis or is considered to be an acceptable level of congestion given the existing constraints and limitations of the specific roadway.

Table 3.2: Volume-to-Capacity Ratio Ranges

Colour	v/c Ratio	Notes
Light Green	<=0.70	Effective operations with light / normal traffic
Orange	>0.70 to <=0.85	Normal operations, urban traffic conditions
Red	>0.85 to <=1.00	At or near capacity
Dark Red	>1.00	Above capacity

3.3 Existing Horizon Calibration

A 2023 baseline model was developed for the transportation network, using existing land use and traffic counts within Airdrie to develop and calibrate the travel demand model. Pre-COVID (2019) traffic count data at 18 locations was obtained from TEC's website and was also provided by the City. Also, traffic count data between 2020 to 2023 at 30 locations was provided by the City. ISL also conducted 12 additional traffic counts. The traffic counts were balanced to higher intersection volumes as traffic counts were undertaken on different days and years.

The calibration plot of the existing network model for PM peak is provided in Appendix D. Regression values (R^2) of 0.94 and 0.93 were obtained for the network in the PM peak for link counts (73 locations provided by the City) and intersection turns (48 locations as mentioned above), respectively. This value represents strong convergence with the existing traffic data; the typical R^2 value for acceptance is 0.80 for a TMP in a medium / large size municipality.

The v/c ratio plot for Airdrie's existing network in the PM peak is provided in Exhibit 3.1. The v/c ratio plot indicates that all existing roadways within Airdrie show good operations with moderate volumes in the PM peak period, and it does not indicate any major network congestion locations or bottlenecks.

From the VISUM analysis, the following v/c ratio criteria were observed for intersections with different number of legs:

- 4-legs Intersection – can accommodate up to v/c ratio of 0.85 on each of the four approaches
- 3-legs Intersection – can accommodate up to v/c ratio of 0.95 on each of the three approaches
- Roadway / Link with free flow condition – can accommodate up to v/c ratio of 1.00

Note that individual movement at the 3-legs or 4-legs intersection might still operate beyond acceptable LOS and/or v/c ratio, therefore it is recommended to monitor an intersection closely when the link v/c ratio meets one of the above conditions.

3.4 Existing Detailed Intersection Analysis

Detailed traffic operation analysis was also completed at all existing intersections in the PM peak with available traffic count data in Synchro. The purpose of the detailed analysis was to verify the findings of the macro-level analysis from VISUM.

3.4.1 Synchro Analysis

Synchro is a widely used macroscopic software used for modelling, optimizing, managing, and simulating transportation networks to improve mobility. Synchro 11 was used to analyze the traffic operations at intersections. The Level of Service (LOS) A represents the highest LOS or generally free flowing conditions, while LOS F generally represents a breakdown or gridlock condition in vehicular flow. There are varying degrees of delay and LOS at the intermediate LOS B, C, D and E levels. LOS D is representative of normal peak hour congestion, while LOS E is representative of an intersection nearing its capacity. Typically, LOS D or better is the accepted standard for peak hour operations in Airdrie. However, as Airdrie becomes more urbanized in the future, it is recommended that LOS E or better to be the accepted standard for peak hour operations to maximize intersection capacity and minimize upgrades. LOS criteria for intersections are based on average delay per vehicle and are summarized in Table 3.3. Synchro also calculates each movement's volume-to-capacity ratio (v/c ratio). A v/c ratio of 1.00 represents an intersection or movement at full capacity. Typically, a v/c ratio of 0.90 or lower for all intersection movements is the accepted standard for peak hour operations in urban areas like Airdrie.

Table 3.3: Level of Service Criteria

LOS		A	B	C	D	E	F
Signalized	Average Delay per Vehicle (s/veh)	< 10	10 – 20	20 – 35	35 – 55	55 – 80	> 80
Unsignalized		< 10	10 – 15	15 – 25	25 – 35	35 – 50	> 50

The Synchro analyses show that majority of the analyzed intersections operated at an acceptable level (LOS E or better and v/c <0.90) with existing traffic controls and lane configurations. However, the following intersections operated beyond the acceptable level:

- Veterans Blvd / Main Street – EBL and WBT operated with v/c over 0.90
- Veterans Blvd / East Lake Ramp – NBL and WBT operated with v/c over 0.90 and/or LOS F
- YVB / Main Street – EBL, WBT and NBL operated with v/c over 0.90 and/or LOS F
- YVB / Sierra Springs Dr – EBT, WBT and NBR operated with v/c over 0.90
- YVB / QEII East Junction – NBL and NBR operated with v/c over 0.90 and/or LOS F

Functional Planning Studies (FPS) for Veterans Blvd and YVB are currently being undertaken and short-term improvements will be provided in the FPS to improve the operations of the above intersections. Also, the 40 Avenue / QEII interchange was opened in October 2023, after the completion of all traffic counts used in this study. Since the opening, traffic on YVB has been observed to be reduced, and qualitative observation is that traffic flows much better on the corridor at all times of day. It is recommended to monitor for operation improvements at the above intersections in the existing horizon. The detailed Synchro results of the existing intersections are shown in Appendix G.

4.0 Future Scenario Road Network and Analysis

4.1 110,000 Population Scenario and VISUM Model

The City of Airdrie is expected to reach a 110K population with 28,440 jobs. The population and employment growth from 80K population to 110K population horizon, as input into the traffic model, is shown in Exhibit 4.1. The majority of the population growth is expected to be in the southwest quadrant of the City in the Chinook Winds CASP area, while most of the employment growth areas are located along QEII in the north and south ends of the City. There is also an additional 1,750 jobs and 1,750 residential population expected in downtown area by the 110K population horizon.

The v/c ratio plot for the 110K population scenario on the existing road network in the PM peak is shown in Exhibit 4.2. The results indicate that there are capacity constraints on Veterans Blvd, Yankee Valley Blvd, 40 Avenue, 56 Avenue and 8 Street. Based on the VISUM analysis, the recommended major upgrades in the 110K population horizon are listed below and are also summarized in Table 4.1:

- Veterans Boulevard: Hamilton Boulevard to just west of Highland Park Boulevard – Widen westbound from 2 lanes to 3 lanes
- Veterans Boulevard: At Main Street Intersection - Added third WBT lane, dual EB, WB and NB left turns
- Veterans Boulevard: At 8 Street Intersection - Dual WB left turns
- Yankee Valley Boulevard: At Main Street Intersection - Added third WBT lane (taper back to 2 lanes west of the intersection)
- 40 Avenue: From 24 Street to Windsong Blvd SW – New 2 lanes construction and new 4 lanes bridge over Dry Creek
- 40 Avenue: From Windstone Way SW to 8 Street – Widen from 2 lanes to 4 lanes
- 40 Avenue: Highview Gate SE to East of Lanark Gate SE - New 2 lanes construction
- 40 Avenue: Dry Creek Bridge – 4 lanes bridge over Dry Creek
- 56 Avenue: 8 Street to the CPKC railway track - New 2 lanes construction (paving)
- 24 Street: Approximately 400m north of 40 Avenue to 56 Avenue - New 2 lanes construction (paving)
- 8 Street: Hillcrest Way SW to 56 Avenue - Widen from 2 lanes to 4 lanes
- Kingsview Boulevard Extension: 40 Avenue to 56 Avenue; new 2 lanes construction

The 110K population horizon v/c ratio plot with the above upgrades is shown in Exhibit 4.3. Detailed 110K population horizon VISUM plots including Total Population and Employment, Annual Average Daily Traffic (AADT), Road Classification, Number of Lanes, Link Volumes, v/c ratio etc. are attached in Appendix H.

4.1.1 110,000 Population Detailed Intersection Analysis

In addition to VISUM analysis, detailed traffic operation analysis was completed at major intersections for the future 110K population horizon in Synchro. The initial analysis found that several intersections operated beyond typical criteria, with some intersection improvements being warranted. At the intersections of Veterans Blvd and Highland Park Gate / East Lake Road, 1 Avenue / Canals Blvd, 1 Avenue / Edmonton Trail, 8 Street / MacKenzie Way, 8 Street / Hillcrest Avenue and 8 Street / 56 Avenue, traffic signals are recommended. The 110K population horizon recommended improvements are as summarized in Table 4.1. It is cautioned that intersection turning volumes from a travel demand model

are generated at a lower level of accuracy than corridor volumes, but do provide an adequate basis for considering future transportation network improvements provided that designers apply good judgment and ensure that any designs incorporate flexibility to accommodate variable local traffic patterns. Local-level analysis through TIAs should continue to be used as part of the development approval process as new growth areas come online, so that they can inform specific roadway design needs. The detailed Synchro results of the 110K population horizon intersections are shown in Appendix G.

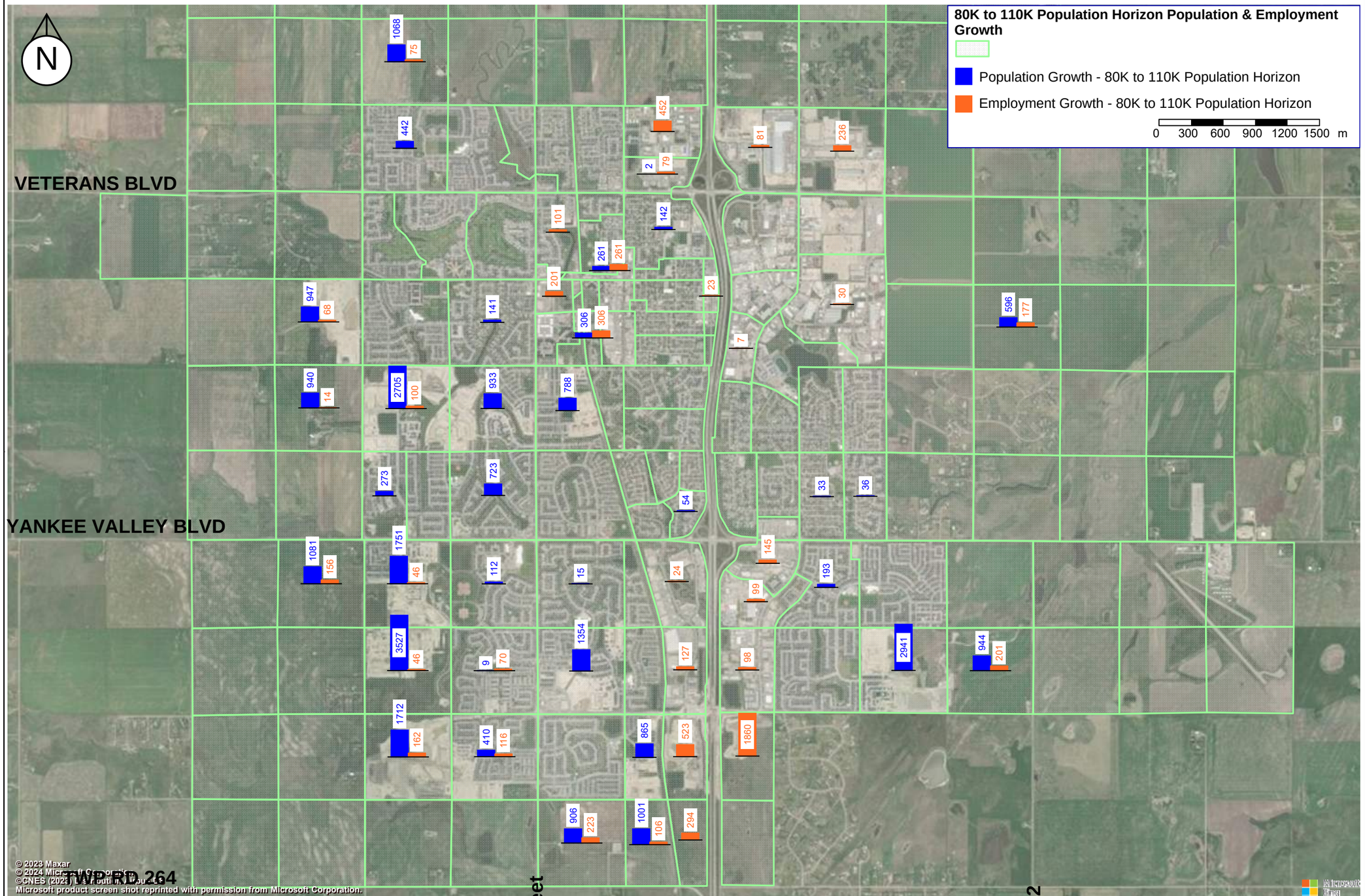

EXHIBIT 4.1
80K TO 110K POPULATION HORIZON
POPULATION AND EMPLOYMENT GROWTH
AIRDRIE TRANSPORTATION MASTER PLAN
MODEL UPDATE

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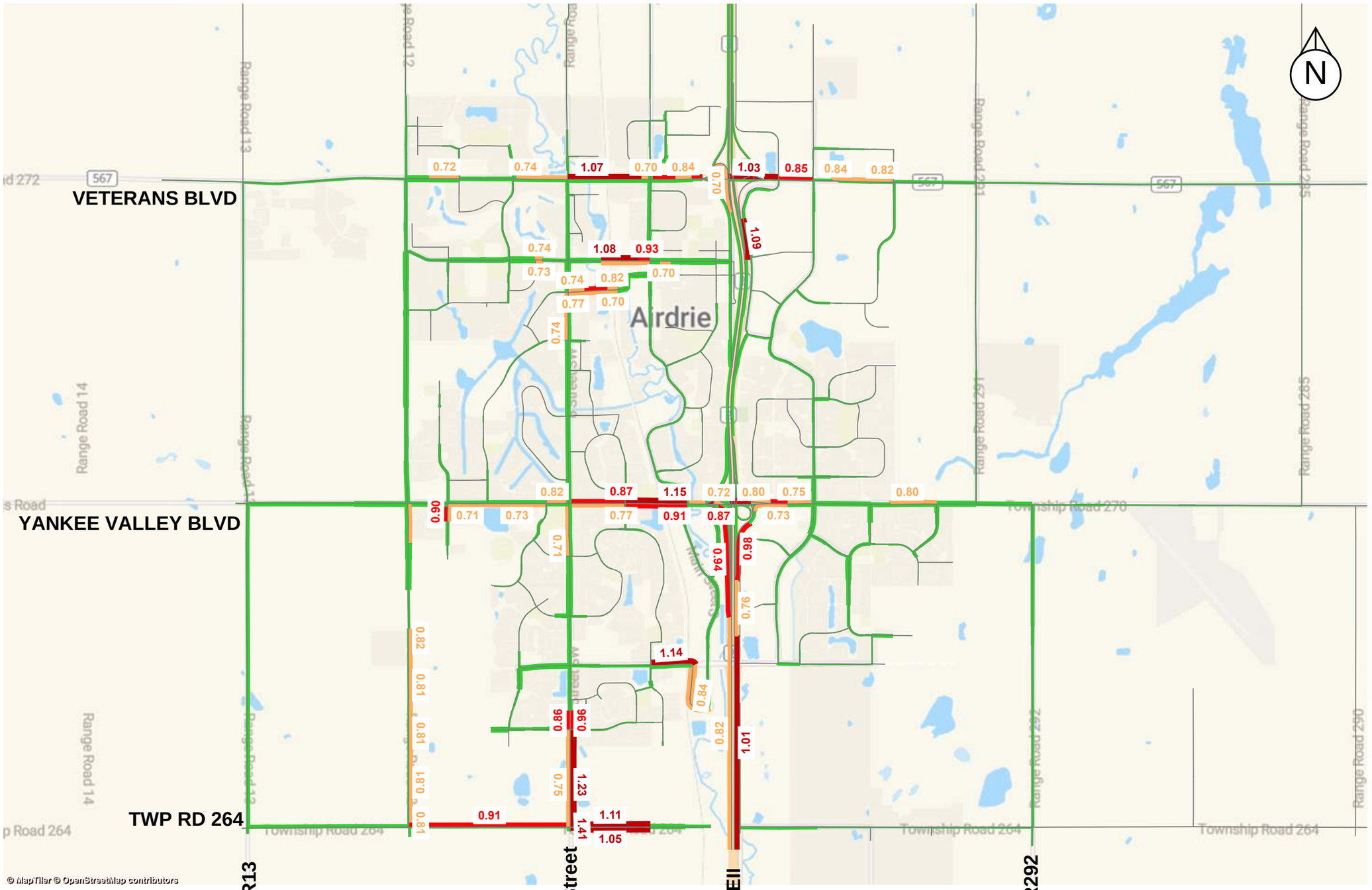

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.2
110K POPULATION HORIZON DO NOTHING SCENARIO VOLUME TO CAPACITY RATIO AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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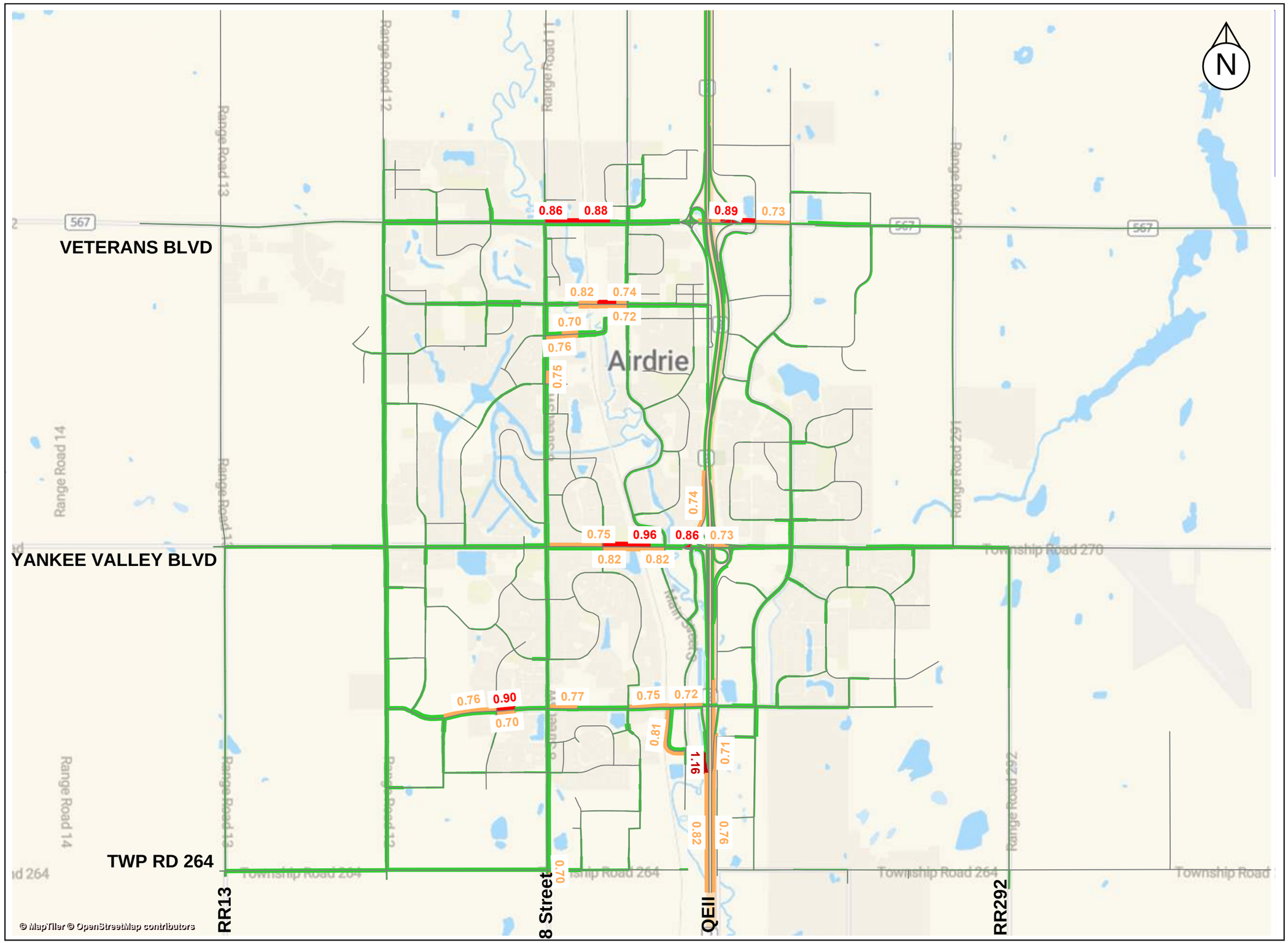

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.3
110K POPULATION HORIZON RECOMMENDED NETWORK VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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Table 4.1: 110K Population Recommended Improvements

Number	Roadway	Section	Recommended Upgrade
1	40 Avenue	24 Street to Windsong Blvd SW	New construction - 2 lanes
2		Windstone Way SW to 8 Street	Widen from 2 lanes to 4 lanes
3		Highview Gate SE to East of Lanark Gate SE	New construction - 2 lanes
4	56 Avenue (TWP Rd 264)	8 Street to the CPKC railway track	New construction (paving) - 2 lanes
5	24 Street (RR12)	Approximately 400m north of 40 Avenue to 56 Avenue	New construction (paving) - 2 lanes
6	8 Street (RR11)	Hillcrest Way SW to 56 Avenue	Widen from 2 lanes to 4 lanes
7	Kingsview Boulevard Extension	40 Avenue to 56 Avenue	New construction - 2 lanes
8	Veterans Boulevard	At Main Street Intersection	Added third WBT lane, dual EB, WB and NB left turns
9		At 8 Street Intersection	Dual WB left turns
10		Hamilton Boulevard / East Lake Boulevard to west of Highland Park Boulevard	Widen westbound from 2 lanes to 3 lanes
11		At Highland Park Gate NE/ East Lake Rd NE	Signalization and urbanize intersection
12	Yankee Valley Boulevard	At Main Street Intersection	Added third WBT lane (taper back to 2 lanes west of the intersection)
13		Sierra Springs Dr SE / QEII SB Off Ramp	Dual NB and SB left turns (convert the current geometry of the SB left turn bay and shared SB left turn / through lane to dual SB lefts and SB dedicated through lane)
14		8 Street	Dual EB and WB left turns
15		Kings Heights Gate SE	Monitor for signalization
16		Ravenswood View SE	Monitor for signalization
17	Main Street	2 Avenue	Monitor for roundabout or signalization
18		1 Avenue	It is recommended to conduct an FPS for 1 Avenue in the downtown segment to identify any potential improvement options
19	8 Street	Willow Brook Gate NW	Monitor for signalization
20		1 Avenue	Added NBR turn bay
21		Railway Ave SW	Added NBR turn bay, modify WBL/T to WBL and EBL/T to EBL
22		MacKenzie Way SW	Signalization and urbanize intersection
23		Luxstone Gate SW	Monitor for signalization
24		Hillcrest Avenue	Signalization
25		56 Avenue	Signalization and urbanize intersection

Number	Roadway	Section	Recommended Upgrade
26	Kingsview Boulevard Extension	TZ 4001 Access	Monitor for signalization
27	40 Avenue	Dry Creek Bridge	4 lanes bridge over Dry Creek
28		Chinook Gate Boulevard SW	Dual lane roundabout
29	1 Avenue	Canals Blvd SW	Signalization
30		Edmonton Trail NE	Signalization

When the recommended improvements are added to the 110K population horizon, no operational issues were identified at most intersections, with the one exception being the Main Street / 1 Avenue intersection downtown, where the EB, WB and NB movements operated with v/c ratios over 1.00 and LOS F. Since there is not enough ROW for any geometric improvements in the existing condition and the intersection is already signalized, it is recommended to conduct a Functional Planning Study for 1 Avenue in the downtown segment to identify any potential improvement options.

Note: In Table 4.1, no immediate improvement is required for recommendations with “Monitor”. However, operational improvements such as signalization and/or geometric upgrades at these locations are likely required soon after the 110K population horizon. As such, traffic analysis should be conducted at these locations in the TIA stage for any development that may impact these intersections to identify required upgrades, if any.

4.2 144,000 Population Scenario and VISUM Model

By the 144K horizon, the City of Airdrie is expected to reach 39,200 jobs. The population and employment growth from the 110K population to 144K population horizon, as input into the traffic model, is shown in Exhibit 4.4. Growth is expected to be spread through all four quadrants of the City with focal points being the Southeast Yankee Valley Boulevard CASP, East Points Industrial CASP, Davy Creek CASP, West Hills CASP, Southwest CASP and South Airdrie CASP areas. The downtown area is expected to be fully densified and an additional 1,750 jobs and 1,750 residential population is also anticipated by the 144K population horizon.

The v/c ratio plot for the 144K population on the 110K population recommended road network scenario in the PM peak is shown in Exhibit 4.5. The results indicate that there are capacity constraints on sections of Veterans Blvd, 1 Avenue, Yankee Valley Blvd, 40 Avenue, 56 Avenue, 8 Street and 24 Street. Based on VISUM analysis, the recommended major upgrades at the 144K population horizon are listed below and summarized in Table 4.2:

- TWP Rd 273: 24 Street to Main Street – New 2 lanes construction
- TWP Rd 273: Nose Creek Bridge – 2 lanes bridge over Nose Creek
- Veterans Boulevard: East of East Lake Boulevard to RR 291 – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: West of 8 Street to Hamilton Boulevard / East Lake Boulevard – Widen from 4 lanes to 6 lanes, which includes the widening of the bridge at QEII (assumed to be a TEC project)
- Veterans Boulevard: Nose Creek Bridge and Culvert - 6 lanes bridge over Nose Creek
- Veterans Boulevard: CPKC Railway Crossing - 6 lanes bridge over CPKC Railway Crossing (see Section 4.2.3 for details)

- Yankee Valley Boulevard: 24 Street - Added second WBT lane (taper back to 1 lane west of the intersection), left and right turn bays for all approaches
- Yankee Valley Boulevard: East of Bayside Gate / Chinook Winds Dr to QEII – Widen from 4 lanes to 6 lanes, which includes the widening of the QEII west junction to 3 WBT lane and the grade separation at the CPKC railway crossing – Sensitivity analyses of the CPKC crossing is discussed below in Section 4.2.3.
- Yankee Valley Boulevard: Kingsview Blvd to Kings Heights Gate SE – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: East of Kings Heights Gate to RR291– Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: At 8 Street, Main Street and Kingsview Blvd – In addition to the Widening, provide dual left turns for all approaches
- Yankee Valley Boulevard: CPKC Railway Crossing - CPKC Railway bridge over 6 lanes YVB
- 40 Avenue: RR13 to 24 Street – New 2 lanes construction (paving)
- 40 Avenue: 24 Street to West of 8 Street – Widen from 2 lanes to 4 lanes
- 40 Avenue: Lanark Gate SE to 800 m East of RR292 – New 2 lanes construction (paving)
- 40 Avenue: At 8 Street – Added third EBT and WBT lane, dual left turns for all approaches
- 40 Avenue: Kingsview Blvd – Added third WBT lane, dual NB left turns and dual NBT lanes. Convert the free flow SBR to signalized dual SBR turns.
- 40 Avenue: Kings Heights Way SE - Signalization and add second EBT and WBT lane (widen at the intersection from 2 lanes to 4 lanes)
- 56 Avenue: 24 Street to 8 Street – New 2 lanes construction (paving)
- 24 Street (RR12): Reunion to TWP Rd 273 – New 2 lanes construction (paving)
- 8 Street (RR11): Silver Springs to TWP Rd 273 – New 2 lanes construction (paving)
- 8 Street: Hillcrest Avenue to south of 56 Avenue – Widen from 4 lanes to 6 lanes
- RR292: Yankee Valley Boulevard to 40 Avenue – Re-alignment and new 2 lanes construction

The 144K population horizon v/c ratio plot with the above upgrades is shown in Exhibit 4.6. Detailed 144K population horizon VISUM plots including Total Population and Employment, AADT, Road Classification, Number of Lanes, Link Volumes, v/c ratio etc. are provided in Appendix H.

4.2.1 144,000 Population Detailed Intersection Analysis

In addition to VISUM analysis, detailed traffic operation analysis was completed at major intersections for the future 144K population horizon in Synchro. The initial analysis found that many intersections operated beyond typical criteria, with some intersection improvements being warranted. New traffic signals are recommended at 25 intersections. Also, it is recommended that a number of new intersections be urbanized with left turn and/or right turn bays on approaches where required. At Main Street / Jensen Drive, a new traffic signal or a roundabout is recommended. The 144K population horizon recommended improvements are as summarized in Table 4.2. The detailed Synchro results of the 144K population horizon intersections are shown in Appendix G.

Table 4.2: 144K Population Recommended Improvements

Number	Roadway	Section	Recommended Upgrade
1	TWP Rd 273	24 Street to Main Street	New construction - 2 lanes
2	24 Street (RR12)	Reunion to TWP Rd 273	New construction (paving) - 2 lanes
3	8 Street (RR11)	Silver Springs to TWP Rd 273	New construction (paving) - 2 lanes
4	Veterans Boulevard	East of East Lake Boulevard to RR 291	Widen from 2 lanes to 4 lanes
5		QEII West Junction to west of Hamilton Boulevard / East Lake Boulevard	Widen from 4 lanes to 6 lanes. This also requires the widening of the bridge at QEII (TEC Project)
6		West of 8 Street to QEII West Junction	Widen from 4 lanes to 6 lanes (including 6 lanes bridge over Nose Creek and 6 lanes bridge over CPKC Railway Crossing) Main Street: WBT remain operated with v/c 0.90 after widening to 6 lanes
7		At Highland Park Blvd / East Lake Ramp	Added dual NB left turns
8		At RR 13	Signalization and urbanize intersection
9		At 24 Street	Signalization and urbanize intersection
10	1 Avenue	24 Street	Signalization and urbanize intersection
11		Sagewood Blvd SW	Monitor for signalization or roundabout
12	RR292	Yankee Valley Boulevard to 40 Avenue	Re-alignment and new construction - 2 lanes
13	Yankee Valley Boulevard	At RR 13	Dual lane roundabout
14		24 Street	Added second WBT lane (taper back to 1 lane west of the intersection), left and right turn bay for all approaches
15		East of Bayside Gate / Chinook Winds Dr to QEII	Widen from 4 lanes to 6 lanes east of Bayside Gate / Chinook Winds Dr to QEII. This also requires the widening of the west junction to 3 WBT lane, and the grade separation of the CPKC railway crossing.
16		Kingsview Blvd to Kings Heights Gate SE	Widen from 4 lanes to 6 lanes
17		East of Kings Heights Gate to RR291	Widen from 2 lanes to 4 lanes
18		At 8 Street Intersection	In addition to the widening, dual left turns for all approaches
19		At Main Street Intersection	In addition to the widening, dual left turns for all approaches
20		Kingsview Blvd	In addition to the widening, dual left turns for all approaches
21		Kings Heights Gate SE	Signalization and urbanize intersection
22		Ravenswood View SE	Signalization and urbanize intersection
23		RR291	Added south leg, signalization and urbanize intersection

Number	Roadway	Section	Recommended Upgrade
24	40 Avenue	At RR 13	Dual lane roundabout
25		RR13 to 24 Street	New construction (paving) - 2 lanes
26		24 Street to West of 8 Street	Widen from 2 lanes to 4 lanes
27		Lanark Gate SE to 800m East of RR292	New construction (paving) - 2 lanes
28		At 8 Street Intersection	Added third EBT and WBT lane, dual left turns for all approaches
29		At Reynolds Gate SW Intersection	Convert the shared SBL/T to SBL and SBT/R, Also convert the shared NBT/R to NBR.
30		Kingsview Blvd	Added third WBT lane, dual NB left turns and dual NBT lanes. Convert the free flow SBR to signalized dual SBR turns.
31		Kings Heights Way SE	Signalization and added second EBT and WBT lane (widen at the intersection from 2 lanes to 4 lanes)
32		Lanark Gate SE	Monitor for signalization
33		TZ 3505_5 Access	Monitor for signalization
34		RR292	Signalization and urbanize intersection
35	56 Avenue (TWP Rd 264)	24 Street to 8 Street	New construction (paving) - 2 lanes
36		RR13	Dual lane roundabout with NBR turn bay
37		24 Street	Dual lane roundabout with WBR turn bay
38		Intersections of TZ3801 Access 2 and TZ3801 Access 1 (west of QEII)	Signalization and urbanize intersection (two Intersections)
39	RR 13	East West collector at TZ 3476_3	Monitor for signalization
40	24 Street (RR12)	6 intersections South of Veterans Blvd. Note: The recommendations at 56 Ave (roundabout), Veterans Blvd (signalization) and 1 Avenue (signalization) are shown as a separated item in this table.	Signalization and urbanize intersection (six Intersections)
41		Bayview Gate SW	Monitor for signalization
42		Creekmill Court SW	Monitor for signalization
43		TZ 3601 Access	Monitor for signalization
44	8 Street (RR11)	Willow Brook Rd NW	Monitor for signalization
45		Willow Brook Gate NW	Monitor for signalization
46		Luxstone Gate SW	Monitor for Signalization
47		TZ3801 Access 3	Signalization
48		Hillcrest Avenue to south of 56 Avenue	Widen from 4 lanes to 6 lanes
49	Main Street	Gateway Link NE	Signalization
50		Jensen Dr NE	Signalization or roundabout
51		1 Avenue	It is recommended to conduct an FPS for 1 Avenue in the downtown segment to identify any potential improvement options
52		Elk Hill SE	Monitor for Signalization

Number	Roadway	Section	Recommended Upgrade
53	Kingsview Blvd	Kingsview Rd SE	Signalization
54		Kingsview Way SE	Signalization
55		TZ4001 Access	Signalization and urbanize intersection
56		TZ 4002 Access	Signalization and urbanize intersection
57	RR291	Future East Lake Hill NE Extension	Dual lane roundabout with EBR turn bay
58		TZ 3805_4 Access	Signalization and urbanize intersection
59	RR292 (Realignment)	TZ 3505_6 Access	Signalization and urbanize intersection
60	TWP Rd 273	Nose Creek Bridge	2 lanes bridge over Nose Creek
61	Veterans Boulevard	Nose Creek Bridge and Culvert	6 lanes bridge over Nose Creek
62	Veterans Boulevard	CPKC Railway Crossing	6 lanes bridge over CPKC Railway Crossing
63	Yankee Valley Boulevard	CPKC Railway Crossing	CPKC Railway bridge over 6 lanes YVB

With the recommended improvements as shown in Table 4.2, the majority of the analyzed intersections operated within the acceptable LOS and good v/c ratio. However, the following locations remain operating beyond the acceptable LOS and/or have v/c ratios over 0.90 at the 144K population horizon:

- YVB / 8 Street: NBT remain at v/c 0.92 after improvements
- YVB / QEII West junction: NBR with v/c 1.03 after improvements
- YVB / QEII East junction: NBR with v/c 0.93 after improvements
- 40 Avenue / 8 Street: NBR remain at v/c 0.95 after improvements
- Main Street / 1 Avenue intersection: similar to 110K population horizon, all four approaches operated with v/c ratio over 1.00 and LOS F.

Among these, the overall intersections operate well, with only one movement operating with v/c over 0.90 at YVB / 8 St, YVB / QEII West Junction, YVB / QEII East Junction and 40 Avenue / 8 Street intersection. No further improvements are recommended at these four intersections in the 144K population horizon.

For the Main Street / 1 Avenue intersection, since there is not enough ROW for any geometric improvements in the existing condition, its recommended to conduct a Functional Planning Study for 1 Avenue in the downtown segment to identify any improvement options.

Note: In Table 4.2, immediate improvements are not required for recommendations with “Monitor”. However, operational improvements such as signalization and/or geometric upgrades at these locations are likely required shortly beyond the 144K population horizon. As such, traffic analysis should be conducted at these locations in the TIA stage for any development that may impact these intersections to identify required upgrades, if any.

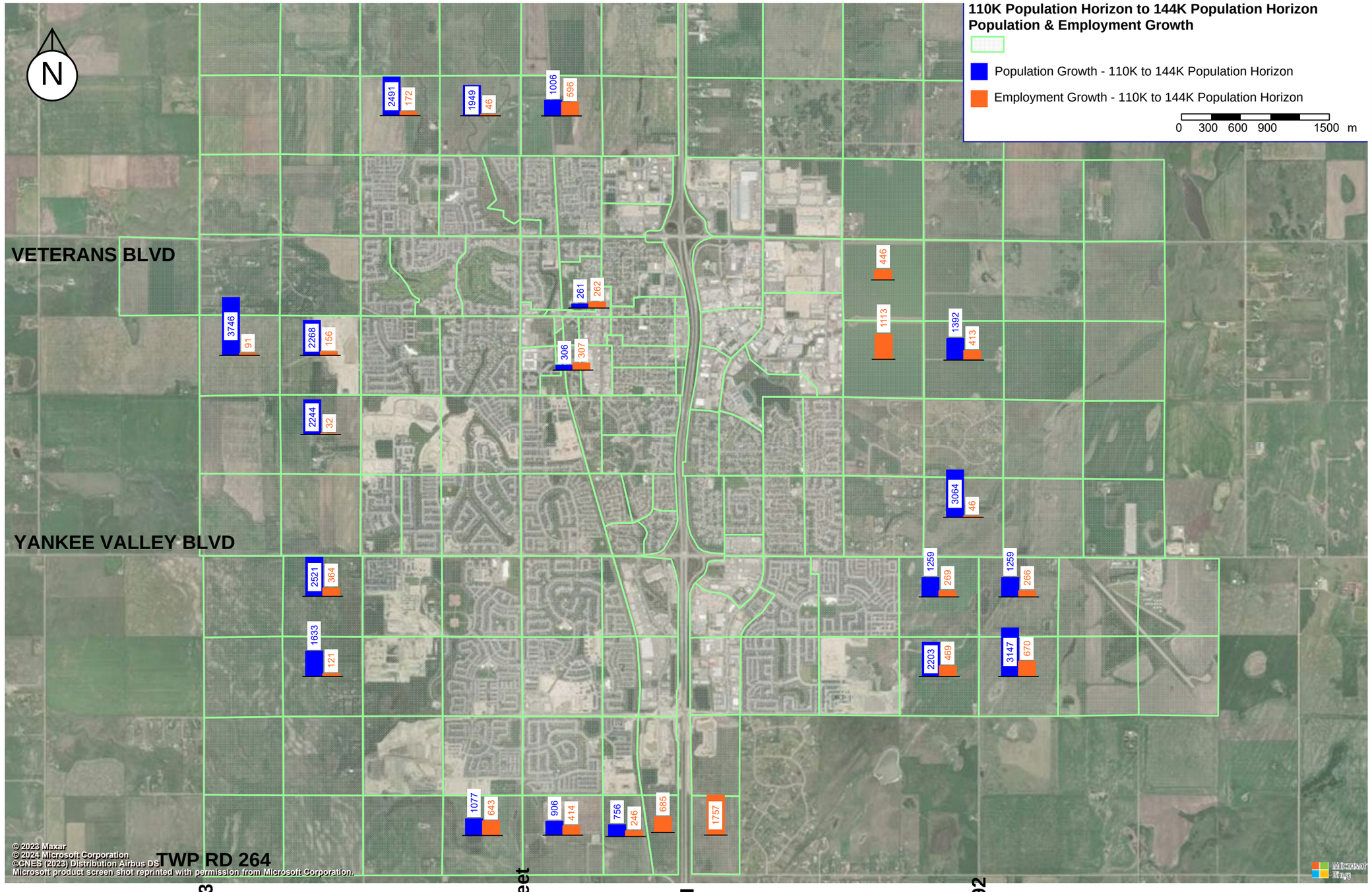

EXHIBIT 4.4
110K TO 144K POPULATION HORIZON
POPULATION AND EMPLOYMENT GROWTH
AIRDRIE TRANSPORTATION MASTER PLAN
MODEL UPDATE

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Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

N

VETERANS BLVD

YANKEE VALLEY BLVD

TWP RD 264

Ardrie

Range Road 13

Range Road 14

RR13

8 Street

QEII

RR292

EXHIBIT 4.5
144K POPULATION HORIZON DO NOTHING SCENARIO VOLUME TO CAPACITY RATIO AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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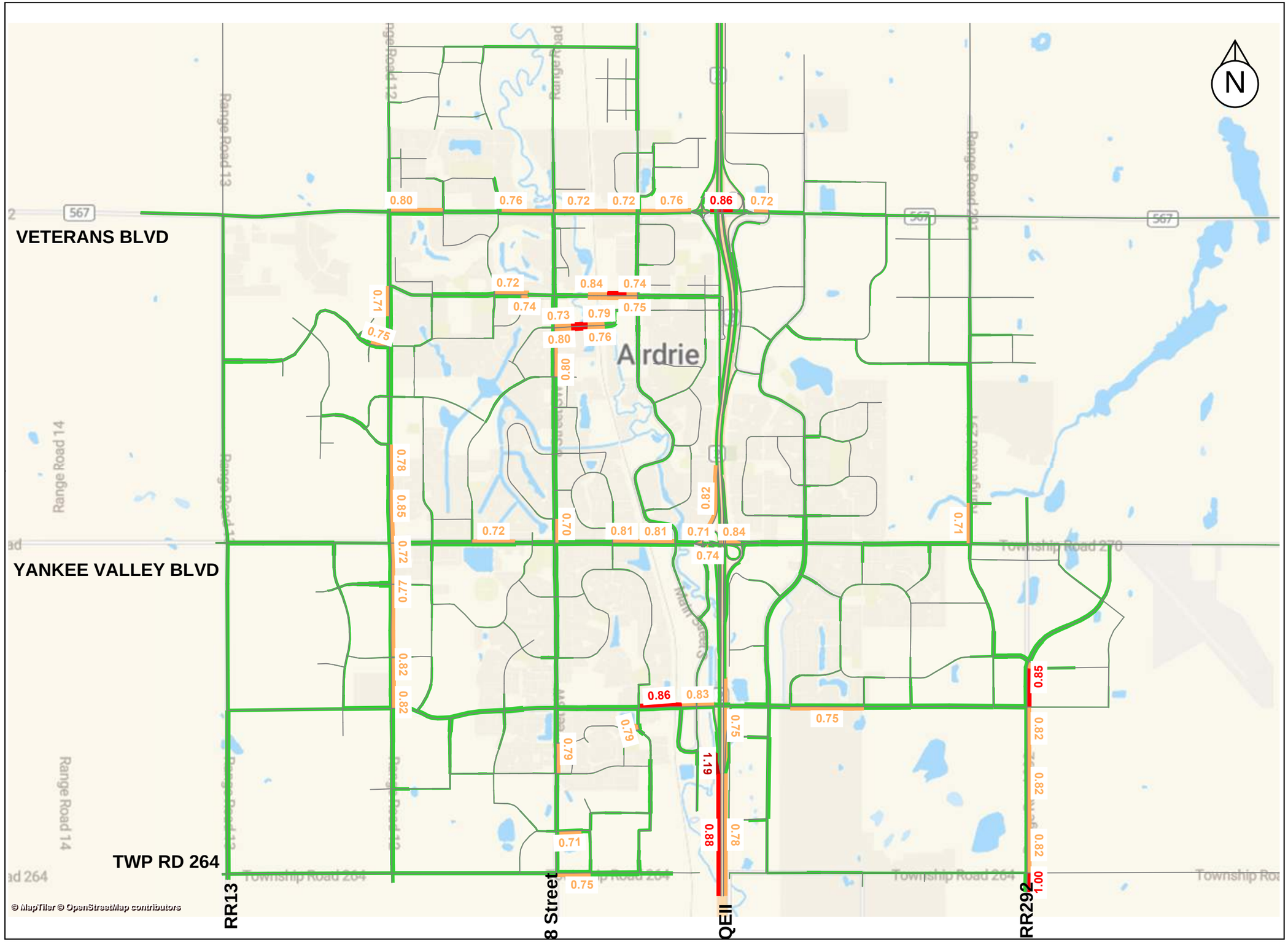

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.6
144K POPULATION HORIZON RECOMMENDED NETWORK VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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4.2.2 Sensitivity Analysis – Gateway Commercial Access

To support the Veterans Boulevard FPS currently underway by ISL, a sensitivity analysis at the 144K population horizon was conducted in Synchro for two configuration options (right in – right out or right in – left out) at the Gateway commercial access on Veterans Blvd, west of the QEII ramp junction. The Synchro results for the 144K population horizon analysis are attached in Appendix G and summarized in Tables 4.3 and 4.4.

Table 4.3: Synchro Results - 144K Population Horizon with RIRO Gateway Access

Intersection		PM Peak			
Location	Movement	v/c Ratio	LOS	Queue Length 95th (m)	Delay (s)
Veterans Blvd / Main Street	EBL	**0.94**	E	84	73.1
	EBT	0.66	C	31	28.1
	EBR	0.63	A	9	6.8
	WBL	0.47	C	67	31.0
	WBT	**0.93**	C	154	25.0
	WBR	0.44	A	6	2.8
	NBL	0.74	E	51	65.0
	NBT	**0.98**	**F**	67	100.4
	NBR	0.61	B	18	14.0
	SBL	**0.98**	**F**	90	87.8
	SBT	0.81	E	63	65.7
	SBR	0.69	B	34	17.6
Veterans Blvd / Gateway RIRO Access (Unsignalized)	EBT	0.29	A	0	0.0
	WBT	0.50	A	0	0.0
	WBR	0.04	A	0	0.0
	SBR	0.23	B	7	12.0

From Table 4.3, the Gateway RIRO Access operated within the acceptable LOS and v/c ratios with the lane configuration improvements in 144K population. However, several movements at the upgraded (see improvements in Table 4.2) Veterans Blvd / Main Street intersection operated at LOS F with v/c's over 0.90. To improve the operation at Main Street, the Veterans Blvd / Gateway RIRO access was converted to RILO Access with signalization. The detailed Synchro results with the signalized Gateway RILO access is summarized in Table 4.4 below:

Table 4.4: Synchro Results - 144K Population Horizon with RILO Gateway Access

Intersection		PM Peak			
Location	Movement	v/c Ratio	LOS	Queue Length 95th (m)	Delay (s)
Veterans Blvd / Main St (Signalized)	EBL	0.86	E	80	66.7
	EBT	0.64	C	31	28.5
	EBR	0.62	A	9	7.4
	WBL	0.46	C	64	26.9
	WBT	0.90	C	134	27.4
	WBR	0.45	A	21	6.0
	NBL	0.82	E	55	73.9
	NBT	0.75	E	51	63.4
	NBR	0.57	B	22	13.5
	SBL	0.81	E	61	68.6
	SBT	0.75	E	61	60.0
	SBR	0.85	C	73	31.9
Veterans Blvd / Gateway RILO Access (Signalized)	EBT	0.35	A	9	2.4
	WBT	0.69	A	31	3.9
	WBR	0.04	A	0	0.0
	SBL	0.73	E	66	63.3

From Table 4.4, all movements at Main Street improved to LOS E or better and v/c 0.90 or lower. Also, the southbound left turn (30 m reduction) and westbound through (20 m reduction) queues at Main Street are reduced. However, the southbound right turn queue increased by 40 m.

At the signalized Gateway RILO access, minimal delay and short queues are experienced for both the eastbound and westbound through movements. From the sensitivity analysis, it is recommended to convert the Veterans Blvd / Gateway RIRO access to a RILO access with signalization. This is consistent with the findings of the Veterans Blvd FPS.

4.2.3 Sensitivity Analysis – YVB Railway Crossing Construction Detours

As concluded above in Section 4.2, 6 lanes along with a grade separated railway crossing is required on YVB. Three sensitivity analyses were conducted in VISUM for the YVB railway crossing grade separation construction. The analyses assumed the QEII / 40 Ave Interchange is completed and all analyses were conducted in the PM peak hour only. The questions addressed in this review were:

1. Verify the timeline for the YVB grade separation construction (i.e. 6 lanes required on YVB)
2. Verify network impacts if YVB is closed for construction
3. Verify if two lane operations (e.g. one lane each direction) on YVB could accommodate detour traffic during construction and the timeline until the network reaches unacceptable levels of traffic queuing in this scenario.

The VISUM plots for the sensitivity analyses are attached in Appendix H, with key findings summarized below.

Timing of Widening / Grade Separation

At the 110K population horizon, the AADT on YVB at the CPKC railway crossing will be 39,150 vehicles per day (vpd), which exceeds the environmental capacity of 35,000 vpd for a four-lane arterial. However, from the Synchro analysis, the queue for the eastbound through movement at YVB / Main Street intersection is 153 m, while the available eastbound storage from the eastbound stop bar to the railway track is approximately 235 m. Therefore, the eastbound storage is adequate and eastbound queue will not spill to the railway track. In addition, the queue for the westbound through movement at YVB / Luxstone Blvd intersection is 198 m, while the available westbound storage is approximately 340 m. As such, the westbound storage is also adequate in the 110K population horizon.

To determine a potential timeline for the YVB widening and CPKC railway grade separation, a sensitivity test was conducted in Synchro. The earliest that a widening of YVB and CPKC railway grade separation could be required is when one of the following conditions is met:

- The eastbound queue at Main Street spills over to the railway track
- A third eastbound lane is required at Main Street
- The westbound queue at Luxstone Blvd spills over to the railway track
- A third westbound lane is required at Luxstone Blvd

From the sensitivity analysis, which interpolates between the population horizons, it is found that YVB widening and CPKC railway grade separation will first be triggered at about 132K population. At this time, the eastbound through queue at YVB / Main Street intersection reaches 194 m and the westbound through queue at YVB / Luxstone Blvd intersection reaches 273 m. Also, many movements at both intersections operate with v/c ratios over 0.90 and/or LOS F. The AADT on YVB at the CPKC railway crossing will be 45,000 vpd by this time, which is well into the typical environmental capacity range for a 6-lane arterial.

Closure Scenarios

In the 110K population horizon PM peak hour scenario, closing YVB for construction will result in the increase of traffic on Veterans Blvd, 1 Avenue, Railway Avenue and 40 Avenue. As shown in Table 4.5, with the closure of YVB, 820 and 990 vehicles for EB and WB will shift from YVB to 40 Avenue, while 438 and 397 vehicles for EB and WB will shift to Veterans Blvd as an alternative route. In addition, the v/c ratios will be over 1.00 for Veterans Blvd, 1 Avenue, and 40 Avenue (highest v/c ratio of 1.09 on 1 Avenue – See VISUM plot in Appendix H). As such, traffic will be highly congested on these roadways at the peak hour. However, traffic impacts to the roadways are likely less during off peak hours closure when traffic volumes are lower. We recommend that an all-day traffic assessment be completed for 40 Avenue and Veterans Blvd at the design stage, so that the cumulative condition and impacts can be understood by the City delivery team, Council and the public at large.

To mitigate the traffic congestion in the closure scenario, Veterans Blvd would be a good candidate for upgrades prior to the YVB construction. If Veterans Blvd is widened to 6 lanes, more rerouted traffic can use Veterans Blvd as an alternative route instead of 1 Avenue and Railway Avenue in particular.

We note that, based on the findings in the in-progress Veterans Boulevard FPS, CPKC railway grade separation (at Veterans Blvd) and Veterans Blvd widening to 6 lanes are required by 135K population horizon. Also, from the findings on the Sensitivity Test 1 above, widening of YVB to six lanes and CPKC railway grade separation on YVB are recommended by 132K population horizon. As such, there is an

opportunity for both projects to be coordinated to best advantage within the 130Ks population. Similar all-day traffic assessment for a Veterans Blvd closure scenario at a future design stage could help inform the optimum sequencing.

Table 4.5: 110K Population Horizon East-West Corridors Traffic Volumes Comparison (Closed YVB)

Roadway	PM Peak (# of Veh)					
	4 lanes on YVB		Closed YVB		Difference with YVB Closure	
	EB	WB	EB	WB	EB	WB
Veterans Blvd	1,332	1,940	1,770	2,337	+438	+397
1 Avenue	818	906	1,023	1,204	+205	+298
Railway Avenue	512	483	622	673	+110	+190
YVB	1,795	2,117	0	0	-1,795	-2,117
40 Avenue	1,698	2,462	2,518	3,452	+820	+990
Total	6,155	7,908	5,933	7,666	-222	-242

Lane Reduction Scenario

Based on VIUSM sensitivity analysis results of the 110K population horizon PM peak hour scenario, reducing YVB to two lanes operation during construction will increase traffic on Veterans Blvd, 1 Avenue, Railway Avenue and 40 Avenue. As shown in Table 4.6, with YVB reduced to two lanes, 430 and 584 vehicles for EB and WB will shift from YVB to 40 Avenue, while 246 and 228 vehicles for EB and WB will shift to Veterans Blvd as an alternative route. Also, based on the VISUM plot attached in Appendix H, the v/c ratios on the parallel corridors will be between 0.90 and 1.00. Furthermore, the YVB railway crossing will experience v/c ratios of 0.99 and 1.07 for eastbound and westbound, respectively. Higher v/c ratios on the parallel corridors are expected from traffic growth for the horizons beyond 110K population. As such, traffic is also congested on these roadways with two lane operations on YVB during the PM peak hour. Similar to YVB closure, all-day traffic assessment could help confirm the time-of-day for congestion conditions, to give decision-makers information needed to assess and accept the related risk.

Table 4.6: 110K Population Horizon East-West Corridors Traffic Volumes Comparison (2 Lanes YVB)

Roadway	PM Peak (# of Veh)					
	4 lanes on YVB		2 lanes on YVB		Difference with 2 lanes on YVB	
	EB	WB	EB	WB	EB	WB
Veterans Blvd	1,332	1,940	1,578	2,168	+246	+228
1 Avenue	818	906	937	1,083	+119	+177
Railway Avenue	512	483	575	599	+63	+116
YVB	1,795	2,117	793	854	-1,002	-1,263
40 Avenue	1,698	2,462	2,128	3,046	+430	+584
Total	6,155	7,908	6,011	7,750	-144	-158

Synchro sensitivity analysis was also conducted to determine if any intersection within the network will fail when reducing YVB to two lanes operation during construction. The findings are as follows:
120K Population Horizon:

- At 40 Avenue / 8 Street intersection: many movements will operate above v/c ratio of 1.00 and LOS F, long queues are also experienced (WBR with the longest queue at 251 m).

- At 40 Avenue / Reynolds Gate intersection: the SBL and WBT will operate with v/c ratio 0.99 and 0.98, respectively.
- At both Main Street and 8 Street intersections on Veterans Blvd: many movements will operate at LOS F and v/c ratios between 0.90 and 1.00. WBT queue at 8 Street will be 202 m.

4.3 203,000 Population Scenario and VISUM Model

By the 203K population horizon, the City of Airdrie is expected to reach 203K population and 71,840 jobs. The population and employment growth from 144K population to 203K population horizon, as input into the traffic model is shown in Exhibit 4.7. The majority of the population growth is expected to be in the southwest quadrant of the City in the West Hills CASP and Southwest CASP areas; while the majority of the employment growth is expected to be in the east side of the City in the Southeast Yankee Valley Boulevard CASP, East Nose Creek CASP and East Points Industrial CASP areas.

The v/c ratio plot for the 203K population on the 144K population recommended road network scenario in the PM peak is shown in Exhibit 4.8. As expected with the population and employment growth at the 203K population horizon, the results indicate there are capacity constraints on Veterans Blvd, 1 Avenue, Yankee Valley Blvd, 40 Avenue, 56 Avenue, 8 Street, 24 Street, RR13, RR292 and QEII. Based on VISUM analysis, the recommended major upgrades at the 203K population horizon are listed below and summarized in Table 4.5:

- The east Airdrie bypass (NE Stoney Trail to Crossfield area) (TEC Project)
- TWP Rd 274: 24 Street to future east Airdrie bypass interchange – New 2 lanes construction (paving)
- TWP Rd 274: QEII – New Diamond Interchange
- TWP Rd 274: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- TWP Rd 273: TZ 3474_4 Access (West of 8 Street) to West of the Flyover – Widen from 2 lanes to 4 lanes
- TWP Rd 273: Flyover at QEII – New 2 lanes construction
- TWP Rd 273: Nose Creek Bridge – Widen from 2 lanes to 6 lanes bridge over Nose Creek
- TWP Rd 273: CPKC Railway Crossing – 6 lanes bridge over CPKC Railway Crossing
- Veterans Boulevard: West of RR13 (City Limit) to the first intersection west of 24 St – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: First intersection west of 24 St to Reunion Gateway NW – Widen from 2 lanes to 6 lanes
- Veterans Boulevard: Reunion Gateway NW to west of 8 Street – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: Hamilton Boulevard to east of Highland Park Gate NE – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- Yankee Valley Boulevard: West of RR13 (City Limit) to west of 24 St – Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: Kings Heights Gate SE to future east Airdrie bypass interchange – Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: 24 Street Intersection – Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively.

- Yankee Valley Boulevard: 8 Street Intersection – Added third NBT and SBT lane. The third NBT and SBT lane is tapered back to 2 lanes north and south of the intersection, respectively. With the improvement, the intersection is now 6 lanes x 6 lanes with dual lefts for all approaches.
- Yankee Valley Boulevard: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- 40 Avenue: Approximately 800m roadway near TZ3505_7 (between RR292 and RR291) – New 2 lanes construction
- 40 Avenue: At 24 Street Intersection - Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively. Also, widen 40 Avenue (approximately 600m) from 2 lanes to 4 lanes.
- 56 Avenue: West of 24 Street to RR292 – Widen from 2 lanes to 4 lanes
- 56 Avenue: QEII – New Parclo AB2 interchange (Stage 1 configuration with 4 lanes)
- 56 Avenue: Future east Airdrie bypass interchange and 3 km of 2-lanes Arterial road (connecting from RR292) – New Diamond Interchange (TEC Project) and new 2 lanes construction (paving)
- RR13: 40 Avenue to south of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes
- 24 Street (RR12): TWP Rd 274 to TWP Rd 273 – New 2 lanes construction (paving)
- 24 Street (RR12): TZ 3475_4 Access to South of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes
- 8 Street (RR11): TWP Rd 274 to TWP Rd 273 – New 2 lanes construction (paving)
- Main Street (Dickson Stevenson Trail): TWP Rd 274 to TWP Rd 273 – Upgrade to Arterial standard (paving)
- RR292 (Realignment): 1 Avenue (approximate longitude) to 1.6km south (TZ3504_27) – New 2 lanes construction (paving)
- RR292 (Realignment): TZ3504_27 Access to YVB – New 4 lanes construction (paving)
- RR292 (Realignment): YVB to 40 Ave – Widen from 2 lanes to 4 lanes
- RR292: 40 Avenue to South of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes

The 203K population horizon v/c ratio plot with the above upgrades is shown in Exhibit 4.9. Note that the future east Airdrie bypass alignment is yet to be confirmed, and it is assumed that the east Airdrie bypass alignment is along RR290 / RR285 on the east side of the city. This would connect south to Stoney Trail at the northeast corner of the Calgary Ring Road.

As shown in Exhibit 4.9, most roadways within the city operated with v/c ratio 0.85 or less, which shows that the majority of the roads will operate well. The only exceptions are a few segments on Veterans Blvd, YVB, 40 Avenue and 56 Avenue that operate at/near capacity with v/c ratios between 0.85 to 1.00.

The v/c ratios on the future east Airdrie bypass are below 0.70. Generally, the north-south orientated roadways operated better with lower v/c ratios than the east-west orientated roadways. In fact, most of the north-south orientated roads operated with v/c ratio 0.85 or less. Since QEII and the CPKC railway track are running north-south with a limited number of crossing points, the east-west orientated roadways are more congested, especially the east-west road segments between 8 Street and Range Road 291 (approximately 1.6 km west and 1.6 km east of QEII).

Detailed 203K population horizon VISUM plots including Total Population and Employment, AADT, Road Classification, Number of Lanes, Link Volumes, v/c ratio etc. are attached in Appendix H.

4.3.1 203,000 Population Detailed Intersection Analysis

In addition to VISUM analysis, detailed traffic operation analysis was completed at major intersections for the future 203K population horizon in Synchro. The initial analysis found that many intersections operated beyond typical criteria, with some intersection improvements being warranted. A new traffic signal is recommended at 50 intersections (including 5 signals on QEII interchange junctions). Also, similar to the prior horizons, it is recommended that many new intersections be urbanized with left turn and/or right turn bays on approaches where required. At Main Street / Elk Hill, a new traffic signal or a roundabout is recommended (determined in future downtown study). The 203K population Horizon recommended improvements are as summarized in Table 4.7. The detailed Synchro results of the 203K population horizon intersections are shown in Appendix G.

Table 4.7: 203K Population Recommended Improvements

Number	Roadway	Section	Recommended Upgrade
1	TWP Rd 274	24 Street to future east Airdrie bypass interchange	New construction (paving) - 2 lanes
2		QEII	New Diamond Interchange (50% of the project costs is assumed to be TEC project and 50% costs is Airdrie project)
3	TWP Rd 273	TZ 3474_4 Access (West of 8 Street) to West of the Flyover	Widen from 2 lanes to 4 lanes
4		Flyover at QEII	New construction - 2 lanes
5		Flyover to RR291	New construction - 2 lanes
6	Veterans Boulevard	West of RR13 (City Limit) to First intersection west of 24 St	Widen from 2 lanes to 4 lanes
7		First intersection west of 24 St to Reunion Gateway NW	Widen from 2 lanes to 6 lanes
8		Reunion Gateway NW to west of 8 Street	Widen from 4 lanes to 6 lanes
9		Hamilton Boulevard to east of Highland Park Gate NE	Widen from 4 lanes to 6 lanes
10	Yankee Valley Boulevard	West of RR13 (City Limit) to West of 24 Street	Widen from 2 lanes to 4 lanes
11		Kings Heights Gate SE to future east Airdrie bypass interchange	Widen from 2 lanes to 4 lanes
12	40 Avenue	Approximately 800m roadway near TZ3505_7 (between RR292 and RR291)	New construction - 2 lanes
13	56 Avenue	West of 24 Street to RR292	Widen from 2 lanes to 4 lanes
14		QEII	New Parclo AB2 interchange (Stage 1 configuration with 4 lanes - 50% of the project costs is assumed to be TEC project and 50% costs is Airdrie project)
15	RR13	Veterans Boulevard to 40 Avenue	New construction (Paving) - Upgrade to 2 lanes Arterial
16		40 Avenue to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes
17	24 Street (RR12)	TWP Rd 274 to TWP Rd 273	New construction (Paving) - 2 lanes
18		TZ 3475_4 Access to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes
19	8 Street (RR11)	TWP Rd 274 to TWP Rd 273	New construction (Paving) - 2 lanes

Number	Roadway	Section	Recommended Upgrade
20	Main Street	TWP Rd 274 to TWP Rd 273	New construction (Paving) - Upgrade to 2 lanes Arterial
21	RR292 (Realignment)	1 Avenue to 1.6km south (TZ3504_27)	New construction (Paving) - 2 lanes
22		TZ3504_27 Access to YVB	New construction (Paving) - 4 lanes
23		YVB to 40 Ave	Widen from 2 lanes to 4 lanes
24	RR292	40 Avenue to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes
25	TWP Rd 273	7 intersections on TWP Rd 273	Signalization and urbanize intersection (seven Intersections) - including 24 St, 8 St and Main St.
26	Veterans Boulevard	24 Street	In addition to the widening, dual left turns for all approaches.
27		8 Street Intersection	Added dual NB and SB left turns and NBT lane. Many movements remain at/over capacity (v/c over 0.95 and/or LOS F)
28		At Main Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.62) even with the North Flyover and QEII / TWP Rd 274 interchange
29		QEII West Junction	West Junction: added SBT lane, dual EBL turn (taper back) before the loop ramp. Many movements remain with v/c over 0.90 and/or LOS F, even with the North Flyover and TWP Rd 274 interchange
30		QEII East Junction	Signalization
31		At Highland Park Blvd / East Lake Ramp	NBL with v/c 0.97 and WBT with v/c 0.95
32		At Hamilton Boulevard / East Lake Boulevard	EBL, NBL and SBR with v/c over 0.90
33	1 Avenue	Sagewood Blvd SW	Monitor for signalization or roundabout
34		Canoe Rd SW	Monitor for signalization or roundabout
35	Yankee Valley Boulevard	6 intersections on Yankee Valley Boulevard	Signalization and urbanize six intersections
36		At 24 Street Intersection	Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively.
37		8 Street Intersection	Added third NBT and SBT lane. The third NBT and SBT lane is tapered back to 2 lanes north and south of the intersection, respectively. The intersection is now 6 lanes x 6 lanes with dual lefts for all approaches. Many movements remain at over capacity
38		Luxstone Blvd SW	WBT with v/c 0.93 and long queue at 240m.

Number	Roadway	Section	Recommended Upgrade
39		Main Street Intersection	Many movements near/over capacity (v/c over 0.96 and LOS F). Geometry of intersection already maxed out. Note: 6 lanes on Main St was tested and will improve operations, but intersection will still remain over capacity
40		at QEII West Junction and East Junction	EBT at West Junction with v/c 0.93 and NBR, WBT at East junction with v/c 0.97 and 0.93
41		Kingsview Blvd	Three movements with v/c over 0.90
42		RR291	EBL with v/c 0.93 and SBR with v/c 0.96
43		RR292 (Realignment)	Signalization and urbanize intersection. Also added dual EBL and NBL turns
44	40 Avenue	4 intersections on 40 Ave	Signalization and urbanize 4 intersections
45		Between TZ3478_3 Access 2 and TZ 3478_4 Access (both intersections located west of 24 Street)	Widen to 4 lanes
46		At 24 Street Intersection	Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively. Also, widen 40 Ave (approximately 600m) from 2 lanes to 4 lanes.
47		Southwinds Blvd SW	Added NBR turn bay at the dual lane roundabout
48		Windsong Boulevard SW	Added SBR turn bay at the dual lane roundabout
49		At 8 Street Intersection	WBT with v/c 0.95 and Queue 95th 193m.
50		Kingsview Blvd	Three movements with v/c over 0.90
51		Highview Gate SE	Monitor for signalization
52		RR292	Added dual NBL turn (drop lane at the TZ 3505_5 Access); widen WB to 2 lanes (380m)
53	56 Avenue (TWP Rd 264)	7 intersections on 56 Ave	Signalization and urbanize 7 intersections
54		8 Street Intersection	Dual lefts for all approaches. Added third EBT and WBT lane. The third EBT and WBT lane is tapered back to 2 lanes east and west of the intersection, respectively.
55		RR292	Triple lane roundabout
56	RR 13	4 intersections on RR13	Signalization and urbanize intersection (four Intersections)
57		TZ3477_3 Access 1	Monitor for signalization
58		TZ3478_1 Access 2	Monitor for signalization
59		TZ3478_3 Access 1	Monitor for signalization
60	24 Street	9 intersections on 24 St	Signalization and urbanize intersection (Nine Intersections)
61	8 Street	TWP Rd 273	Signalization and urbanize intersection
62		Willow Brook Rd NW	Signalization

Number	Roadway	Section	Recommended Upgrade
63		1 Ave NW	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.12).
64		MacKenzie Way SW	NB movements with v/c 0.92
65		Railway Gate SW	NBT and SBL with v/c 0.91
66		Luxstone Gate SW	Monitor for signalization
67	Main Street	TZ3470_3 Access 1	Monitor for signalization
68		TZ3470_3 Access 2	Signalization
69		1 Avenue	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.84). It is recommended to conduct an FPS for 1 Avenue in the downtown segment to identify any potential improvement options
70		Elk Hill SE	Signalization or roundabout
71		Allen Street SE	Monitor for signalization or roundabout
72	RR291	TZ 3804_1 Access	Monitor for roundabout
73		TZ 3804_2 Access	Dual lane roundabout
74		TZ 3804_4 Access	Dual lane roundabout
75	RR292 (Realignment)	TZ 3505_2 Access	Signalization and urbanize intersection
76		TZ 3504_24 Access	Signalization and urbanize intersection
77	TWP Rd 274	Future east Airdrie bypass interchange	New Diamond Interchange (TEC Project)
78	Veterans Boulevard	Future east Airdrie bypass interchange	New Diamond Interchange (TEC Project)
79	Yankee Valley Boulevard	Future east Airdrie bypass interchange	New Diamond Interchange (TEC Project)
80	56 Avenue (TWP Rd 264)	Future east Airdrie bypass interchange and 3 km 2-lanes Arterial (Connection from RR292)	New Diamond Interchange (TEC Project) and new 2 lane Arterial Road construction
81	TWP Rd 274	Dickson Stevenson Trail	Signalization and urbanize intersection
82	TWP Rd 273	Nose Creek Bridge	Widen from 2 lanes to 6 lanes bridge over Nose Creek
83		CPKC Railway Crossing	6 lanes bridge over CPKC Railway Crossing

With the recommended improvements as shown in Table 4.5, the majority of the analyzed intersections operated within the acceptable LOS and good v/c ratio. However, the following locations operated beyond the acceptable LOS and/or v/c over 0.90 in the 203K population Horizon:

- Veterans Blvd / 8 Street: Several movements remain at/over capacity (v/c over 0.95 and/or LOS F)
- Veterans Blvd / Main Street: Several movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.62) even with the North Flyover and TWP Rd 274 interchange
- Veterans Blvd / QEII West Junction: Many movements remain with v/c over 0.90 and/or LOS F, even with the North Flyover and TWP Rd 274 interchange
- Veterans Blvd and Highland Park Blvd / East Lake Ramp: NBL with v/c 0.97 and WBT with v/c 0.95
- Veterans Blvd and Hamilton Boulevard / East Lake Boulevard: EBL, NBL and SBR with v/c over 0.90
- YVB / 8 Street: Many movements remain at/over capacity (v/c over 0.90 and/or LOS F)

- YVB / Main Street: Many movements remain at/over capacity (v/c over 0.96 and LOS F)
- YVB / QEII West junction: EBT with v/c 0.93
- YVB / QEII East junction: NBR and WBT with v/c 0.97 and 0.93
- YVB / Kingsview Blvd: Three movements with v/c over 0.90
- YVB / RR291: EBL with v/c 0.93 and SBR with v/c 0.96
- 40 Avenue / 8 Street: WBT with v/c 0.95 and 193m queue
- 40 Avenue / Kingsview Blvd: Three movements with v/c over 0.90
- 8 Street / 1 Avenue: Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.12)
- 8 Street / MacKenzie Way SW: NB movements with v/c 0.92
- 8 Street / Railway Gate SW: NBT and SBL with v/c 0.91
- Main Street / 1 Avenue intersection: similar to 110K population and 144K population horizons, all four approaches operated with v/c ratio over 1.00 and LOS F.

Airdrie is a rapidly growing City and by the 203K population horizon is estimated to have 2.5 times the existing population and a significant proportional increase in traffic demand. High v/c ratios between 0.90 and 1.00 may be expected for the worst traffic movements at the major intersections in the future. The following mitigation measures could be implemented to reduce traffic demand and relieve traffic congestions:

- Increase public transit routes and frequency to help encourage mode shift from passenger vehicles to public transit
- Increase connectivity and priority of sidewalks and regional pathways to help encourage mode shift from passenger vehicles to walk or bike.
- Mixed land uses in the new greenfield quarter sections to reduce external travel demand on City's Arterial roads.

More specific strategies to improve active modes and accessibility to transit have been considered in greater detail in the new Airdrie Active Transportation Plan, concurrently underway by ISL and Martinson-Golly. The proactive implementation of strategies over a period of time can help reinforce and normalize these approaches well in advance of the 203K population horizon.

4.4 Ultimate Scenario and VISUM Model

By the Ultimate horizon, the City of Airdrie is expected to reach 265K population and 92,700 jobs. The population and employment growth from the 203K population to Ultimate horizon, as input into the traffic model, is shown in Exhibit 4.10. The population growth is expected to be predominantly in the northeast and northwest quadrants of the City in the greenfield quarter sections; while employment growth is expected to be predominantly on the north side of the City adjacent to QEII and in the northeast quadrant near Veterans Blvd.

The v/c ratio plot for the Ultimate population on the 203K population recommended road network scenario in the PM peak is shown in Exhibit 4.11.

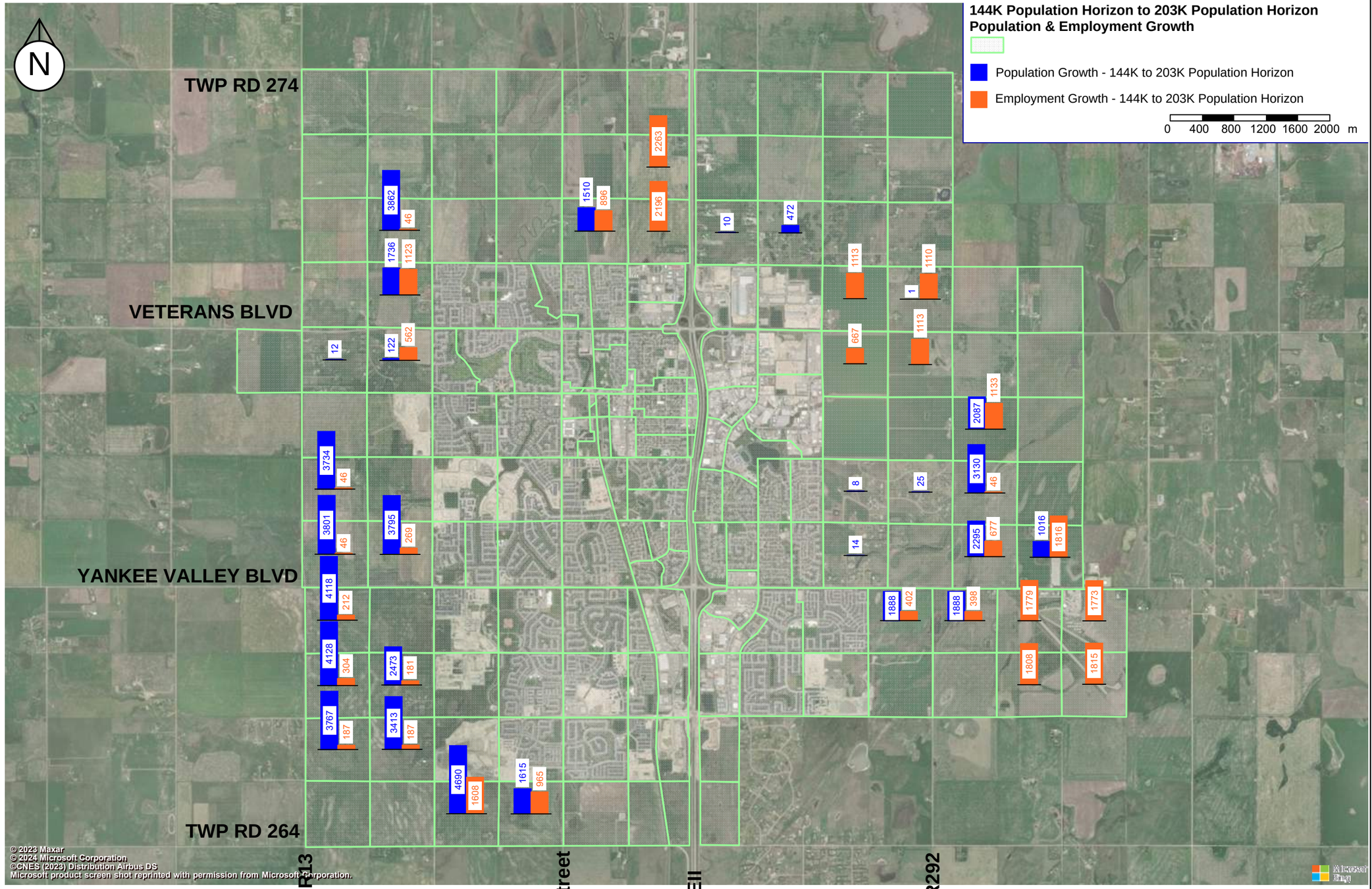

EXHIBIT 4.7
144K TO 203K POPULATION HORIZON
POPULATION AND EMPLOYMENT GROWTH
AIRDRIE TRANSPORTATION MASTER PLAN
MODEL UPDATE

ISL

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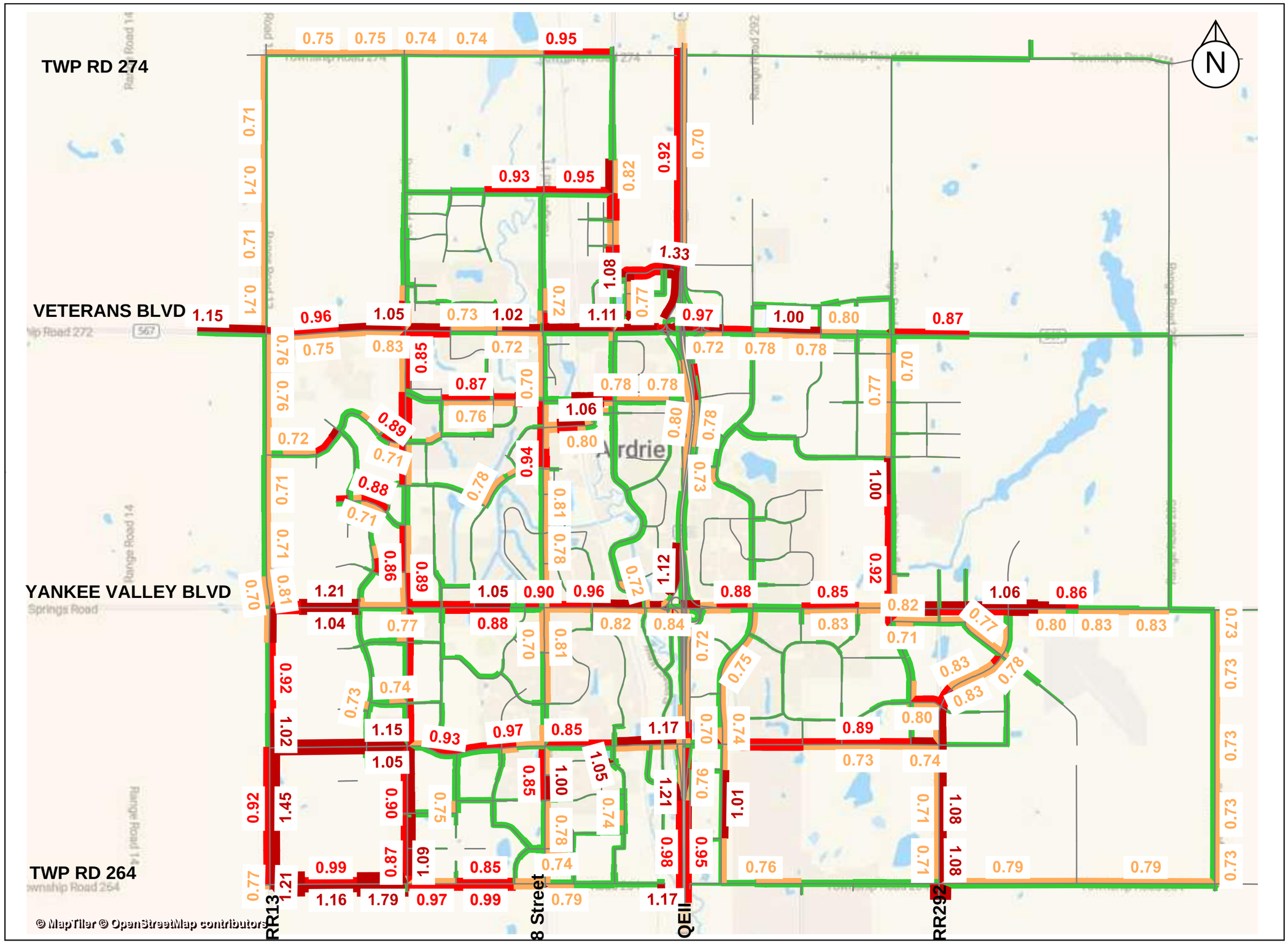

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.8
203K POPULATION HORIZON DO NOTHING SCENARIO VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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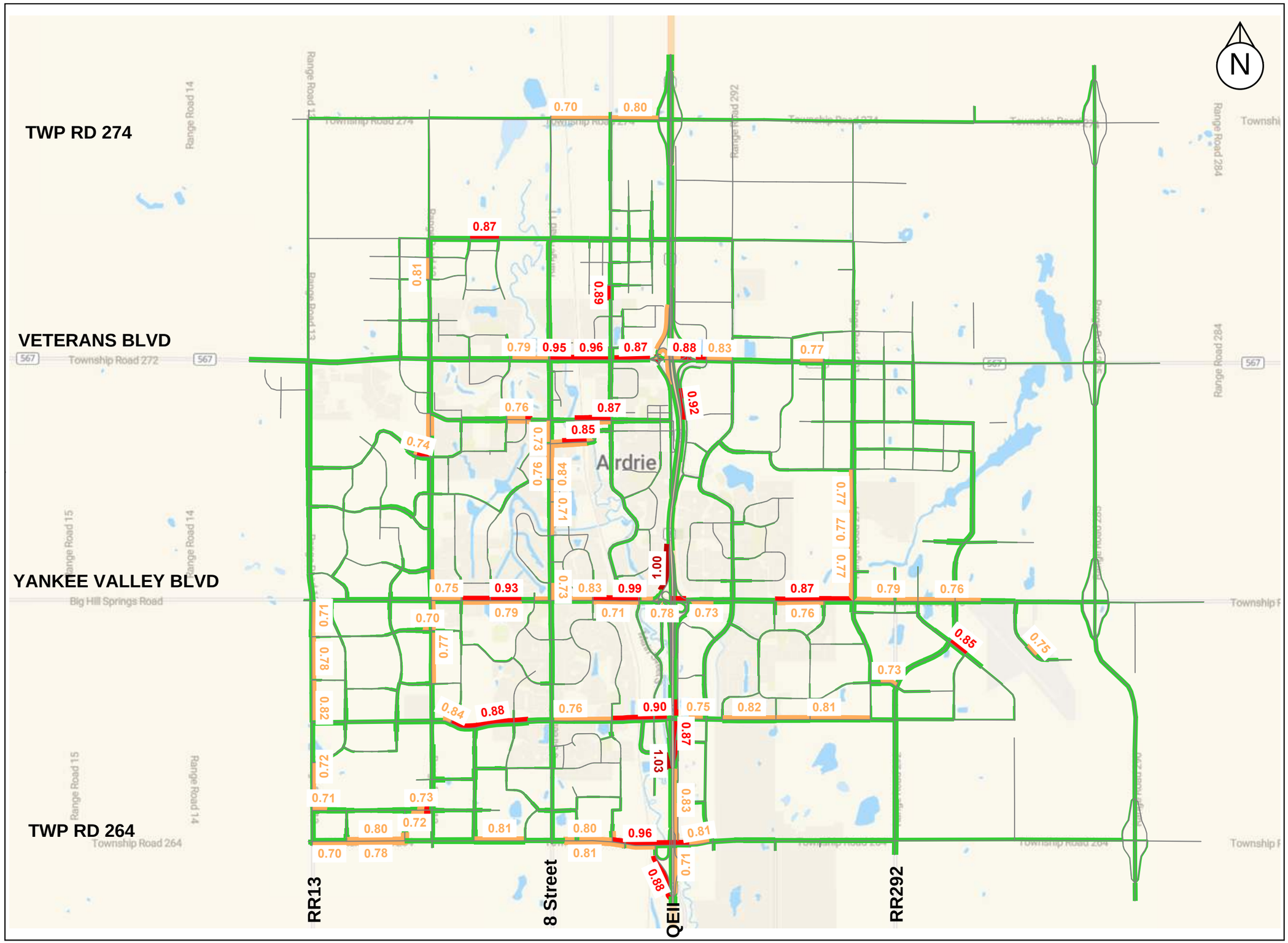

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.9
203K POPULATION HORIZON RECOMMEDNED NETWORK VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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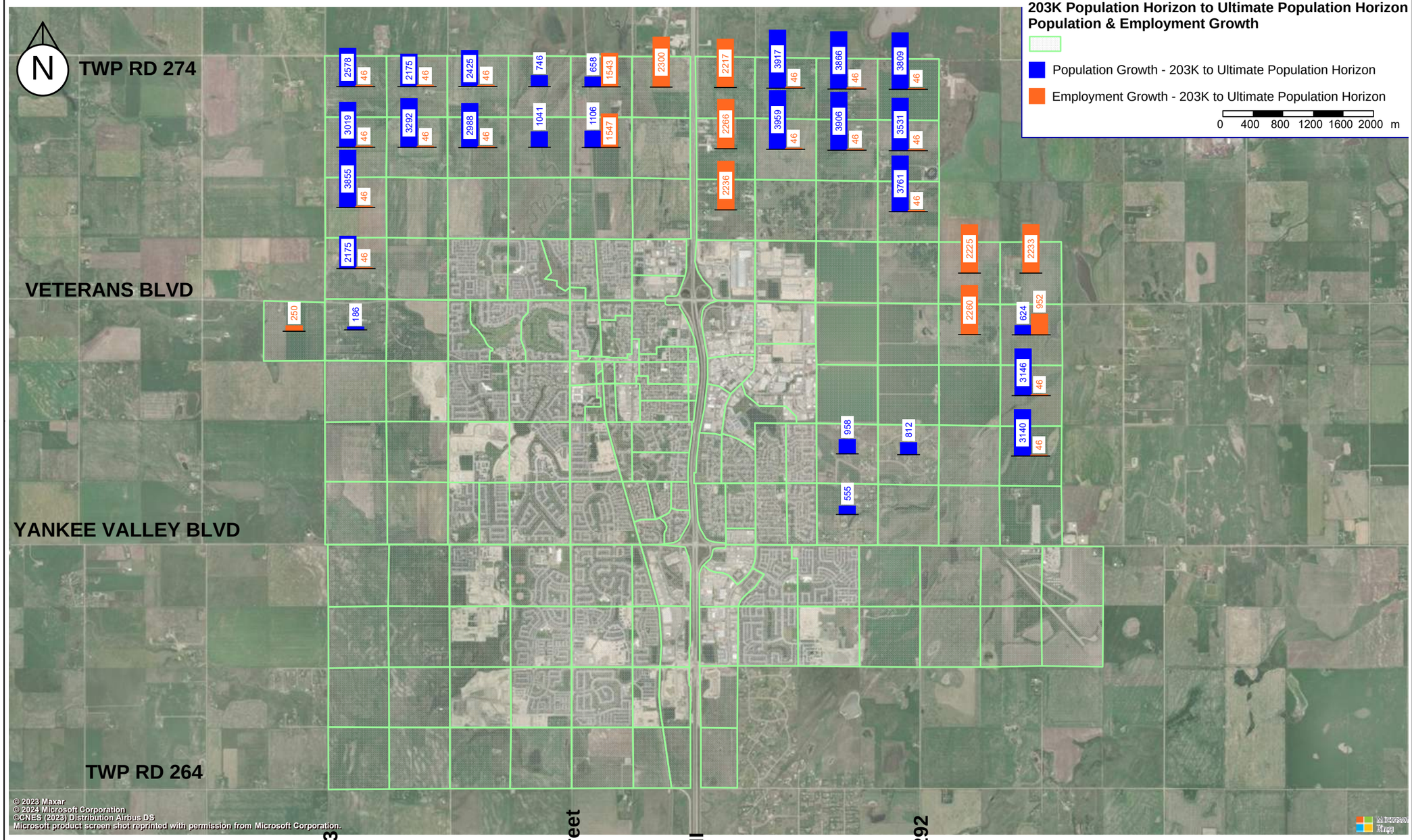

EXHIBIT 4.10
203K TO ULTIMATE POPULATION HORIZON
POPULATION AND EMPLOYMENT GROWTH
AIRDRIE TRANSPORTATION MASTER
PLAN MODEL UPDATE

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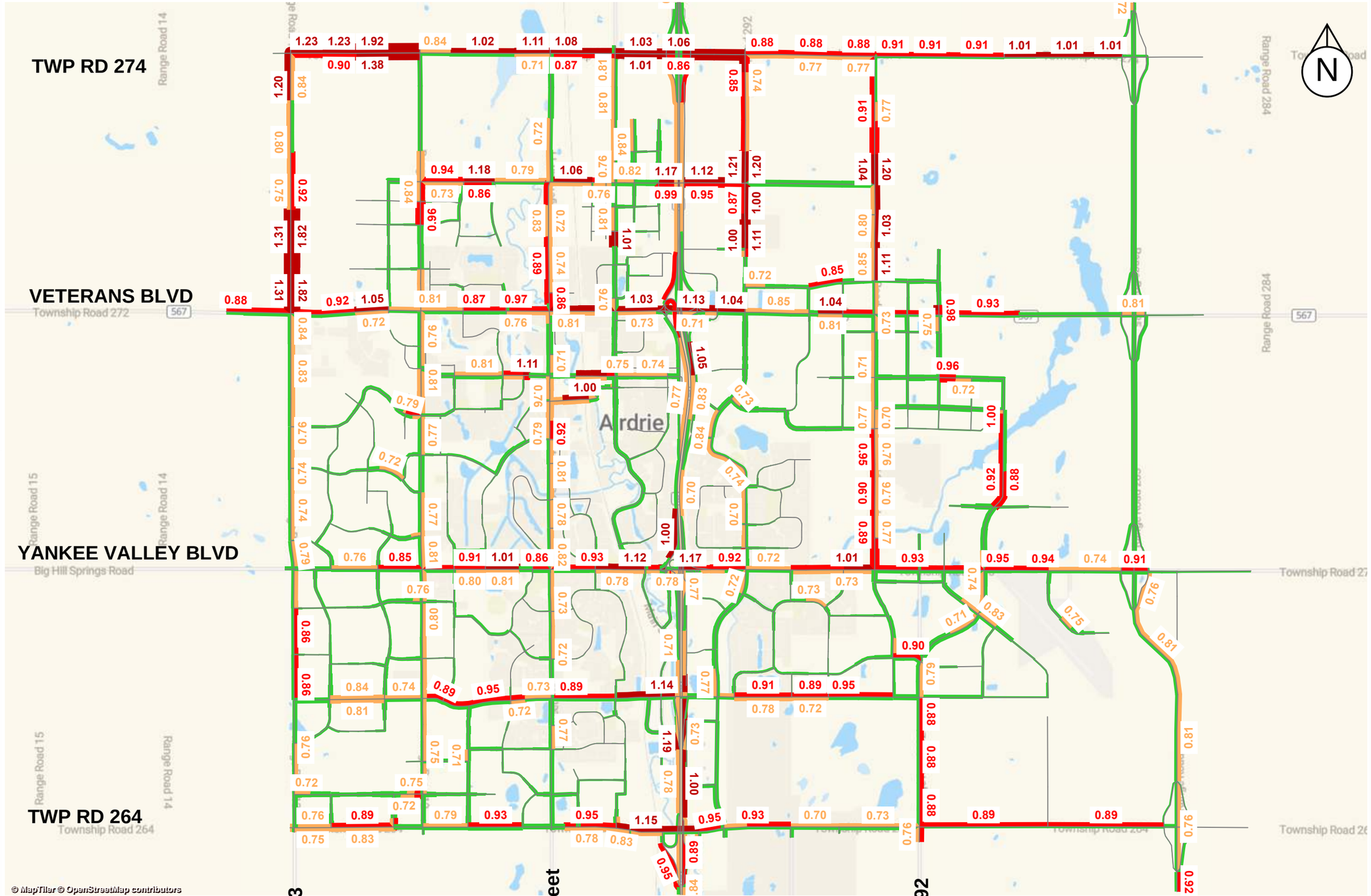

Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.11
2090 HORIZON DO NOTHING SCENARIO
VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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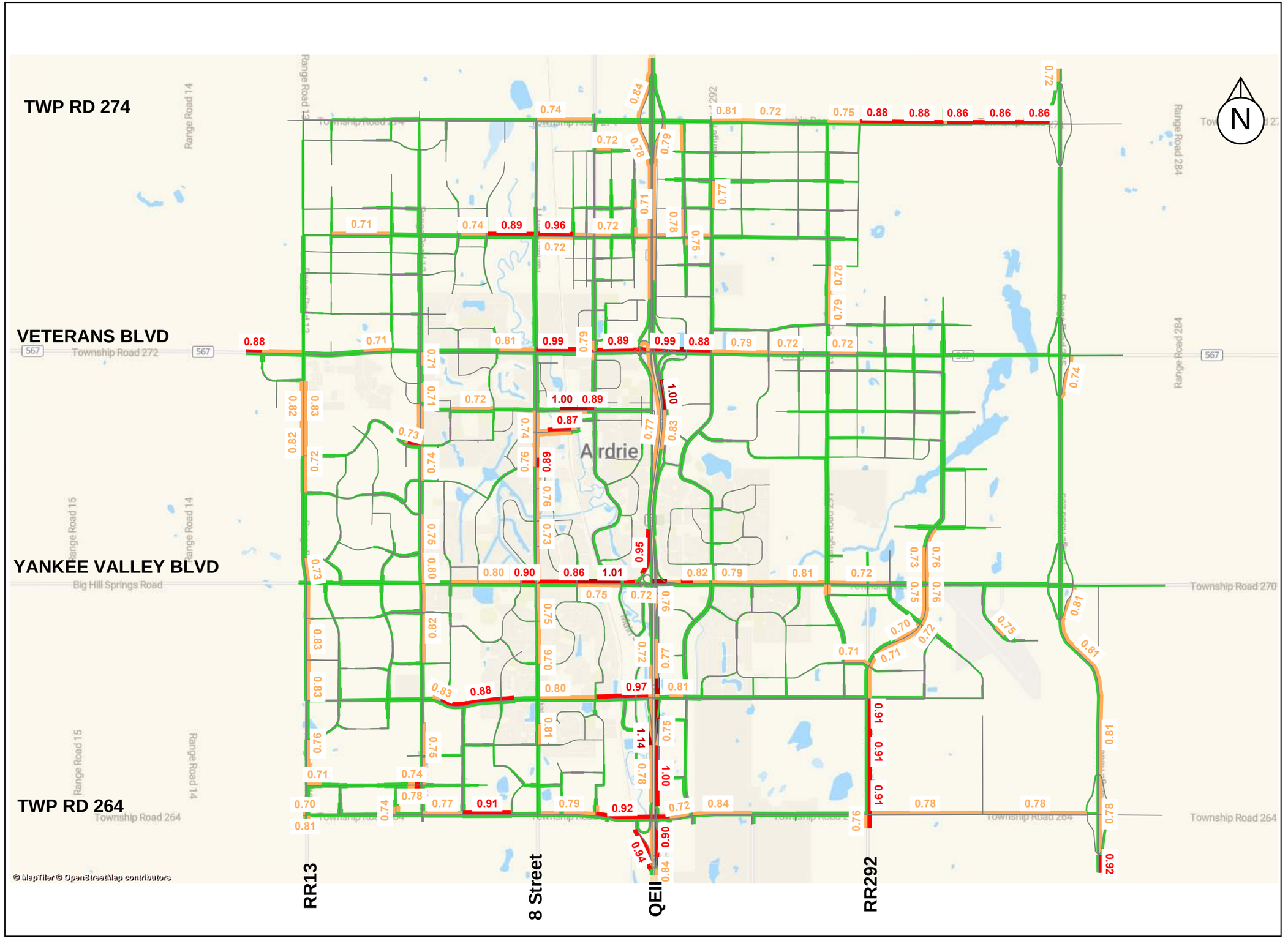
As expected with the population and employment growth at the Ultimate horizon, the results indicate that there are capacity constraints on most Arterials within Airdrie including TWP Rd 274, TWP Rd 273, Veterans Blvd, 1 Avenue, Yankee Valley Blvd, 40 Avenue, 56 Avenue, 8 Street, 24 Street, RR13, RR292, RR291 and QEII. Based on VISUM analysis, the recommended major upgrades in the Ultimate Horizon are listed below and summarized in Table 4.6:

- TWP Rd 274: 24 Street to East of RR292 (Including the QEII interchange) – Widen from 2 lanes to 4 lanes
- TWP Rd 273: TZ 3475_2 Access (West of 24 Street) to 24 Street – Widen from 2 lanes to 4 lanes
- TWP Rd 273: 24 Street to TZ 3474_2 Access (950m) – Widen from 2 lanes to 6 lanes
- TWP Rd 273: TZ 3474_2 Access to TZ 3470_2 Access (just west of Flyover) – Widen from 4 lanes to 6 lanes
- TWP Rd 273: Flyover (TZ 3470_2 Access to TZ 3802_1 Access) – Widen from 2 lanes to 6 lanes
- TWP Rd 273: TZ 3802_1 Access to RR291 – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: East of Highland Park Gate NE to RR292 Realignment – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: East Airdrie bypass interchange – Widen WB from 1 lane to 2 lanes, added dual NBL turns (TEC Project)
- 1 Avenue: Woodside Drive to East of Woodside Gate – Widen from 2 lanes to 4 lanes (widening not required for roundabout option)
- Yankee Valley Boulevard: TZ 3478_2 Access to Bayside Gate – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: Kings Heights Gate SE to Airport Access – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: East Airdrie bypass interchange – Widen WB from 1 lane to 2 lanes, added dual NBL turns (TEC Project)
- 40 Avenue: RR13 to TZ3478_3 Access 2 – Widen from 2 lanes to 4 lanes
- 40 Avenue: Kings Heights Way to RR292 – Widen from 2 lanes to 4 lanes
- 56 Avenue: West of RR13 (City Limit) to TZ 3479_4 Access – Widen from 2 lanes to 4 lanes
- 56 Avenue: East of 8 St to QEII West junction – Widen from 4 lanes to 6 lanes
- 56 Avenue: QEII West junction to Kingsview Boulevard Extension (WB Only) – Widen WB from 2 lanes to 3 lanes
- RR13: 600m North of Veterans Boulevard to 400m south of Veterans Boulevard – Widen from 2 lanes to 4 lanes (lane dropped at the first intersection after Veterans Boulevard)
- 24 Street: TWP Rd 273 to TZ 3474_3 Access – Widen from 2 lanes to 4 lanes
- Main Street: TWP Rd 274 to North of Stonegate Drive – Widen from 2 lanes to 4 lanes
- RR292: 400m North of TWP Rd 273 to 200m South of Highland Park Lane – Widen from 2 lanes to 4 lanes
- RR292: 800m North of TWP Rd 273 to YVB – Widen from 2 lanes to 4 lanes
- RR292 (Realignment): 800m North of Veterans Boulevard to Veterans Boulevard – New 4 lanes construction (paving)
- RR292 (Realignment): Veterans Boulevard to 800m south of Veterans Boulevard – New 4 lanes construction (paving)
- RR292 (Realignment): 800m south of Veterans Boulevard to 600m North of YVB – Widen from 2 lanes to 4 lanes

The Ultimate Horizon v/c ratio plot with the above upgrades is shown in Exhibit 4.12 and most roadways within the City operating well with v/c ratios at 0.85 or less. The v/c ratio on the east Airdrie bypass is at 0.81. Similar to the 203K population horizon, the north-south orientated roadways operate better with lower v/c ratios than the east-west orientated roadways.

As shown in Exhibit 4.12, a few sections on Veterans Blvd, YVB, 40 Avenue and 56 Avenue will operate at/near capacity with v/c ratios between 0.85 to 1.00. As such, it is recommended to monitor closely for upgrades on these segments. Detailed Ultimate horizon VISUM plots including Total Population and Employment, AADT, Road Classification, Number of Lanes, Link Volumes, v/c ratio etc. are attached in Appendix H.



Legend

V/C ratio

- <= 0.70
- <= 0.85
- <= 1.00
- > 1.00

EXHIBIT 4.12
ULTIMATE HORIZON RECOMMENDED NETWORK VOLUME TO CAPACITY RATIO
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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4.4.1 Ultimate Detailed Intersection Analysis

In addition to VISUM analysis, detailed traffic operation analysis was completed at major intersections for the future Ultimate horizon in Synchro. The initial analysis found that many intersections operated beyond typical criteria, with some intersection improvements being warranted. New traffic signals are recommended at 45 intersections. Also, like previous horizons, it is recommended that many new intersections be urbanized with left turn and/or right turn bays on approaches where required. The Ultimate horizon recommended improvements are as summarized in Table 4.8. The detailed Synchro results of the Ultimate horizon intersections are shown in Appendix G.

Table 4.8: Ultimate Recommended Improvements

Number	Roadway	Section	Recommended Upgrade
1	TWP Rd 274	24 Street to East of RR292 (including the QEII interchange)	Widen from 2 lanes to 4 lanes. See below for upgrade at QEII Interchange
2	TWP Rd 273	TZ 3475_2 Access (west of 24 Street) to 24 Street	Widen from 2 lanes to 4 lanes
3		24 Street to TZ 3474_2 Access	Widen from 2 lanes to 6 lanes
4		TZ 3474_2 Access to TZ 3470_2 Access (Just west of Flyover)	Widen from 4 lanes to 6 lanes
5		Flyover (TZ 3470_2 Access to TZ 3802_1 Access)	Widen from 2 lanes to 6 lanes
6		TZ 3802_1 Access to RR291	Widen from 2 lanes to 4 lanes
7	Veterans Boulevard	East of Highland Park Gate NE to RR292 Realignment	Widen from 4 lanes to 6 lanes
8		Future East Airdrie Bypass Interchange	Widen WB from 1 lane to 2 lanes, added dual NBL turns
9	1 Avenue	Woodside Drive to East of Woodside Gate	Widen from 2 lanes to 4 lanes
10	Yankee Valley Boulevard	TZ 3478_2 Access to Bayside Gate	Widen from 4 lanes to 6 lanes
11		Kings Heights Gate SE to Airport Access	Widen from 4 lanes to 6 lanes
12		Future East Airdrie Bypass Interchange	Widen WB from 1 lane to 2 lanes, added dual NBL turns
13	40 Avenue	RR13 to TZ3478_3 Access 2	Widen from 2 lanes to 4 lanes
14		Kings Heights Way to RR292	Widen from 2 lanes to 4 lanes
15	56 Avenue	West of RR13 (City Limit) to TZ 3479_4 Access	Widen from 2 lanes to 4 lanes
16		East of 8 St to QEII West junction	Widen from 4 lanes to 6 lanes
17		QEII West junction to Kingsview Boulevard Extension	Widen WB from 2 lanes to 3 lanes
18	RR13	600m North of Veterans Boulevard to 400m south of Veterans Boulevard	Widen from 2 lanes to 4 lanes (lane dropped at the first intersection after Veterans Boulevard)
19	24 Street	TWP Rd 273 to TZ 3474_3 Access	Widen from 2 lanes to 4 lanes
20	Main Street	TWP Rd 274 to North of Stonegate Drive	Widen from 2 lanes to 4 lanes

Number	Roadway	Section	Recommended Upgrade
21	RR292	400m North of TWP Rd 273 to 200m South of Highland Park Lane	Widen from 2 lanes to 4 lanes
22	RR291	800m North of TWP Rd 273 to YVB	Widen from 2 lanes to 4 lanes
23	RR292 (Realignment)	800m North of Veterans Boulevard to Veterans Boulevard	New construction (paving) - 4 lanes
24		Veterans Boulevard to 800m south of Veterans Boulevard	New construction (paving) - 4 lanes
25		800m south of Veterans Boulevard to 600m North of YVB	Widen from 2 lanes to 4 lanes
26	TWP Rd 274	7 intersections on TWP Rd 274	Signalization and urbanize intersection (nine intersections) - including 8 St intersection
27		QEII	West Junction: added dual SBL turn and modify SBR turn to free flow (taper back) East Junction: added dual NBL turn and modify NBR turn to free flow (taper back)
28		RR292	Dual lane roundabout
29		RR291	Single lane roundabout
30	TWP Rd 273	8 intersections on TWP Rd 273	Signalization and urbanize 8 intersections, including RR292 intersection
31		8 Street Intersection	In addition to the widening on TWP Rd 273, added dual lefts for all approaches and added NBT and SBT lane. The second NBT and SBT lane is tapered back to 1 lane north and south of the intersection, respectively. WBT remain at v/c 0.91
32		TZ3470_3 Access 3	Added dual EBL left. Three movements remain with v/c over 0.90 and/or LOS F
33		RR291	Dual lane roundabout
34	Veterans Boulevard	8 Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.09) even with the North Flyover and TWP Rd 274 interchange. Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on 8 St.
35		Main Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.70) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Main St.
36		QEII	Three movements remain with v/c over 0.90 and/or LOS F.
37		At Highland Park Blvd / East Lake Ramp	Added dual EBL. Four movements remain with v/c over 1.16 and LOS F
38		At Hamilton Boulevard / East Lake Boulevard	Dual Lefts for all approaches. Widen the NB and SB through lanes to 2 lanes per direction. Four movements remain with v/c over 0.90 and/or LOS F.

Number	Roadway	Section	Recommended Upgrade
39		RR291	Dual lefts for all approaches. WBT remain at v/c 0.91 and NBT at v/c 0.93.
40		RR292 (Realignment)	Triple lane roundabout
41		Future East Airdrie Bypass Interchange	Added dual NBL turn at the east junction, required widening bridge for the WB lanes (from one to two WB lanes). Also, free flow SBR turn (taper back to main road) is required at the west junction.
42	1 Avenue	Sagewood Blvd SW	Monitor for signalization or roundabout
43		8 Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.04). Recommend widening to 6 lanes and dual lefts if there is enough ROW.
44	Yankee Valley Boulevard	24 Street Intersection	Dual lefts for all approaches
45		8 Street Intersection	Many movements remain at/over capacity (v/c over 1.00 and LOS F - highest v/c is 1.07) - Intersection already built to 6 lanes x 6 lanes with dual lefts for all approaches.
46		Luxstone Blvd SW	Added SBL turn bay. WBT remain with v/c 0.92 and 244m queue
47		Main Street Intersection	Many movements remain at/over capacity (v/c over 0.96 and LOS F) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Main St.
48		at QEII West Junction and East Junction	A few movements at the West Junction at/near capacity with v/c 0.90 to 1.00. NBR and WBT at the East junction with v/c 1.10 and 1.04
49		Market St / Yankee Valley Crossing	Three movements with v/c between over 0.93 and 0.98
50		Kingsview Blvd	Many movements remain at/over capacity (v/c over 1.00 and LOS F - highest v/c is 1.08) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Kingsview Blvd
51		RR291	Added dual WBL and SBL. Added second NBT and SBT lane (widen from 2 lanes to 4 lanes at the intersection). Added signalized dual SBR turns.
52		RR292 (Realignment)	Added dual WBL and SBL turns. Added third NBT and SBT lane. The third NBT and SBT lane is tapered back to 2 lanes north and south of the intersection, respectively. The SBR remain at v/c 0.95 and 157m queue.
53		Future East Airdrie Bypass interchange	Added dual NBL turn at the east junction. This also requires the widening of the bridge for the WB lanes (from one to two WB lanes).

Number	Roadway	Section	Recommended Upgrade
54	40 Avenue	24 Street Intersection	Added dual NBL and SBL turns
55		8 Street Intersection	WBT with v/c 0.95 and 189m queue
56		Kingsview Blvd	Four movements with v/c near 1.00
57		RR292	Added second WBT lane at the intersection, dual EBL turn, signalized dual SBR turns.
58	56 Avenue (TWP Rd 264)	24 Street Intersection	Added signalized dual WBR turns.
59		8 Street Intersection	Added signalized dual WBR turns. WBT and NBT remain with v/c 0.92 and 0.97 respectively
60		Kingsview Blvd Extension	Added signalized dual SBR turns and added third WBT lane at the intersection
61		RR 293	Added dual NBL turns
62		RR292	Added signalized dual EBR turns. Added dual EBL turns, third SBT and NBT lane. The third SBT and NBT lane is tapered back to 2 lanes south and north of the intersection, respectively.
63	RR 13	3 intersections on RR13	Signalization and urbanize 3 intersections
64		TZ3478_1 Access 2 and TZ3478_3 Access 1 (both intersections located between YVB and 40 Ave)	Monitor for signalization or roundabout
65	24 Street	TZ3459_2 Access and TZ3475_2 Access (both intersections located between TWP Rd 274 and TWP 273)	Signalization and urbanize 2 intersections
66	8 Street	Railway Ave	WBL at v/c 0.92
67		MacKenzie Way	NBT/R movements at v/c 0.94. Recommended to add NBR turn bay, if there is enough ROW
68		Luxstone Gate	Signalization
69	Main Street	3 intersections on Main Street	Signalization and urbanize 3 intersections
70		Gateway Link	Added NBL and SBL turn bay
71		1 Avenue	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 2.00)
72	Hamilton Boulevard (RR292)	5 intersections on Hamilton Boulevard	Signalization and urbanize 5 intersections
73	RR291	7 intersections on RR291	Signalization and urbanize 7 intersections
74	RR292 (Realignment)	4 intersections on RR292 (Realignment)	Signalization and urbanize 4 intersections
75	TWP Rd 274	Nose Creek Bridge	4 lanes bridge over Nose Creek
76		CPKC Railway Crossing	4 lanes bridge over CPKC Railway Crossing

With the recommended improvements summarized in Table 4.6, the majority of the analyzed intersections will operate within the acceptable LOS and good v/c ratio. However, the following locations remain beyond the acceptable LOS and/or v/c over 1.00, and are fundamentally concerning in traffic operations in the Ultimate Horizon:

- Veterans Blvd / 8 Street: Many movements over capacity (v/c over 1.00 and LOS F)
- Veterans Blvd / Main Street: Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.70) even with the North Flyover and TWP Rd 274 interchange
- Veterans Blvd and Highland Park Blvd / East Lake Ramp: Many movements over capacity (v/c over 1.00 and LOS F)
- 8 Street / 1 Avenue: Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.04)
- YVB / 8 Street: Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.07)
- YVB / QEII East junction: NBR and WBT with v/c 1.10 and 1.04
- YVB / Kingsview Blvd: Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.08)
- Main Street / 1 Avenue intersection: similar to other horizons, all four approaches operated with v/c ratios over 1.00 and LOS F.

When a movement exceeded a v/c ratio of 1.00, the queues and delays for that approach are very unpredictable and could result in long queue spilling-over to upstream intersection(s) and cause traffic gridlock condition; bringing traffic in all directions to a complete standstill. Therefore, the locations listed above are vital and require extra attention in the Ultimate horizon.

In addition to the above listed intersections, the following intersections also operated beyond the acceptable LOS and/or v/c ratios between 0.90 to 1.00:

- TWP Rd 273 / 8 Street: WBT with v/c 0.91
- TWP Rd 273 / TZ3470_3 Access 3: Three movements with v/c over 0.90 and/or LOS F
- Veterans Blvd / QEII West Junction: Many movements remain with v/c over 0.90 and/or LOS F
- Veterans Blvd and Hamilton Boulevard / East Lake Boulevard: Many movements at capacity (v/c over 0.90 and/or LOS F)
- Veterans Blvd / RR291: WBT and NBT with v/c 0.91 and 0.93
- YVB / Luxstone Blvd: WBT remain with v/c 0.92 and 244m queue
- YVB / Main Street: Many movements remain at/over capacity (v/c over 0.96 and LOS F)
- YVB / QEII West junction: Few movements at/near capacity with v/c 0.90 to 1.00
- YVB / Market St / Yankee Valley Crossing: Three movements with v/c between over 0.93 and 0.98
- YVB / RR292 (Realignment): SBR with v/c 0.95 and 157m queue
- 40 Avenue / 8 Street: WBT with v/c 0.95 and 189m queue
- 40 Avenue / Kingsview Blvd: Four movements with v/c over 0.90
- 56 Avenue / 8 Street: WBT and NBT remain with v/c 0.92 and 0.97
- 8 Street / Railway Ave: WBL with v/c 0.92
- 8 Street / MacKenzie Way SW: NB movements with v/c 0.94

By the Ultimate horizon, the population in Airdrie will be more than 3.3 times higher than the existing population, and equivalent to other existing mid-size Canadian cities like Windsor, Ontario or Saskatoon, Saskatchewan. High v/c ratios between 0.90 and 1.00 will continue to be experienced at major

intersections and roadways. Movements at some of the intersections will be over capacity during the PM peak hour and without further mode shift will be the new normal in the future. Similar to the 203K population horizon, further prioritization should be given to mixed land use and mode shift strategies to ingrain these shifts in Airdrie well in advance of this horizon. It is recommended to implement a traffic management plan by the 203K population horizon to manage traffic and reduce traffic congestion.

4.4.2 Sensitivity Analysis – TWP Rd 274 and/or 56 Avenue Further Widening

Since most of the east-west corridors within the City are congested by the ultimate horizon, and limited ROW are available for widening on Veterans Blvd, Yankee Valley Blvd and 40 Avenue, a sensitivity analysis was conducted to verify if widen of future TWP Rd 274 and/or 56 Avenue could relief some of the traffic demand on Veterans Blvd, Yankee Valley Blvd and 40 Avenue. The following upgrades were implemented to the Ultimate model in the sensitivity test:

- TWP Rd 274 – added an eastbound through lane and a westbound through lane (total 4-6 lanes) for the roadways between first intersection west of 24 Street to RR291 (approximately 6.1 km in length and included addition lanes on the future QEII / TWP Rd 274 interchange)
- 56 Avenue - added an eastbound through lane and a westbound through lane (total 6-8 lanes) for the roadways between first intersection west of 24 Street to RR292 (approximately 6.7 km in length and included addition lanes on the future QEII / 56 Avenue interchange)

With the above upgrades applied to the ultimate model, the following results were concluded:

- TWP Rd 274 – minor increase on traffic demand with less than 50 WB vehicles and 50 EB vehicles on segments between 24 Street and QEII. Slightly higher traffic demand on segments between QEII and RR291 with a range of 83 to 138 WB vehicles and 50 to 96 EB vehicles.
- TWP Rd 273 – minor reduction on traffic demand with 45 to 104 less WB vehicles and 16 to 34 less EB vehicles on segments between 24 Street and RR291.
- Veterans Blvd – minor reduction on traffic demand with 21 to 58 less WB vehicles and 30 to 43 less EB vehicles on segments between 24 Street and RR291.
- YVB – minor decrease on traffic demand with 37 to 95 less WB vehicles and 16 to 39 less EB vehicles on segments between 24 Street and RR291.
- 40 Avenue – moderate reduction on traffic demand with 48 to 200 less WB vehicles and 38 to 91 less EB vehicles on segments between 24 Street and RR292. Segments near the QEII interchange experienced the most decrease of traffic demand with approximately 2,600 AADT reduction.
- 56 Avenue – significant traffic demand increase on WB vehicles and moderate increase on EB vehicles. 235 to 441 WB vehicles and 67 to 174 EB vehicles increment experienced on segments between 24 Street and RR292. This translates to 3,000 to 6,150 AADT increment; segments from 24 St to QEII interchange experienced the most increase in traffic demand with average AADT increment over 5,500. With the additional EB and WB through lanes, the v/c ratio on 56 Avenue also improved with 0.78 or lower.

From the sensitivity analysis, it is concluded that benefits to the major east-west corridors are minimal for the further widening of TWP Rd 274. However, the benefits to the major east-west corridors are more significant for the further widening of 56 Avenue. Detailed Ultimate horizon sensitivity analysis VISUM plots including AADT comparison, Number of Lanes comparison, Link Volumes comparison, v/c ratio are attached in Appendix H.

4.5 Roundabout Analysis

Sidra 9.1 was used to analyze 30 locations for potential roundabout implementation in the City. Since the Ultimate traffic volumes are the highest and most conservative among all the horizons, and to minimize throwaway costs; all the roundabout analysis was performed in the Ultimate horizon only. If a roundabout operates acceptably in the Ultimate horizon, then it would also do so at earlier horizons.

Sidra is a roundabout analysis software that considers traffic operations in addition to geometric factors, environmental factors, and human behavior factors. Sidra also calculates the traffic operations of the roundabout based on Level of Service (LOS), volume to capacity (v/c) ratio and queue length.

The acceptable performance criteria are LOS D or better with v/c ratios of 0.90 or less for each movement at the intersection. In the analysis, the default Sidra LOS standard is shown in Table 4.9 below and is between the LOS standards for signalized and unsignalized intersections.

Table 4.9: Sidra LOS Criteria

LOS	A	B	C	D	E	F
Average Delay per Vehicle (s/veh)	< 10	10 – 20	20 – 35	30 – 50	50 – 70	> 70

Sidra analysis was completed for the either single lane, dual lane or triple lane roundabout configurations depending the number of lanes on the future Arterial (e.g. dual lane roundabout configuration was analyzed on location with 4 lanes Arterial cross section). Also, roundabout analysis was undertaken in greenfield locations or at existing locations with no ROW constraints. From Table 4.10, the Sidra analysis confirms that 15 locations operate acceptably in the Ultimate Horizon. In general, the roundabouts at these 15 locations operated better than signalized intersection configurations and should be considered as an option when functional plans are completed.

Two additional intersections could also be candidates for roundabouts:

- Elk Hill SE / Main Street single lane roundabout: The northbound approach operates at v/c 0.93 with 156 m queues, which is slightly over the acceptable v/c of 0.90. With a dual lane roundabout or modified single lane roundabout with dual northbound lane, this location could be a good candidate for a roundabout.
- TWP Rd 273 / Main Street: The westbound approach at the future TWP Rd 273 / Main Street triple lane roundabout operates at v/c 0.91 with 82 m queues, which is just above capacity thresholds.

The detailed Sidra results for the Ultimate horizon analysis are shown in Appendix G.

Table 4.10: Ultimate Horizon Roundabout Results and Summary

E-W Street	N-S Street	Configuration	Results
56 Ave	RR13	Dual lane with NBR turn bay	Acceptable
56 Ave	24 Street	Dual lane with WBR turn bay	Acceptable
56 Ave	8 Street	Triple lane	WB: v/c 1.80, LOS F and 1,033m queue NB: v/c 1.36, LOS F and 555m queue Roundabout not considered
56 Ave	Kingsview Blvd	Triple lane	SB: v/c 1.12, LOS F and 158m queue Roundabout not considered
56 Ave	RR292	Triple lane	Acceptable
40 Ave	RR13	Dual lane	Acceptable
40 Ave	24 Street	Triple lane	WB: v/c 1.44, LOS F and 567m queue NB: v/c 0.92 Roundabout not considered
40 Ave	RR292	Triple lane	WB: v/c 0.97, LOS D and 62m queue Roundabout not considered
YVB	RR13	Dual lane	Acceptable
YVB	24 Street	Triple lane	WB: v/c 1.70, LOS F and 885m queue NB: v/c 1.02 and 135m queue Roundabout not considered
YVB	RR291	Triple lane	WB: v/c 0.95 and 104m queue SB: v/c 1.49, LOS F and 487m queue Roundabout not considered
YVB	RR292 Realignment	Triple lane	NB: v/c 0.96 WB: v/c 1.70, LOS F and 850m queue SB: v/c 1.11, LOS E and 226m queue Roundabout not considered
Veterans Blvd	RR13	Dual lane	WB: v/c 1.16, LOS F and 339m queue EB: v/c 0.95 and 108m queue Roundabout not considered
Veterans Blvd	24 Street	Triple lane	WB: v/c 1.34, LOS F and 532m queue NB: v/c 0.96 SB: v/c 1.08 and 165m queue Roundabout not considered
Veterans Blvd	RR291	Triple lane	WB: v/c 1.33, LOS F and 574m queue Roundabout not considered
Veterans Blvd	RR292 Realignment	Triple lane	Acceptable
TWP Rd 273	RR13	Single lane	Acceptable
TWP Rd 273	24 Street	Dual lane	SB: v/c 1.01 and 96m queue Roundabout not considered
TWP Rd 273	Main Street	Triple lane	WB: v/c 0.91 and 82m queue Acceptable, only slightly above capacity
TWP Rd 273	RR292	Dual lane	WB: v/c 1.11, LOS F and 226m queue NB: v/c 1.24, LOS F and 389m queue Roundabout not considered
TWP Rd 273	RR291	Dual lane	Acceptable

E-W Street	N-S Street	Configuration	Results
TWP Rd 274	Main Street	Dual lane	WB: v/c 0.92 and 126m queue SB: v/c 1.31, LOS F and 302m queue Roundabout not considered
TWP Rd 274	RR292	Dual lane	Acceptable
TWP Rd 274	RR291	Single lane	Acceptable
1 Ave	Woodside Gate NW	Single lane	Acceptable
1 Ave	Woodside Dr NW	Single lane	Acceptable
Elk Hill SE	Main Street	Single lane	NB: v/c 0.93 and 156m queue Acceptable, only slightly above capacity
40 Ave	Windsong Boulevard SW	Dual lane	Acceptable
40 Ave	Southwinds Blvd	Dual lane	Acceptable
40 Ave	Chinook Gate Boulevard SW	Dual lane	Acceptable
RR291	Future TZ 3804_2 Access	Dual lane	Acceptable
RR291	Future TZ 3804_4 Access	Dual lane	Acceptable
RR291	East Lake Hill Extension	Dual lane with EBR turn bay	Acceptable

5.0 Roundabout Policy

The 2020 TMP included an updated Roundabout Policy which touched on the general benefits of roundabouts and recommended a “roundabout first” approach that would evaluate the merits of roundabouts versus alternative treatments for upgrades along arterials and in neighborhoods. It further recommended that an operational comparison be conducted through the 110K population and 144K population horizons to evaluate the effectiveness of roundabouts or signalization at upgrade locations.

The recommended network screening and operational comparison of roundabouts for future intersection upgrades has been completed as part of this TMP update, and is summarized in Section 4.5 above.

The roundabout policy has been further supplemented with the following information summarized below:

- A review and summary of papers or guidelines related to the safety of roundabouts for all users and modes (bikes, pedestrians including vulnerable users such as children and disabled persons, proximity to schools);
- Site selection criteria for roundabouts versus other treatments (stop control, signals). Variables may include: proximity to schools, expected users, adjacent land use, accommodation of on-street parking, past collision data, design vehicle, property impacts, etc.;
- From the above, develop guiding questions and factors for the City to use when evaluating roundabouts versus other intersection treatments selection / consideration matrix.

5.1 Past Safety Studies of Other Modes

ISL undertook a review of completed papers or guidelines on the safety of roundabouts for all users and modes. A summary of findings is as follows:

- Pedestrians:
  - Benefits: Slower approach vehicle speeds are evident which leads to a reduction in the number of deaths and severe injuries. More vehicle compliance is observed for yielding to pedestrians. Higher pedestrian visibility is noted. Pedestrians have shorter wait times as compared to a signalized intersection, along with shorter crossing distances and simpler crossings (e.g. future conflict points).
  - Disadvantages: Drivers are found to pay attention to other drivers at busier roundabouts, and less to pedestrians and cyclists.
  - Multi-lane roundabouts: Less compliance is evident for yielding to pedestrians in multi-lane scenarios. There are higher approach speeds, as compared to a single-lane roundabouts. Driver confusion regarding signs / pavement marking / lane and right of way among drivers can be a distraction from paying attention to vulnerable users.
- School / children / elderly:
  - Benefits: Often, crashes involving children involve errors or other unpredictable behaviors, and severity can be increased in locations where drivers are at higher speeds and/or have less time to react. Slower approach speeds at a roundabout can give drivers more time to react and/or contribute to less severe injuries. Near schools, single-lane roundabouts are preferred over multi-lane roundabouts due to lower vehicle speeds, simpler crossings, and higher driver compliance to yielding to pedestrian crossings. School crossing guards can also enhance the safety of children crossing at roundabouts, given the known risk that younger children have reduced decision-making capability crossing traffic.

- Disadvantages: Less current experience / education about these types of crossing, slower walking speeds, reduced visibility due to smaller size, more judgement needed to identify gaps and approaching vehicle speeds, and a perception that vehicles can stop instantly. These factors can contribute to lower comfort crossing roundabout crosswalks.

- Visually impaired pedestrians:
  - Advantages: Median refuge can accommodate two-stage crossing with use of appropriate tactile surfaces.
  - Disadvantages: No audible cue to cross the street, more experience required to cross street.
- Bicycles:
  - Advantages: Depending on the cyclist's level of comfort, cyclists have the option to travel through the roundabout or dismount and travel through as a pedestrian. Slower vehicle speed through roundabout can reduce crash severity.
  - Disadvantages: Larger, multi-lane roundabouts can be intimidating and difficult to maneuver for those who are not confident Cyclists.

As shown above, there are varying benefits and challenges of a roundabout for vulnerable users. When planning for a roundabout, it is important to identify all potential user(s) of the roundabout and consider the benefits and disadvantages to the user(s). We note particularly that some of the advantages of roundabouts can be reduced in multi-lane applications, and that these should be considered in a context-specific manner when evaluating multi-lane roundabouts.

Finally, we note that current literature and guidelines do not have significant data or findings for multi-lane roundabouts with 3 or more lanes. The higher-lane configurations also have very limited current application in the Alberta context. Particular caution should be exercised in these cases.

5.2 Roundabout vs Signal / Stop Controlled

When considering the traffic control of an at-grade intersection, roundabouts are most commonly compared with a traffic signal or stop controlled configuration. Stop-control is typically used as an interim stage toward ultimate signalization as it has similar geometric design features such as turn lanes, crosswalk placement, etc. Roundabout staging may progress from single-lane to multi-lane configuration, but in general is not considered to be a suitable "interim" form for an ultimate signalized intersection, or vice versa, given the significantly differing geometric features, property requirements, etc.

We recommend that the following guiding questions and factors should be considered when evaluating the appropriate intersection type in Airdrie:

- Traffic operations: How does the roundabout and signal / stop sign operate and is there a significant difference between the different controls? Is the differential significant or minimal, and does this change through later traffic forecasting horizons?
- Adjacent land use: Is the roundabout or signal / stop sign more suitable for the adjacent land use? Is property available for either option? Typically, industrial areas tend to be signal controlled while roundabouts have been implemented more in residential areas. It is recommended to consult and engage with the community if a new intersection configuration will be replacing a current one.
- Access management: Is there an intersection spacing issue? Typically, the spacing of roundabouts can be more frequent than traffic signals, as there are no left turn bays and tapers to accommodate.

- On-street parking: Will losing on-street parking be an issue? Roundabouts will take up more on-street parking, as compared to a traditional intersection.
- Property impact: Are there limitations to the lands adjacent to the intersection? Roundabouts will require differently-shaped right-of-way, especially at the corners of the intersection, but could also require less right-of-way approaching the intersection.
- Users: What level of use is required for vulnerable users (i.e. children, elderly, visually impaired)? Is the intersection along a primary cycling or active modes route?
- Schools: Are there limitations to the school lands adjacent to the intersection? A roundabout may have impacts on school bus parking and parent pick-up / drop-off areas. Will a roundabout afford opportunity to provide U-turns for buses or parental activity? What is the students' age? Is there (or could there be) a crossing guard program?
- Design vehicle: What is the largest vehicle that will be using the intersection? Garbage / recycle / fire trucks in residential areas, larger trucks for industrial areas, transit on transit routes, etc.
- Bus routes: What is the intersection delay with each traffic control? Are transit priority measures required? Transit signal priority cannot be implemented at a roundabout.
- Cost: Roundabouts typically cost more to construct but typically cost less to operate and maintain.
- Transition: Is there a need to transition between different road classifications, or to transition between different land uses? Roundabouts are often used to transition road types and land uses.
- Collisions: Is there an existing collision history and could a signal or roundabout address the collision issue?
- Consistency: What are the adjacent intersection types on the same corridor? Generally, it is preferred to consistently use one intersection type for a given corridor segment and to have defined transition points where a corridor may change from one intersection type to another, rather than having an alternating series of intersection changes along a corridor.

We recommend that each corridor or intersection should be considered on its merits, and would caution against using a purely "checklist" or "scoring" approach for these evaluations.

6.0 Opinion of Probable Cost

Class 5 (order of magnitude) opinions of probable cost were prepared to provide an estimated order of magnitude for potential future transportation infrastructure costs. The Class 5 cost estimates are intended to update and coordinate with other infrastructure budgeting tools to assist with infrastructure programming and general budgeting on a City-wide scale for future transportation studies, designs, and capital construction projects. Future transportation studies and designs should continue to be used to provide the more detailed estimates required to continually review and update the off-site levy bylaw, or to budget and implement individual projects.

Class 5 “order of magnitude” estimates with an accuracy of +75% to -40%. The assumptions used in the development of the Class 5 opinion of probable cost are as follows:

- Costs in 2024 dollars;
- Includes urban design with storm systems, but generally assuming discharge through communities to stormwater management facilities constructed by others;
- Excludes land acquisition (assumes that land will be dedicated to the City through the development process);
- Contingency of 30% and engineering / administration allowance of 15%;
- The suggested improvement years between the modelled horizons is estimated and will be subject to change due to actual development patterns and background traffic growth;
- All improvements to QEII and the future east Airdrie bypass (Interchanges) are assumed to be fully funded by TEC and not included in the costs, except the followings:
  - 50% of the project costs for the TWP Rd 274 / QEII diamond interchange and 56 Ave / QEII Parclo AB2 interchange are assumed to be funded by the City;
  - 100% of the project costs for the TWP Rd 273 / QEII flyover is assumed to be funded by the City;
- As indicated in Section 4.2.2, the Veterans Boulevard recommendations in the TMP closely resemble the design of the Veterans Boulevard FPS, thus the FPS’ cost estimate were referenced;

Unless noted below, the unit costs used were taken from typical rates for Class 5 cost estimates on Calgary region projects as follows:

- Arterial with 40 m ROW:
  - 2-lane arterial with pathways on both sides: $3.2 Million per km;
  - Widen from 2 lanes to 4 lanes: $2.0 Million per km;
  - Widen from 4 lanes to 6 lanes: $2.0 Million per km;
- Arterial with 48 m ROW:
  - New green field 2-lane arterial with pathways on both sides: $4.2 Million per km;
  - Widen from 2 lanes to 4 lanes: $2.7 Million per km;
  - Widen from 4 lanes to 6 lanes: $3.075 Million per km;
- New traffic Signal (Municipal intersection): $500,000;
- 150m dual left turns (per direction): $210,000;
- Single left turn lane (per direction): $65,000;
- Single right turn lane (per direction): $60,000;
- Bridge (per square meter): $7,000;

- The following costs were assumed for locations with roundabout options:
  - Single lane roundabout: $4.5 Million per location.
  - Dual lane roundabout: $6.5 Million per location.
  - Triple lane roundabout: $8.5 Million per location.
- Railway pre-emption cost does not include any infrastructure upgrades to the railway crossing system, and any labour and equipment cost that might be incurred by CPKC;
- The cost of the internal Collector roads or others with lower classification within the CASP and NSP areas were assumed to be the responsibility of the developer as part of their respective subdivision development agreements, and are not provided here;

6.1 Future Improvement Summary for Capital Improvements

The cost estimate of the recommended improvements in each horizon are summarized in Tables 6.1 to 6.5 below. Also, the approximate location of the recommended improvements with "#" in each horizon are shown in Exhibits 6.1 to 6.4.

Table 6.1: 110K Population Recommended Improvements and Cost

Roadway	#	Section	Improvement Description	Cost Estimate
Recommended Improvements by 110K Population				
40 Avenue	1	24 Street to Windsong Blvd SW	New construction - 2 lanes	$3,680,000
	2	Windstone Way SW to 8 Street	Widen from 2 lanes to 4 lanes	$1,404,000
	3	Highview Gate SE to East of Lanark Gate SE	New construction - 2 lanes	$1,472,000
56 Avenue (TWP Rd 264)	4	8 Street to the CPKC railway track	New construction (paving) - 2 lanes	$4,480,000
24 Street	5	Approximately 400m north of 40 Avenue to 56 Avenue	New construction (paving) - 2 lanes	$8,400,000
8 Street	6	Hillcrest Way SW to 56 Avenue	Widen from 2 lanes to 4 lanes	$4,050,000
Kingsview Boulevard Extension	7	40 Avenue to 56 Avenue	New construction - 2 lanes	$6,930,000
Veterans Boulevard	8	At Main Street Intersection	Add third WBT lane, dual EB, WB and NB left turns	$16,900,000[A]
	9	At 8 Street Intersection	Dual WB left turns (costs included in the Veterans Blvd FPS upgrades - see item #8 above)	-[A]
	10	Hamilton Boulevard / East Lake Boulevard to west of Highland Park Boulevard	Widen the westbound from 2 lanes to 3 lanes	$810,000
	11	At Highland Park Gate NE/ East Lake Rd NE	Signalization and urbanize intersection	$875,000
Yankee Valley Boulevard	12	At Main Street Intersection	Add third WBT lane (taper back to 2 lanes after the intersection)	$13,000,000[B]
	13	Sierra Springs Dr SE / QEII SB Off Ramp	Dual NB and SB left turns	$420,000
	14	8 Street	Dual EB and WB left turns	$420,000
	15	Kings Heights Gate SE	Monitor for signalization	-
	16	Ravenswood View SE	Monitor for signalization	-

Roadway	#	Section	Improvement Description	Cost Estimate
Main Street	17	2 Avenue	Monitor for roundabout or signalization	-
	18	1 Avenue	It is recommended to conduct an FPS for 1 Avenue in the downtown segment to identify any potential improvement options	-
8 Street	19	Willow Brook Gate NW	Monitor for signalization	-
	20	1 Avenue	Add NBR turn bay	$60,000
	21	Railway Ave SW	Add NBR turn bay, modify WBL/T to WBL and EBL/T to EBL	$60,000
	22	MacKenzie Way SW	Signalization and urbanize intersection	$750,000
	23	Luxstone Gate SW	Monitor for signalization	-
	24	Hillcrest Avenue	Signalization	$500,000
	25	56 Avenue	Signalization and urbanize intersection	$1,000,000
Kingsview Boulevard Extension	26	TZ 4001 Access	Monitor for signalization	-
40 Avenue	27	Dry Creek Bridge	4 lanes bridge over Dry Creek	$11,200,000
	28	Chinook Gate Boulevard SW	Dual lane roundabout	$6,500,000
1 Avenue	29	Canals Blvd SW	Signalization and urbanize intersection or roundabout	$625,000
	30	Edmonton Trail NE	Signalization	$500,000
Total (Rounded)				**$85 Million**

[A] Cost estimate obtained from the Veterans Boulevard FPS

[B] Cost estimate assumed to be similar to the Veterans Boulevard FPS

Table 6.2: 144K Population Recommended Improvements and Cost

Roadway	#	Section	Improvement Description	Cost Estimate
Recommended Improvements by 144K Population				
TWP Rd 273	1	24 Street to Main Street	New construction - 2 lanes	$10,500,000
24 Street (RR12)	2	Reunion to TWP Rd 273	New construction (paving) - 2 lanes	$8,900,000
8 Street (RR11)	3	Silver Springs to TWP Rd 273	New construction (paving) - 2 lanes	$2,560,000
Veterans Boulevard	4	East of East Lake Boulevard to RR 291	Widen from 2 lanes to 4 lanes	$3,000,000
	5	QEII West Junction to west of Hamilton Boulevard / East Lake Boulevard	Widen from 4 lanes to 6 lanes, and the widening of the bridge at QEII - TEC Project	$5,535,000
	6	West of 8 Street to QEII West Junction	Widen from 4 lanes to 6 lanes (included 6 lanes bridge over Nose Creek and 6 lanes bridge over CPKC Railway Crossing) Main Street: WBT remain operated with v/c 0.90 after widening to 6 lanes	$49,800,000[A]
	7	At Highland Park Blvd / East Lake Ramp	Add dual NB left turns	$210,000
	8	At RR 13	Signalization and urbanize intersection	$1,000,000
	9	At 24 Street	Signalization and urbanize intersection	$1,000,000
1 Avenue	10	24 Street	Signalization and urbanize intersection	$750,000
	11	Sagewood Blvd SW	Monitor for signalization or roundabout	-
RR292	12	Yankee Valley Boulevard to 40 Avenue	Re-alignment and new construction - 2 lanes	$6,400,000
Yankee Valley Boulevard	13	At RR 13	Dual lane roundabout	$6,500,000
	14	24 Street	Add second WBT lane (taper back to 1 lane west of the intersection), left and right turn bay for all approaches	$1,148,000
	15	East of Bayside Gate / Chinook Winds Dr to QEII	Widen from 4 lanes to 6 lanes east of Bayside Gate / Chinook Winds Dr to QEII. This also requires the widening of the west junction to 3 WBT lanes, and the grade separation of the CPKC railway crossing.	$66,700,000[B]
	16	Kingsview Blvd to Kings Heights Gate SE	Widen from 4 lanes to 6 lanes	$1,845,000
	17	East of Kings Heights Gates to RR291	Widen from 2 lanes to 4 lanes	$2,700,000
	18	At 8 Street Intersection	In addition to the widening, dual left turns for all approaches (costs included in the YVB upgrades - see item #16 above)	-[B]
	19	At Main Street Intersection	In addition to the Widening, dual left turns for all approaches (costs included in the YVB upgrades - see item #16 above)	-[B]
	20	Kingsview Blvd	In addition to the widening, dual left turns for all approaches	$840,000

Roadway	#	Section	Improvement Description	Cost Estimate
	21	Kings Heights Gate SE	Signalization and urbanize intersection	$750,000
	22	Ravenswood View SE	Signalization and urbanize intersection	$750,000
	23	RR291	Add south leg, signalization and urbanize intersection	$1,000,000
40 Avenue	24	At RR 13	Dual lane roundabout	$6,500,000
	25	RR13 to 24 Street	New construction (paving) - 2 lanes	$6,804,000
	26	24 Street to West of 8 Street	Widen from 2 lanes to 4 lanes	$4,482,000
	27	Lanark Gate SE to 800m East of RR292	New construction (paving) - 2 lanes	$8,400,000
	28	At 8 Street Intersection	Add third EBT and WBT lane, dual left turns for all approaches (widen from 4 to 6 lanes)	$2,685,000
	29	At Reynolds Gate SW Intersection	Convert the shared SBL/T to SBL and SBT/R, Also convert the shared NBT/R to NBR.	-
	30	Kingsview Blvd	Add third WBT lane, dual NB left turns and dual NBT lanes. Convert the free flow SBR to signalized dual SBR turns.	$330,000
	31	Kings Heights Way SE	Signalization and add second EBT and WBT lane (widen at the intersection from 2 lanes to 4 lanes)	$1,400,000
	32	Lanark Gate SE	Monitor for signalization	-
	33	TZ 3505_5 Access	Monitor for signalization	-
	34	RR292	Signalization and urbanize intersection	$1,000,000
56 Avenue (TWP Rd 264)	35	24 Street to 8 Street	New construction (paving) - 2 lanes	$6,804,000
	36	RR13	Dual lane roundabout with NBR turn bay	$6,560,000
	37	24 Street	Dual lane roundabout with WBR turn bay	$6,560,000
	38	Intersections of TZ3801 Access 2 and TZ3801 Access 1 (west of QEII)	Signalization and urbanize intersection (two Intersections)	$1,750,000
RR 13	39	East West collector at TZ 3476_3	Monitor for signalization	-
24 Street	40	6 intersections South of Veterans Blvd. The recommendations at 56 Ave (roundabout), Veterans Blvd (signalization) and 1 Avenue (signalization) are shown separately (See Item #9, #10, #38)	Signalization and urbanize intersection (Six Intersections)	$6,250,000
	41	Bayview Gate SW	Monitor for signalization	-
	42	Creekmill Court SW	Monitor for signalization	-
	43	TZ 3601 Access	Monitor for signalization	-

Roadway	#	Section	Improvement Description	Cost Estimate
8 Street	44	Willow Brook Rd NW	Monitor for signalization	-
	45	Willow Brook Gate NW	Monitor for signalization	-
	46	Luxstone Gate SW	Monitor for Signalization	-
	47	TZ3801 Access 3	Signalization	$500,000
	48	Hillcrest Avenue to south of 56 Avenue	Widen from 4 lanes to 6 lanes	$3,690,000
Main Street	49	Gateway Link NE	Signalization	$500,000
	50	Jensen Dr NE	Signalization or roundabout	$500,000
	51	1 Avenue	Need intersection improvements to improve operation.	-
	52	Elk Hill SE	Monitor for signalization	-
Kingsview Blvd	53	Kingsview Rd SE	Signalization	$500,000
	54	Kingsview Way SE	Signalization	$500,000
	55	TZ4001 Access	Signalization and urbanize intersection	$815,000
	56	TZ 4002 Access	Signalization and urbanize intersection	$815,000
RR291	57	Future East Lake Hill NE Extension	Dual lane roundabout with EBR turn bay	$6,560,000
	58	TZ 3805_4 Access	Signalization and urbanize intersection	$750,000
RR292 (Realignment)	59	TZ 3505_6 Access	Signalization and urbanize intersection	$1,000,000
TWP Rd 273	60	Nose Creek Bridge	2 lanes bridge over Nose Creek	$5,600,000
Veterans Boulevard	61	Nose Creek Bridge and Culvert	6 lanes bridge over Nose Creek (costs included in the Veterans Blvd FPS upgrades - see Item #6 above)	-[A]
Veterans Boulevard	62	CPKC Railway Crossing	6 lanes bridge over CPKC Railway Crossing (costs included in the Veterans Blvd FPS upgrades - see Item #6 above)	-[A]
Yankee Valley Boulevard	63	CPKC Railway Crossing	CPKC Railway bridge over 6 lanes YVB (costs included in the YVB upgrades - see Item #16 above)	-[B]
Total (Rounded)				**$254 Million**

[A] Cost estimate obtained from the Veterans Boulevard FPS

[B] Cost estimate assumed to be similar to the Veterans Boulevard FPS

Table 6.3: 203K Population Recommended Improvements and Cost

Roadway	#	Section	Improvement Description	Cost Estimate
Recommended Improvements by 203K Population				
TWP Rd 274	1	24 Street to future east Airdrie bypass interchange	New construction (Paving) - 2 lanes	$36,960,000
	2	QEII	New Diamond Interchange (50% of the project costs is assumed to be TEC project and 50% costs is Airdrie project)	$41,950,000
TWP Rd 273	3	TZ 3474_4 Access (West of 8 Street) to West of the Flyover	Widen from 2 lanes to 4 lanes	$5,670,000
	4	Flyover at QEII	New construction - 2 lanes (100% assumed to be City project)	$43,100,000
	5	Flyover to RR291	New construction - 2 lanes	$9,450,000
Veterans Boulevard	6	West of RR13 (City Limit) to First intersection west of 24 St	Widen from 2 lanes to 4 lanes	$5,670,000
	7	First intersection west of 24 St to Reunion Gateway NW	Widen from 2 lanes to 6 lanes	$5,486,250
	8	Reunion Gateway NW to west of 8 Street	Widen from 4 lanes to 6 lanes	$2,613,750
	9	Hamilton Boulevard to east of Highland Park Gate NE	Widen from 4 lanes to 6 lanes	$3,075,000
Yankee Valley Boulevard	10	West of RR13 (City Limit) to West of 24 Street	Widen from 2 lanes to 4 lanes	$3,240,000
	11	Kings Heights Gate SE to future east Airdrie bypass interchange	Widen from 2 lanes to 4 lanes	$11,340,000
40 Avenue	12	Approximately 800m roadway near TZ3505_7 (between RR292 and RR291)	New construction - 2 lanes	$3,360,000
56 Avenue	13	West of 24 Street to RR292	Widen from 2 lanes to 4 lanes	$17,820,000
	14	QEII	New Parclo AB2 interchange (Stage 1 configuration with 4 lanes - TEC Project)	-
RR13	15	Veterans Boulevard to 40 Avenue	New construction (paving) - Upgrade to 2 lanes Arterial	$20,370,000
	16	40 Avenue to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes	$5,400,000
24 Street (RR12)	17	TWP Rd 274 to TWP Rd 273	New construction (paving) - 2 lanes	$6,804,000
	18	TZ 3475_4 Access to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes	$22,410,000
8 Street (RR11)	19	TWP Rd 274 to TWP Rd 273	New construction (paving) - 2 lanes	$6,804,000
Main Street	20	TWP Rd 274 to TWP Rd 273	New construction (paving) - Upgrade to 2 lanes Arterial	$6,804,000
RR292 (Realignment)	21	1 Avenue to 1.6km south (TZ3504_27)	New construction (paving) - 2 lanes	$6,720,000
	22	TZ3504_27 Access to YVB	New construction (paving) - 4 lanes	$5,865,000
	23	YVB to 40 Ave	Widen from 2 lanes to 4 lanes	$5,400,000

Roadway	#	Section	Improvement Description	Cost Estimate
RR292	24	40 Avenue to South of 56 Ave (City Limit)	Widen from 2 lanes to 4 lanes (NOTE: Widen to 6 lanes if no east Airdrie bypass)	$5,130,000
TWP Rd 273	25	7 intersections on TWP Rd 273	Signalization and urbanize intersection (seven intersections) - including 24 St, 8 St and Main St.	$6,500,000
Veterans Boulevard	26	24 Street	In addition to the Widening, dual left turns for all approaches.	$840,000
	27	8 Street Intersection	Add dual NB and SB left turns. Many movements remain at/over capacity (v/c over 0.95 and/or LOS F) - Monitor for further improvements.	$420,000
	28	At Main Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.62) even with the North Flyover and TWP Rd 274 interchange - monitor for further upgrades.	-
	29	QEII West Junction	West Junction: add SBT lane, dual EBL turn (taper back) before the loop ramp. Many movements remain with v/c over 0.90 and/or LOS F, even with the North Flyover and TWP Rd 274 interchange	-
	30	QEII East Junction	Signalization (TEC project)	-
	31	At Highland Park Blvd / East Lake Ramp	NBL with v/c 0.97 and WBT with v/c 0.95	-
	32	At Hamilton Boulevard / East Lake Boulevard	EBL, NBL and SBR with v/c over 0.90	-
1 Avenue	33	Sagewood Blvd SW	Monitor for signalization or roundabout	-
	34	Canoe Rd SW	Monitor for signalization or roundabout	-
Yankee Valley Boulevard	35	6 intersections on Yankee Valley Boulevard	Signalization and urbanize intersection (six intersections) - excluding RR292 realignment, see below	$5,750,000
	36	At 24 Street Intersection	Add third NBT and WBT lane (both lanes dropped after the intersection) 3 WBT lane and 2 EBT lane just west of 24 St.	$2,016,000
	37	8 Street Intersection	Add third NBT and SBT lane (both lanes dropped after the intersection), intersection is now 6 lanes x 6 lanes with dual lefts for approaches. Many movements remain at/over capacity (v/c over 0.90 and/or LOS F)	$1,383,750

Roadway	#	Section	Improvement Description	Cost Estimate
	38	Luxstone Blvd SW	WBT with v/c 0.92 and Queue 95th 243m. Monitor for improvements	-
	39	Main Street Intersection	Many movements remain at/over capacity (v/c over 0.96 and LOS F) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Main St.	-
	40	at QEII West Junction and East Junction	EBT at West Junction with v/c 0.93 and NBR and WBT at East junction with v/c 0.97 and 0.93 - Monitor for improvements	-
	41	Kingsview Blvd	Three movements with v/c over 0.90	-
	42	RR291	EBL with v/c 0.93 and SBR with v/c 0.96	-
	43	RR292 (Realignment)	Signalization and urbanize intersection - Also add dual EBL and NBL turns	$1,290,000
40 Avenue	44	4 intersections on 40 Ave	Signalization and urbanize intersection (four intersections)	$3,500,000
	45	Between TZ3478_3 Access 2 and TZ 3478_4 Access (both intersections located west of 24 Street)	Widen to 4 lanes	$1,782,000
	46	At 24 Street Intersection	Add third NBT and WBT lane (both lanes dropped after the intersection). 3 WBT lane and 2 EBT lane just west of 24 St. Also, widen 40 Ave (approximately 600m) from 2 lanes to 4 lanes.	$1,974,000
	47	Southwinds Blvd SW	Add NBR turn bay at the dual lane roundabout	-
	48	Windsong Boulevard SW	Add SBR turn bay at the dual lane roundabout	-
	49	At 8 Street Intersection	WBT with v/c 0.95 and Queue 95th 193m	-
	50	Kingsview Blvd	Three movements with v/c over 0.90	-
	51	Highview Gate SE	Monitor for signalization	-
	52	RR292	Add dual NBL turn (drop lane at the TZ 3505_5 Access); Widen WB to 2 lanes (380m)	$825,600
56 Avenue (TWP Rd 264)	53	7 intersections on 56 Ave	Signalization and urbanize intersection (Seven Intersections) - Not including the two signals at the QEII junctions	$6,000,000
	54	8 Street Intersection	Dual lefts for all approaches. Added third EBT and WBT lane. The third EBT and WBT lane is tapered back to 2 lanes east and west of the intersection, respectively.	$2,055,000
	55	RR292	Triple lane roundabout	$8,500,000

Roadway	#	Section	Improvement Description	Cost Estimate
RR 13	56	4 intersections on RR13	Signalization and urbanize intersection (four intersections)	$3,000,000
	57	TZ3477_3 Access 1	Monitor for signalization	-
	58	TZ3478_1 Access 2	Monitor for signalization	-
	59	TZ3478_3 Access 1	Monitor for signalization	-
24 Street	60	9 intersections on 24 St	Signalization and urbanize intersection (nine intersections)	$8,750,000
8 Street	61	TWP Rd 273	Signalization and urbanize intersection	$1,000,000
	62	Willow Brook Rd NW	Signalization	$500,000
	63	1 Ave NW	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.12).	-
	64	MacKenzie Way SW	NB movements with v/c 0.92	-
	65	Railway Gate SW	NBT and SBL with v/c 0.91	-
	66	Luxstone Gate SW	Monitor for signalization	-
Main Street	67	TZ3470_3 Access 1	Monitor for signalization	-
	68	TZ3470_3 Access 2	Signalization	$500,000
	69	1 Avenue	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.84)	-
	70	Elk Hill SE	Signalization or roundabout	$500,000
	71	Allen Street SE	Monitor for signalization or roundabout	-
RR291	72	TZ 3804_1 Access	Monitor for roundabout	$0
	73	TZ 3804_2 Access	Dual lane roundabout	$6,500,000
	74	TZ 3804_4 Access	Dual lane roundabout	$6,500,000
RR292 (Realignment)	75	TZ 3505_2 Access	Signalization and urbanize intersection	$1,000,000
	76	TZ 3504_24 Access	Signalization and urbanize intersection	$1,000,000
TWP Rd 274	77	Future East Airdrie Bypass Interchange	New Diamond Interchange (TEC Project)	-
Veterans Boulevard	78	Future East Airdrie Bypass Interchange	New Diamond Interchange (TEC Project)	-
Yankee Valley Boulevard	79	Future East Airdrie Bypass Interchange	New Diamond Interchange (TEC Project)	-
56 Avenue (TWP Rd 264)	80	Future East Airdrie Bypass Interchange and 3km 2-lanes Arterial (Connection from RR292)	New Diamond Interchange (TEC Project) and new 2 lane Arterial Road construction	$12,600,000
TWP Rd 274	81	Main Street Intersection	Signalization and urbanize intersection	$1,000,000
TWP Rd 273	82	Nose Creek Bridge	Widen from 2 lanes to 6 lanes bridge over Nose Creek	$7,700,000
	83	CPKC Railway Crossing	6 lanes bridge over CPKC Railway Crossing	$15,960,000
Total (Rounded)				**$467 Million**

Table 6.4: Ultimate Recommended Improvements and Cost

Roadway	#	Section	Improvement Description	Cost Estimate
Recommended Improvements by Ultimate (Population - 265K)				
TWP Rd 274	1	24 Street to East of RR292 (Including the QEII interchange)	Widen from 2 lanes to 4 lanes. See below for upgrade at QEII Interchange	$11,610,000
TWP Rd 273	2	TZ 3475_2 Access (West of 24 Street) to 24 Street	Widen from 2 lanes to 4 lanes	$1,080,000
	3	24 Street to TZ 3474_2 Access	Widen from 2 lanes to 6 lanes	$5,486,250
	4	TZ 3474_2 Access to TZ 3470_2 Access (Just west of Flyover)	Widen from 4 lanes to 6 lanes	$6,765,000
	5	Flyover (TZ 3470_2 Access to TZ 3802_1 Access)	Widen from 2 lanes to 6 lanes	$26,039,500
	6	TZ 3802_1 Access to RR291	Widen from 2 lanes to 4 lanes	$6,750,000
Veterans Boulevard	7	East of Highland Park Gate NE to RR292 Realignment	Widen from 4 lanes to 6 lanes	$8,148,750
	8	Future East Airdrie Bypass Interchange	Widen WB from 1 lane to 2 lanes, add dual NBL turns (TEC Project)	-
1 Avenue	9	Woodside Drive to East of Woodside Gate	Widen from 2 lanes to 4 lanes (widening not required for roundabout option)	$800,000
Yankee Valley Boulevard	10	TZ 3478_2 Access to Bayside Gate	Widen from 4 lanes to 6 lanes	$5,996,250
	11	Kings Heights Gate SE to Airport Access	Widen from 4 lanes to 6 lanes	$10,639,500
	12	Future East Airdrie Bypass Interchange	Widen WB from 1 lane to 2 lanes, add dual NBL turns (TEC Project)	-
40 Avenue	13	RR13 to TZ3478_3 Access 2	Widen from 2 lanes to 4 lanes	$1,215,000
	14	Kings Heights Way to RR292	Widen from 2 lanes to 4 lanes	$6,885,000
56 Avenue	15	West of RR13 (City Limit) to TZ 3479_4 Access	Widen from 2 lanes to 4 lanes	$3,901,500
	16	East of 8 St to QEII West junction	Widen from 4 lanes to 6 lanes	$4,243,500
	17	QEII West junction to Kingsview Boulevard Extension	Upgrade to Ultimate configurations (50% of the project costs is assumed to be TEC project and 50% costs is Airdrie project)	$46,221,200
RR13	18	600m North of Veterans Boulevard to 400m south of Veterans Boulevard	Widen from 2 lanes to 4 lanes (lane dropped at the first intersection after Veterans Boulevard)	$2,700,000
24 Street	19	TWP Rd 273 to TZ 3474_3 Access	Widen from 2 lanes to 4 lanes	$2,160,000
Main Street	20	TWP Rd 274 to North of Stonegate Drive	Widen from 2 lanes to 4 lanes	$6,750,000
RR292	21	400m North of TWP Rd 273 to 200m South of Highland Park Lane	Widen from 2 lanes to 4 lanes	$3,915,000
RR291	22	800m North of TWP Rd 273 to YVB	Widen from 2 lanes to 4 lanes	$15,255,000

Roadway	#	Section	Improvement Description	Cost Estimate
RR292 (Realignment)	23	800m North of Veterans Boulevard to Veterans Boulevard	New construction (paving) - 4 lanes	$5,520,000
	24	Veterans Boulevard to 800m south of Veterans Boulevard	New construction (paving) - 4 lanes	$5,520,000
	25	800m south of Veterans Boulevard to 600m North of YVB	Widen from 2 lanes to 4 lanes	$5,130,000
TWP Rd 274	26	7 intersections on TWP Rd 274	Signalization and urbanize intersection (nine intersections) - including 8 St intersection	$6,000,000
	27	QEII	West Junction: add dual SBL turn and modify SBR turn to free flow (taper back) East Junction: add dual NBL turn and modify NBR turn to free flow (taper back)	$13,300,000
	28	RR292	Dual lane roundabout	$6,500,000
	29	RR291	Single lane roundabout	$4,500,000
TWP Rd 273	30	8 intersections on TWP Rd 273	Signalization and urbanize 8 intersections, including RR292 intersection	$7,750,000
	31	8 Street Intersection	In addition to the widening on TWP Rd 273, added dual lefts for all approaches and added NBT and SBT lane. The second NBT and SBT lane is tapered back to 1 lane north and south of the intersection, respectively. WBT remain at v/c 0.91	$1,920,000
	32	TZ3470_3 Access 3	Add dual EBL left. Three movements remain with v/c over 0.90 and/or LOS F	$210,000
	33	RR291	Dual lane roundabout	$6,500,000
Veterans Boulevard	34	8 Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.09) even with the North Flyover and TWP Rd 274 interchange. Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on 8 St.	-
	35	Main Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.70) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Main St.	-
	36	QEII	West Junction: Three movements remain with v/c over 0.90 and/or LOS F	-

Roadway	#	Section	Improvement Description	Cost Estimate
	37	At Highland Park Blvd / East Lake Ramp	Add dual EBL. Four movements remain with v/c over 1.16 and LOS F	$210,000
	38	At Hamilton Boulevard / East Lake Boulevard	Dual Lefts for all approaches. Widen the NB and SB through lanes to 2 lanes per direction. Four movements remain with v/c over 0.90 and/or LOS F	$1,640,000
	39	RR291	Dual lefts for all approaches. WBT remain at v/c 0.91 and NBT at v/c 0.93.	$840,000
	40	RR292 (Realignment)	Triple lane roundabout	$8,500,000
	41	Future East Airdrie Bypass Interchange	Add dual NBL turn at the east junction, required widening bridge for the WB lanes (from one to two WB lanes). Also, free flow SBR turn (taper back to main road) is required at the west junction.	-
1 Avenue	42	Sagewood Blvd SW	Monitor for signalization or roundabout	-
	43	8 Street Intersection	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 1.04) - monitor for upgrades. Recommend widen to 6 lanes and dual lefts if there is enough ROW.	-
Yankee Valley Boulevard	44	24 Street Intersection	Dual lefts for all approaches.	$840,000
	45	8 Street Intersection	Many movements remain at/over capacity (v/c over 1.00 and LOS F - highest v/c is 1.07) - Intersection already built to 6 lanes x 6 lanes with dual lefts for all approaches.	-
	46	Luxstone Blvd SW	Add SBL turn bay. WBT remain with v/c 0.92 and Queue 95th 244m	$65,000
	47	Main Street Intersection	Many movements remain at/over capacity (v/c over 0.96 and LOS F) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Main St.	-
	48	at QEII West Junction and East Junction	Few movements at the West Junction at/near capacity with v/c 0.90 to 1.00. NBR and WBT at the East junction with v/c 1.10 and 1.04	-
	49	Market St / Yankee Valley Crossing	Three movements with v/c between over 0.93 and 0.98	-

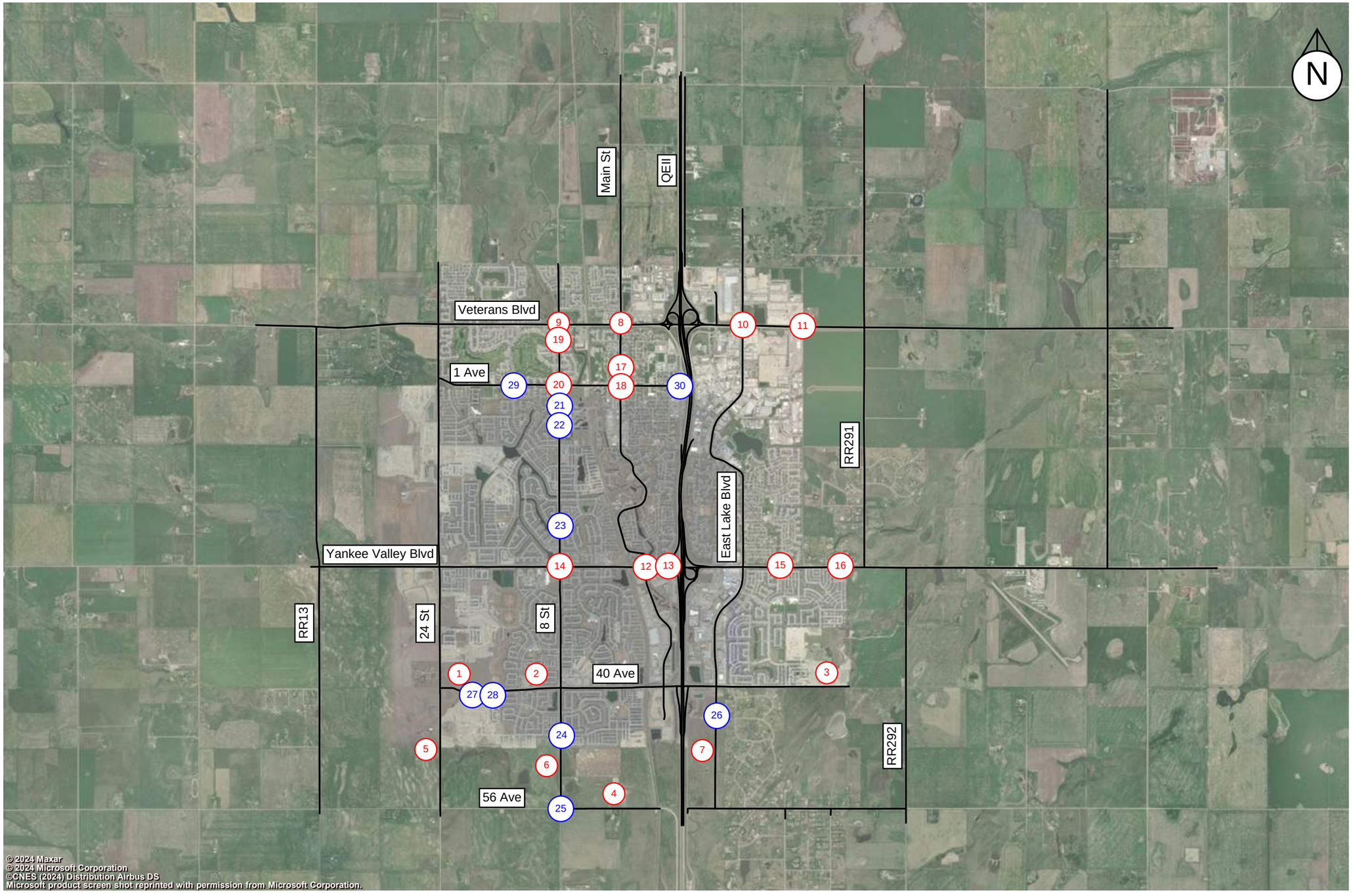
Roadway	#	Section	Improvement Description	Cost Estimate
	50	Kingsview Blvd	Many movements remain at/over capacity (v/c over 1.00 and LOS F - highest v/c is 1.08) - Intersection already with dual lefts for all approaches, 6 lanes on YVB and 4 lanes on Kingsview Blvd	-
	51	RR291	Add dual WBL and SBL. Add second NBT and SBT lane (Widen from 2 lanes to 4 lanes at the intersection). Add signalized dual SBR turns.	$1,620,000
	52	RR292 (Realignment)	Add dual WBL and SBL turns. Add third NBT and SBT lane (Widen from 4 lanes to 6 lanes at the intersection - lane drop on the next intersection). SBR remain at v/c 0.95 and 157m queue.	$2,265,000
	53	Future East Airdrie Bypass Interchange	Add dual NBL turn at the east junction, required widening bridge for the WB lanes (from one to two WB lanes).	-
40 Avenue	54	24 Street Intersection	Add dual NBL and SBL turns.	$420,000
	55	8 Street Intersection	WBT with v/c 0.95 and 189m queue.	-
	56	Kingsview Blvd	Four movements with v/c near 1.00	-
	57	RR292	Add second WBT lane at the intersection, dual EBL turn, signalized dual SBR turns.	$654,000
56 Avenue (TWP Rd 264)	58	24 Street Intersection	Add signalized dual WBR turns.	$120,000
	59	8 Street Intersection	Add signalized dual WBR turns (WBT and NBT remain with v/c 0.92 and 0.97 respectively)	$120,000
	60	Kingsview Blvd Extension	Add signalized dual SBR turns and add third WBT lane at the intersection)	$444,000
	61	RR 293	Add dual NBL turns	$210,000
	62	RR292	Added signalized dual EBR turns. Added dual EBL turns, third SBT and NBT lane. The third SBT and NBT lane is tapered back to 2 lanes south and north of the intersection, respectively.	$1,560,000
RR 13	63	3 intersections on RR13	Signalization and urbanize 3 intersections	$2,500,000
	64	TZ3478_1 Access 2 and TZ3478_3 Access 1 (both intersections located between YVB and 40 Ave)	Monitor for signalization or roundabout	-

Roadway	#	Section	Improvement Description	Cost Estimate
24 Street	65	TZ3459_2 Access and TZ3475_2 Access (both intersections located between TWP Rd 274 and TWP 273)	Signalization and urbanize 2 intersections	$2,000,000
8 Street	66	Railway Ave	WBL at v/c 0.92	-
	67	MacKenzie Way	NBT/R movements at v/c 0.94. Recommended to add NBR turn bay, if there is enough ROW	-
	68	Luxstone Gate	Signalization	$500,000
Main Street	69	3 intersections on Main Street	Signalization and urbanize 3 intersections	$3,000,000
	70	Gateway Link	Added NBL and SBL turn bay	$130,000
	71	1 Avenue	Many movements over capacity (v/c over 1.00 and LOS F - highest v/c is 2.00). It is recommended to conduct an FPS for 1 Avenue in the downtown segment to identify any potential improvement options	-
Hamilton Boulevard (RR292)	72	5 intersections on Hamilton Boulevard	Signalization and urbanize 5 intersections	$5,000,000
RR291	73	7 intersections on RR291	Signalization and urbanize 7 intersections	$6,750,000
RR292 (Realignment)	74	4 intersections on RR292 (Realignment)	Signalization and urbanize 4 intersections	$3,750,000
TWP Rd 274	75	Nose Creek Bridge	4 lanes bridge over Nose Creek	$11,200,000
	76	CPKC Railway Crossing	4 lanes bridge over CPKC Railway Crossing	$13,020,000
Total (Rounded)				**$307 Million**

Table 6.5: Recommended Program Cost Summary

By Horizon	Opinion of Probable Cost (Class 5)
110K Population	$85 Million
144K Population	$254 Million
203K Population	$467 Million
Ultimate	$307 Million
GRAND TOTAL (Rounded)	**$1.11 Billion**
Average Annual Investment (over 65 Years)	**$17.1 Million**

*All Costs are in 2024 dollars



Legend

Recommended Improvement Location #

- #1 - #20 (#)
- #21 - #Max (#)

EXHIBIT 6.1
110K POPULATION HORIZON
RECOMMENDED IMPROVEMENTS
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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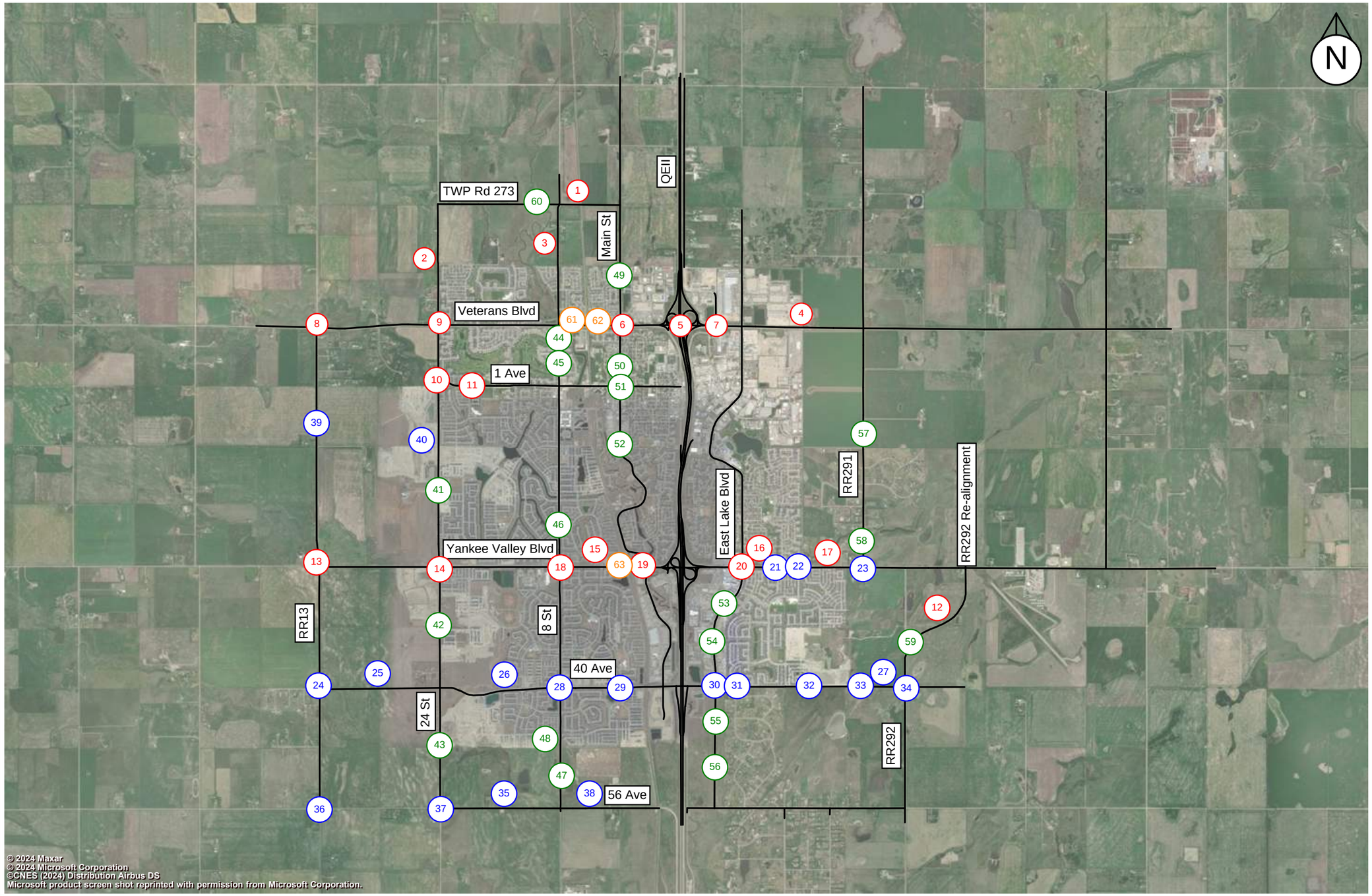

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Recommended Improvement Location #

- #1 - #20
- #21 - #40
- #41 - #60
- #61 - #Max

EXHIBIT 6.2
144K POPULATION HORIZON
RECOMMENDED IMPROVEMENTS
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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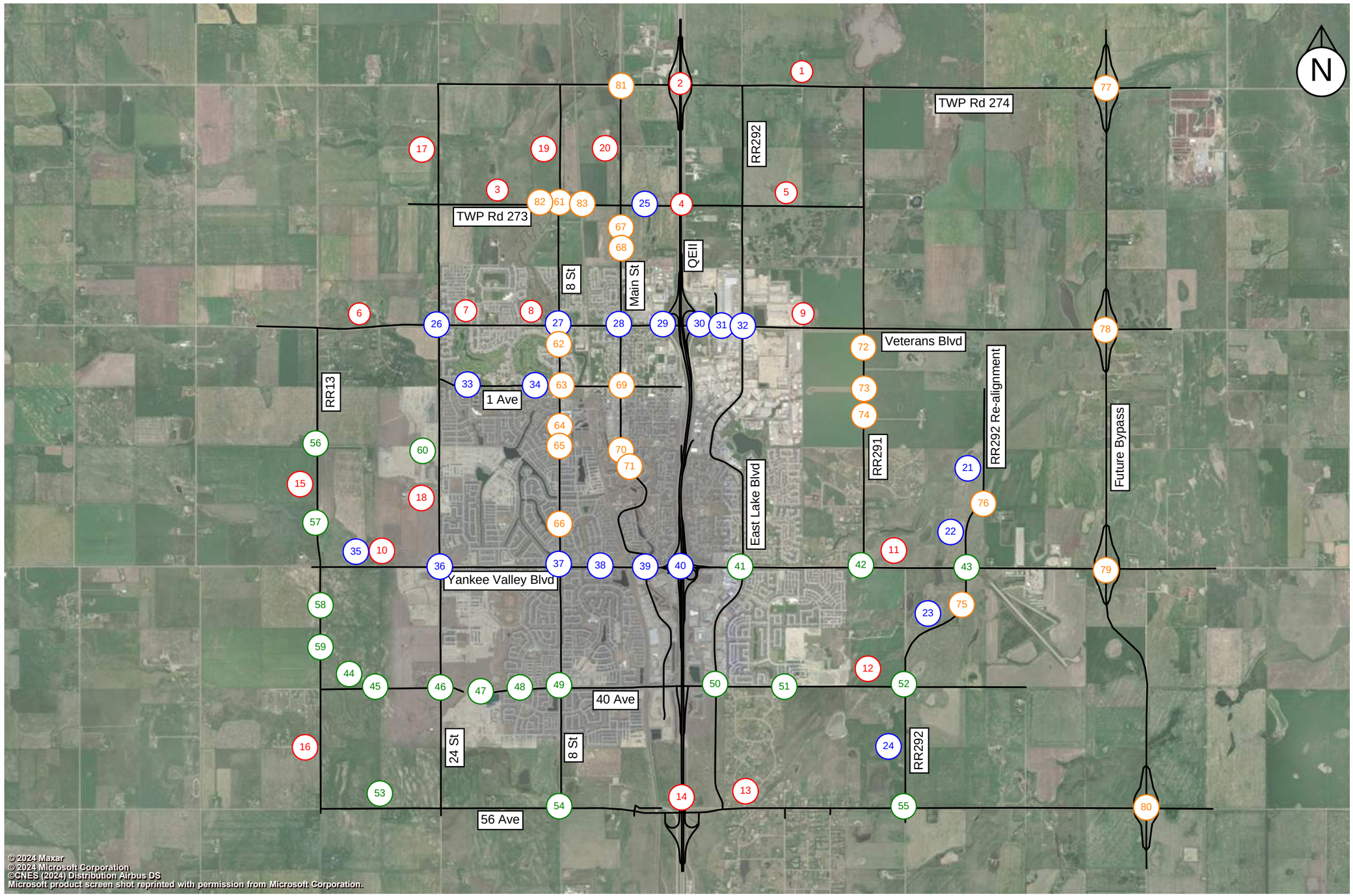

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Recommended Improvement Location #

- #1 - #20
- #21 - #40
- #41 - #60
- #61 - #Max

EXHIBIT 6.3
203K POPULATION HORIZON
RECOMMENDED IMPROVEMENTS
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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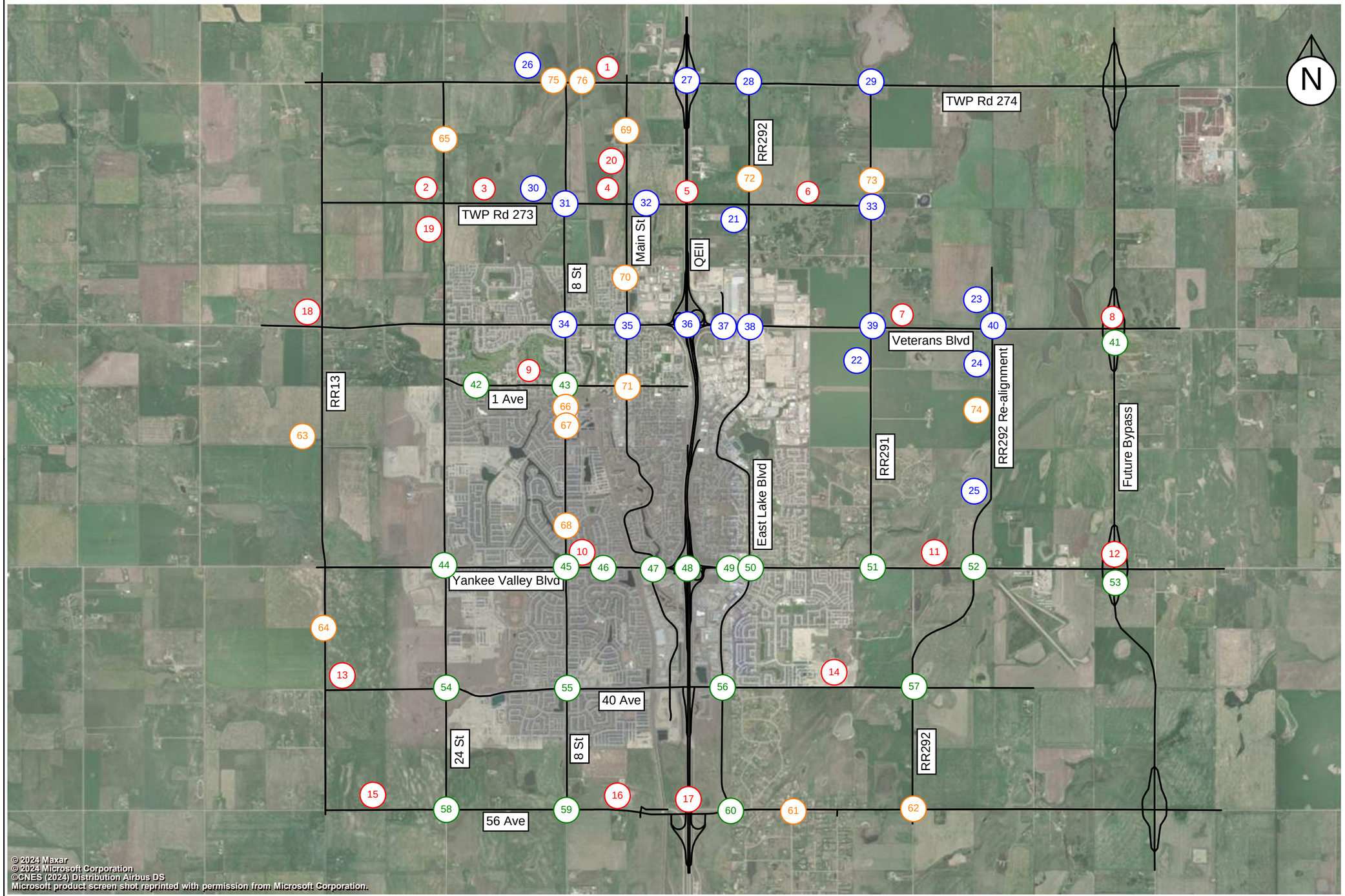

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Recommended Improvement Location #

- #1 - #20
- #21 - #40
- #41 - #60
- #61 - #Max

EXHIBIT 6.4
ULTIMATE HORIZON
RECOMMENDED IMPROVEMENTS
AIRDRIE TRANSPORTATION MASTER PLAN MODEL UPDATE

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7.0 Conclusion and Recommendations

7.1 Traffic Analysis Summary

The focal point of this TMP update for the City of Airdrie was to update the VISUM models and enhance the previous TMP to include additional studies and approved plans for the post-2012-annexation areas, as well as the redevelopment plans for the downtown that have been confirmed since the prior TMP in 2020. This was primarily a technical and programming update, and did not update or revisit other aspects of the TMP such as policy, active modes, transit, or stakeholder engagement.

Based on the analysis results, recommended upgrades, timelines and opinions of probably cost for the road network upgrades are determined and summarized in this TMP update. This report provides the steps, methodologies and model inputs used to develop the travel demand models and will aid the City of Airdrie with budget planning and programming for the infrastructure improvements of the future horizons. The analysis, findings and recommendations from the existing and four future horizons are summarized below.

7.1.1 Existing (2023)

The traditional 4-step (trip generation, trip distribution, trip assignment and mode-split) travel demand modelling process was used to develop the existing travel demand model. The trip distribution was developed using StreetLight Data's travel pattern data from smart phones and navigation devices, and used pre-COVID travel pattern data. The existing horizon consists of a population of 80,649, 28,743 households and 20,494 jobs (retail, non-retail, industrial and school).

The travel demand model (VISUM) reflects the PM peak period and was calibrated to both link counts (73 locations) and intersection turn volumes (48 locations). From the travel demand model and intersection operation analysis (Synchro and Sidra), no immediate improvements are required to support the population on the existing roadway network, which reflects well on the strong level of investment that Airdrie has made in its transportation network an ongoing basis for 25+ years. Also, no improvements are required to the CPKC railway crossings at the existing horizon.

7.1.2 Future Horizons

Four future horizons were considered in the TMP reflecting future land use, population and employment (retail, non-retail, industrial, school) growth based on the City's approved planning policy and documents (Airdrie's Downtown Revitalization Plan, CASPs, NSPs, TIAs etc.).

The population and jobs of the future horizons are as follows:

- 110K Population: Residential population of 110,000 people and 28,440 jobs
- 144K Population: Residential population of 144,000 people and 39,200 jobs
- 203K Population: Residential population of 203,000 people and 71,840 jobs
- Ultimate: Residential population of 265,000 people and 92,660 jobs

From the VISUM and Synchro analyses, the locations of the recommended road improvements in each horizon are shown in Exhibits 6.1 to 6.4 and summarized below.

110K Population Horizon

- Veterans Boulevard: Hamilton Boulevard to just west of Highland Park Boulevard – Widen westbound from 2 lanes to 3 lanes
- Veterans Boulevard: At Main Street Intersection - Added third WBT lane, dual EB, WB and NB left turns
- Veterans Boulevard: At 8 Street Intersection - Dual WB left turns
- Yankee Valley Boulevard: At Main Street Intersection - Added third WBT lane (Taper back to 2 lanes west of the intersection)
- 40 Avenue: From 24 Street to Windsong Blvd SW – New 2 lanes construction and new 4 lanes bridge over Dry Creek
- 40 Avenue: From Windstone Way SW to 8 Street – Widen from 2 lanes to 4 lanes
- 40 Avenue: Highview Gate SE to East of Lanark Gate SE - New 2 lanes construction
- 40 Avenue: Dry Creek Bridge – 4 lanes bridge over Dry Creek
- 56 Avenue: 8 Street to the CPKC railway track - New 2 lanes construction (paving)
- 24 Street: Approximately 400m north of 40 Avenue to 56 Avenue - New 2 lanes construction (paving)
- 8 Street: Hillcrest Way SW to 56 Avenue - Widen from 2 lanes to 4 lanes
- North-South Road (Kingsview Boulevard SE): 40 Avenue to 56 Avenue; New 2 lanes construction

144K Population Horizon

- TWP Rd 273: 24 Street to Main Street – New 2 lanes construction
- TWP Rd 273: Nose Creek Bridge – 2 lanes bridge over Nose Creek
- Veterans Boulevard: East of East Lake Boulevard to RR 291 – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: West of 8 Street to Hamilton Boulevard / East Lake Boulevard – Widen from 4 lanes to 6 lanes, which includes the widening of the bridge at QEII (assumed to be a TEC project)
- Veterans Boulevard: Nose Creek Bridge and Culvert - 6 lanes bridge over Nose Creek
- Veterans Boulevard: CPKC Railway Crossing - 6 lanes bridge over CPKC Railway Crossing
- Sensitivity Analysis of Veterans Boulevard Gateway Commercial: The conversion to a RILO access with signalization operates better as compared to the current Veterans Blvd / Gateway RIRO access. This is consistent with the findings of the Veterans Blvd FPS.
- Yankee Valley Boulevard: 24 Street - Added second WBT lane (Taper back to 1 lane west of the intersection), left and right turn bays for all approaches
- Yankee Valley Boulevard: East of Bayside Gate / Chinook Winds Dr to QEII – Widen from 4 lanes to 6 lanes, which includes the widening of the QEII west junction to 3 WBT lane and the grade separation at the CPKC railway crossing
- Sensitivity analyses of the CPKC crossing:
  - Timing of Widening / Grade Separation: From the sensitivity analysis which interpolates between horizon years, it is found that YVB widening and CPKC railway grade separation will first be triggered at about 132K population. At this time, the eastbound through queue at YVB / Main Street intersection reaches 194 m and the westbound through queue at YVB / Luxstone Blvd intersection reaches 273 m. Also, many movements at both intersections operate with v/c ratios over 0.90 and/or LOS F. The AADT on YVB at the CPKC railway crossing will be 45,000 vpd by this time, which is well into the typical environmental capacity range for a 6-lane arterial.

- Closure Scenarios: We note that, based on the findings in the in-progress Veterans Boulevard FPS, CPKC railway grade separation (at Veterans Blvd) and Veterans Blvd widening to 6 lanes are required by 135K population horizon. Also, from the findings on the Sensitivity Test 1 above, the widening of YVB to six lanes and CPKC railway grade separation on YVB are recommended by 132K population horizon. As such, there is opportunity for both projects to be coordinated to best advantage within the 130Ks population. Similar all-day traffic assessment for both the Yankee Valley Blvd and Veterans Blvd closure scenario at a future design stage could help inform the optimum sequencing.
- Lane Reduction Scenario: Based on 110K population horizon sensitivity analysis results, reducing YVB to two lanes operation during construction will increase traffic on Veterans Blvd, 1 Avenue, Railway Avenue and 40 Avenue. 430 and 584 vehicles for EB and WB will shift from YVB to 40 Avenue, while 246 and 228 vehicles for EB and WB will shift to Veterans Blvd as an alternative route. Also, the v/c ratios on the parallel corridors will be between 0.90 and 1.00. Furthermore, the YVB railway crossing will experience v/c ratios of 0.99 and 1.07 for eastbound and westbound, respectively. Higher v/c ratios on the parallel corridors are expected from traffic growth for the horizons beyond 110K population. As such, traffic is also congested on these roadways with two lane operations on YVB during the PM peak hour. Similar to YVB closure, all-day traffic assessment could help confirm the time-of-day for congestion conditions, to give decision-makers information needed to assess and accept the related risk.

- Yankee Valley Boulevard: Kingsview Blvd to Kings Heights Gate SE – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: East of Kings Heights Gate to RR291– Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: At 8 Street, Main Street and Kingsview Blvd – In addition to the Widening, provide dual left turns for all approaches
- Yankee Valley Boulevard: CPKC Railway Crossing - CPKC Railway bridge over 6 lanes YVB
- 40 Avenue: RR13 to 24 Street – New 2 lanes construction (paving)
- 40 Avenue: 24 Street to West of 8 Street – Widen from 2 lanes to 4 lanes
- 40 Avenue: Lanark Gate SE to 800 m East of RR292 – New 2 lanes construction (paving)
- 40 Avenue: At 8 Street – Added third EBT and WBT lane, dual left turns for all approaches
- 40 Avenue: Kingsview Blvd – Added third WBT lane, dual NB left turns and dual NBT lanes. Convert the free flow SBR to signalized dual SBR turns.
- 40 Avenue: Kings Heights Way SE - Signalization and add second EBT and WBT lane (widen at the intersection from 2 lanes to 4 lanes)
- 56 Avenue: 24 Street to 8 Street – New 2 lanes construction (paving)
- 24 Street (RR12): Reunion to TWP Rd 273 – New 2 lanes construction (paving)
- 8 Street (RR11): Silver Springs to TWP Rd 273 – New 2 lanes construction (paving)
- 8 Street: Hillcrest Avenue to south of 56 Avenue – Widen from 4 lanes to 6 lanes
- RR292: Yankee Valley Boulevard to 40 Avenue – Re-alignment and new 2 lanes construction
- Convert the Veterans Blvd / Gateway RIRO access to a RILO access with signalization

203K Population Horizon

- The east Airdrie bypass (NE Stoney Trail to Crossfield area) (TEC Project)
- TWP Rd 274: 24 Street to future east Airdrie bypass interchange – New 2 lanes construction (Paving)
- TWP Rd 274: QEII – New Diamond Interchange

- TWP Rd 274: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- TWP Rd 273: TZ 3474_4 Access (West of 8 Street) to West of the Flyover – Widen from 2 lanes to 4 lanes
- TWP Rd 273: Flyover at QEII – New 2 lanes construction
- TWP Rd 273: Nose Creek Bridge – Widen from 2 lanes to 6 lanes bridge over Nose Creek
- TWP Rd 273: CPKC Railway Crossing – 6 lanes bridge over CPKC Railway Crossing
- Veterans Boulevard: West of RR13 (City Limit) to First intersection west of 24 St – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: First intersection west of 24 St to Reunion Gateway NW – Widen from 2 lanes to 6 lanes
- Veterans Boulevard: Reunion Gateway NW to west of 8 Street – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: Hamilton Boulevard to east of Highland Park Gate NE – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- Yankee Valley Boulevard: West of RR13 (City Limit) to west of 24 St – Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: Kings Heights Gate SE to future east Airdrie bypass interchange – Widen from 2 lanes to 4 lanes
- Yankee Valley Boulevard: 24 Street Intersection – Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively.
- Yankee Valley Boulevard: 8 Street Intersection – Added third NBT and SBT lane. The third NBT and SBT lane is tapered back to 2 lanes north and south of the intersection, respectively. With the improvement, the intersection is now 6 lanes x 6 lanes with dual lefts for all approaches.
- Yankee Valley Boulevard: Future east Airdrie bypass interchange – New Diamond Interchange (TEC Project)
- 40 Avenue: Approximately 800m roadway near TZ3505_7 (between RR292 and RR291) – New 2 lanes construction
- 40 Avenue: At 24 Street Intersection - Added third NBT and WBT lane. The third NBT and WBT lane is tapered back to 2 lanes north and west of the intersection, respectively. Also, widen 40 Avenue (approximately 600m) from 2 lanes to 4 lanes.
- 56 Avenue: West of 24 Street to RR292 – Widen from 2 lanes to 4 lanes
- 56 Avenue: QEII – New Parclo AB2 interchange (Stage 1 configuration with 4 lanes)
- 56 Avenue: Future east Airdrie bypass interchange and 3 km of 2-lanes Arterial road (connecting from RR292) – New Diamond Interchange (TEC Project) and new 2 lanes construction (Paving)
- RR13: 40 Avenue to South of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes
- 24 Street (RR12): TWP Rd 274 to TWP Rd 273 – New 2 lanes construction (Paving)
- 24 Street (RR12): TZ 3475_4 Access to South of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes
- 8 Street (RR11): TWP Rd 274 to TWP Rd 273 – New 2 lanes construction (Paving)
- Main Street (RR11): TWP Rd 274 to TWP Rd 273 – Upgrade to Arterial standard (paving)
- RR292 (Realignment): 1 Avenue (approximate longitude) to 1.6km south (TZ3504_27) – New 2 lanes construction (Paving)
- RR292 (Realignment): TZ3504_27 Access to YVB – New 4 lanes construction (Paving)

- RR292 (Realignment): YVB to 40 Ave – Widen from 2 lanes to 4 lanes
- RR292: 40 Avenue to South of 56 Ave (City Limit) – Widen from 2 lanes to 4 lanes
- TWP Rd 274 and/or 56 Avenue Further Widening

Ultimate Horizon

- TWP Rd 274: 24 Street to East of RR292 (Including the QEII interchange) – Widen from 2 lanes to 4 lanes
- TWP Rd 273: TZ 3475_2 Access (West of 24 Street) to 24 Street – Widen from 2 lanes to 4 lanes
- TWP Rd 273: 24 Street to TZ 3474_2 Access (950m) – Widen from 2 lanes to 6 lanes
- TWP Rd 273: TZ 3474_2 Access to TZ 3470_2 Access (Just west of Flyover) – Widen from 4 lanes to 6 lanes
- TWP Rd 273: Flyover (TZ 3470_2 Access to TZ 3802_1 Access) – Widen from 2 lanes to 6 lanes
- TWP Rd 273: TZ 3802_1 Access to RR291 – Widen from 2 lanes to 4 lanes
- Veterans Boulevard: East of Highland Park Gate NE to RR292 Realignment – Widen from 4 lanes to 6 lanes
- Veterans Boulevard: Future east Airdrie bypass interchange – Widen WB from 1 lane to 2 lanes, added dual NBL turns (TEC Project)
- 1 Avenue: Woodside Drive to East of Woodside Gate – Widen from 2 lanes to 4 lanes (widening not required for roundabout option)
- Yankee Valley Boulevard: TZ 3478_2 Access to Bayside Gate – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: Kings Heights Gate SE to Airport Access – Widen from 4 lanes to 6 lanes
- Yankee Valley Boulevard: Future east Airdrie bypass interchange – Widen WB from 1 lane to 2 lanes, added dual NBL turns (TEC Project)
- 40 Avenue: RR13 to TZ3478_3 Access 2 – Widen from 2 lanes to 4 lanes
- 40 Avenue: Kings Heights Way to RR292 – Widen from 2 lanes to 4 lanes
- 56 Avenue: West of RR13 (City Limit) to TZ 3479_4 Access – Widen from 2 lanes to 4 lanes
- 56 Avenue: East of 8 St to QEII West junction – Widen from 4 lanes to 6 lanes
- 56 Avenue: QEII ultimate interchange
- Sensitivity Analysis of TWP Rd 274 and/or 56 Avenue Further Widening: It is concluded that benefits to the major east-west corridors are minimal for the further widening of TWP Rd 274. However, the benefits to the major east-west corridors are more significant for the further widening of 56 Avenue.
- RR13: 600m North of Veterans Boulevard to 400m south of Veterans Boulevard – Widen from 2 lanes to 4 lanes (lane dropped at the first intersection after Veterans Boulevard)
- 24 Street: TWP Rd 273 to TZ 3474_3 Access – Widen from 2 lanes to 4 lanes
- Main Street: TWP Rd 274 to North of Stonegate Drive – Widen from 2 lanes to 4 lanes
- RR292: 400m North of TWP Rd 273 to 200m South of Highland Park Lane – Widen from 2 lanes to 4 lanes
- RR291: 800m North of TWP Rd 273 to YVB – Widen from 2 lanes to 4 lanes
- RR292 (Realignment): 800m North of Veterans Boulevard to 800m south of Veterans Boulevard – New 4 lanes construction (paving)
- RR292 (Realignment): 800m south of Veterans Boulevard to 600m north of YVB – Widen from 2 lanes to 4 lanes

7.1.3 Roundabouts Analysis

From the Sidra analysis, 18 arterial-level intersection locations would operate acceptably with roundabouts in the Ultimate Horizon. In general, the roundabouts at these 18 locations operated better than signalized intersection configurations and should be considered as an option when their respective corridors are planned in detail.

Two additional intersections could also be candidates for roundabout:

- Elk Hill SE / Main Street single lane roundabout: The northbound approach operates at v/c 0.93 and 156 m queue, which is slightly over the acceptable v/c of 0.90. With a dual lane roundabout or modified single lane roundabout with dual northbound lane, this location could be a candidate for roundabout option.
- TWP Rd 273 / Main Street: The westbound approach at the future TWP Rd 273 / Main Street triple lane roundabout operates at v/c 0.91 and 82 m queue, which is just above capacity thresholds.

Table 7.1: Ultimate Horizon Roundabout Results and Summary

E-W Street	N-S Street	Configuration	Results
56 Ave	RR13	Dual lane with NBR turn bay	Acceptable
56 Ave	24 Street	Dual lane with WBR turn bay	Acceptable
56 Ave	RR292	Triple lane	Acceptable
40 Ave	RR13	Dual lane	Acceptable
YVB	RR13	Dual lane	Acceptable
Veterans Blvd	RR292 Realignment	Triple lane	Acceptable
TWP Rd 273	RR13	Single lane	Acceptable
TWP Rd 273	Main Street	Triple lane	WB: v/c 0.91 and 82m queue Acceptable, only slightly above capacity
TWP Rd 273	RR291	Dual lane	Acceptable
TWP Rd 274	RR292	Dual lane	Acceptable
TWP Rd 274	RR291	Single lane	Acceptable
1 Ave	Woodside Gate NW	Single lane	Acceptable
1 Ave	Woodside Dr NW	Single lane	Acceptable
Elk Hill SE	Main Street	Single lane	NB: v/c 0.93 and 156m queue Acceptable, only slightly above capacity
40 Ave	Windsong Boulevard SW	Dual lane	Acceptable
40 Ave	Southwinds Blvd	Dual lane	Acceptable
40 Ave	Chinook Gate Boulevard SW	Dual lane	Acceptable
RR291	TZ 3804_2 Access (Adjacent to Spring Valley NSP)	Dual lane	Acceptable
RR291	TZ 3804_4 Access (Adjacent to Spring Valley NSP)	Dual lane	Acceptable
RR291	East Lake Hill Extension	Dual lane with EBR turn bay	Acceptable

7.2 Roundabout Policy

7.2.1 Past Safety Studies of Other Modes

ISL undertook a review of completed papers or guidelines on the safety of roundabouts for all users and modes. There are varying benefits and challenges of a roundabout for vulnerable users. When planning for a roundabout, it is important to identify all potential user(s) of the roundabout and consider the benefits and disadvantages to the user(s). We note particularly that some of the advantages of roundabouts can be reduced in multi-lane applications, and that these should be considered in a context-specific manner when evaluating multi-lane roundabouts.

Finally, we note that current literature and guidelines do not have significant data or findings for multi-lane roundabouts with 3 or more lanes. The higher-lane configurations also have very limited current application in the Alberta context. Particular caution should be exercised in these cases.

7.2.2 Roundabout vs Signal / Stop Controlled

When considering the traffic control of an at-grade intersection, roundabouts are most commonly compared with a traffic signal or stop controlled configuration. Stop-control is typically used as an interim stage toward ultimate signalization as it has similar geometric design features such as turn lanes, crosswalk placement, etc. Roundabout staging may progress from single-lane to multi-lane configuration, but in general is not considered to be a suitable “interim” form for an ultimate signalized intersection, or vice versa, given the significantly differing geometric features, property requirements, etc.

We recommend that the following guiding questions and factors should be considered when evaluating the appropriate intersection type in Airdrie:

- Traffic operations: How does the roundabout and signal / stop sign operate and is there a significant difference between the different controls? Is the differential significant or minimal, and does this change through later traffic forecasting horizons?
- Adjacent land use: Is the roundabout or signal / stop sign more suitable for the adjacent land use? Is property available for either option? Typically, industrial areas tend to be signal controlled while roundabouts have been implemented more in residential areas. It is recommended to consult and engage with the community if a new intersection configuration will be replacing a current one.
- Access management: Is there an intersection spacing issue? Typically, the spacing of roundabouts can more frequent than traffic signals, as there are no left turn bays and tapers to accommodate.
- On-street parking: Will losing on-street parking be an issue? Roundabouts will take up more on-street parking, as compared to a traditional intersection.
- Property impact: Are there limitations to the lands adjacent to the intersection? Roundabouts will require differently-shaped right-of-way, especially at the corners of the intersection, but could also require less right-of-way approaching the intersection.
- Users: What level of use is required for vulnerable users (i.e. children, elderly, visually impaired)? Is the intersection along a primary cycling or active modes route?
- Schools: Are there limitations to the school lands adjacent to the intersection? A roundabout may have impacts on school bus parking and parent pick-up / drop-off areas. What is the school board’s preference from their experience of intersection control near school? Will a roundabout afford opportunity to provide U-turns for buses or parental activity? What is the students’ age? Is there (or could there be) a crossing guard program?

- Design vehicle: What is the largest vehicle that will be using the intersection? Garbage / recycle / fire trucks in residential areas, larger trucks for industrial areas, transit on transit routes, etc.
- Bus routes: What is the intersection delay with each traffic control? Are transit priority measures required? Transit signal priority cannot be implemented at a roundabout.
- Cost: Roundabouts typically cost more to construct but typically cost less to operate and maintain.
- Transition: Is there a need to transition between different road classifications, or to transition between different land uses? Roundabouts are often used to transition road types and land uses.
- Collisions: Is there an existing collision history and could a signal or roundabout address the collision issue?
- Consistency: What are the adjacent intersection types on the same corridor? Generally, it is preferred to consistently use one intersection type for a given corridor segment and to have defined transition points where a corridor may change from one intersection type to another, rather than having an alternating series of intersection changes along a corridor.

We recommend that each corridor or intersection should be considered on its merits, and would caution against using a purely “checklist” or “scoring” approach for these evaluations.

7.3 Opinion of Probable Cost

Class 5 (order of magnitude) opinions of probable cost were prepared to provide an estimated order of magnitude for potential future transportation infrastructure costs. The total cost estimate of improvements in each horizon is summarized in Table 7.2 below. The location (improvement #) of the recommended improvements in each horizon are shown in Exhibits 6.1 to 6.4.

Table 7.2: Recommended Program Cost Summary

By Horizon	Opinion of Probable Cost (Class 5) *
110K Population	$85 Million
144K Population	$254 Million
203K Population	$467 Million
Ultimate	$307 Million
GRAND TOTAL (Rounded)	**$1.11 Billion**
Average Annual Investment (Over 65 Years)**	**$17.1 Million**

*All Costs are in 2024 dollars**Ultimate was assumed to occur in 2090