TAB A-1(G)

OFF-SITE LEVY BYLAW

EXECUTIVE SUMMARY

The purpose of this report is to present the proposed off-site levy rates and community services charges for implementation on 2016 February 1. The off-site levy bylaw project began one year ago and included extensive industry and public engagement. The process is now complete and has resulted in a comprehensive set of recommendations and a commitment to continued collaboration with industry.

The component of the levies for water and wastewater treatment will be charged citywide, which includes charging this levy in the Established Areas; this is a new aspect of the levy regime. A density incentive program for high density development in the Established Areas is also proposed to ensure that the impact of charging off-site levies will not discourage this form of development.

In the Greenfield Areas, there will also be charges for water distribution, wastewater collection, drainage, transportation, and community services. The Greenfield rates have been calculated based on capturing 100% of the proportionate share of the costs attributable to new growth.

All calculations and methodologies are included in the background report which is a schedule of the proposed Bylaw (Attachment 1-Schedule C). This background report was prepared to ensure that the information is transparent, accountable, and well documented for future reference.

The proposed levy regime will contribute to the building of complete communities and achieving financial sustainability.

ADMINISTRATION RECOMMENDATION(S)

That Council Hold a Public Hearing on Bylaw 2M2016 and Council resolution, and:

1. Give three readings to Bylaw 2M2016 (Attachment 1);
2. Adopt by resolution, the Community Services Charges (Attachment 2); and
3. Direct Administration to implement the key deliverables of the 2016 work plan to address issues that arose through this process, as outlined in Attachment 3.
4. Direct Administration to create an Established Area Redevelopment Incentive Budget (EARIB) to offset reduced revenue resulting from the proposed density incentive program.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2011 May 16, Council gave three readings to the Off-site Levy Bylaw 34M2011. As detailed in LPT2011-35, there was an agreement between Industry and Administration to revisit the levy calculations by 2015 December 31.

On 2014 September 15, Council approved, at the Special Strategic Planning Meeting of Council, the five areas of focus as indicated in the "Leadership Strategic Plan: Contract with Council." One of the five areas of focus was the off-site levy bylaw project.

Council approved in principle, direction to the off-site levy bylaw process as discussed at the 2015 May 4 Strategic Planning Meeting, with respect to Report C2015-0436.

BACKGROUND

Calgary is a great city known worldwide for its quality of life and robust economy. As a result, it has continued to experience rapid growth. Despite the recent economic downturn, Calgary is forecasted to grow by 1.3 million people in the next 60 years. Growth provides numerous benefits including support for local businesses, arts and culture, community vibrancy, and the population threshold needed to support amenities such as transit.

With growth also comes a substantial requirement for investment in services and infrastructure. Developers fund the capital cost of the local infrastructure within new communities such as roads, sidewalks, parks and underground utilities. Growth also creates a need for additional or expanded infrastructure that is off-site from these communities such as water and wastewater systems, and major roads and interchanges. One of the tools used to help fund the capital cost of this infrastructure is to charge developers off-site levies.

The Municipal Government Act (MGA) authorizes municipalities to create off-site levies that can be imposed at the time of subdivision or development permit approval. According to this legislation, an off-site levy may be used to fund all or part of the capital cost of new or expanded infrastructure including:

- Facilities for the storage, transmission, treatment or supplying of water;
- Facilities for the movement, treatment or disposal of sanitary sewage;
- Storm sewer drainage facilities;
- Roads required for or impacted by a subdivision or development; and
- Land required for or in connection with these facilities.

Growth also creates the need for community services such as emergency response stations, police stations and recreation facilities. The MGA does not include the capital cost of these types of services in the list of eligible infrastructure for which off-site levies can be imposed. To address this, charges are calculated for these infrastructure needs and developers are encouraged to contribute to their cost. It was confirmed by development industry representatives during the process that these services are important in order to build complete communities.

Infrastructure costs resulting from growth represent a significant portion ($4.6 billion of $8.1 billion or 57 per cent) of The City's 2015-2019 capital budget. Off-site levies are one of the sources of funding used to fund infrastructure. Other funding sources include utility rates, property taxes and government grants. The off-site levy rates have been calculated to determine how much of the capital cost due to growth should be funded by the development industry. If the costs attributable to industry are not fully captured through the levies, then these costs need to be covered through the other sources of funding.

Bylaw 34M2011 was approved on 2011 May 16, which included off-site levies for water, wastewater, drainage and transportation infrastructure components. Council also approved, by resolution, charges for community services infrastructure. At that time, a commitment was made by Administration and endorsed by Council, that an updated off-site levy bylaw would be prepared in 2015.

OFF-SITE LEVY BYLAW

In 2014 October, in response to the significant growth experienced in Calgary, the Build Calgary team was created to fulfill the "Leadership Strategic Plan" contract with Council which was presented in 2014 September as follows:

1. Focus immediate and collective attention on planning and building a great city:
    - Corporate approach to strategic planning and investment
    - Integrate master plans with a growth management philosophy
    - Align capital investment with strategic infrastructure requirements
    - Build trust with all partners and together address future growth

2. Strengthen the Corporation's financial position:
    - Create an investment strategy to fund essential infrastructure and close the current infrastructure gap, emphasizing return on municipal investment
    - Secure provincial commitment through City Charter negotiations and MGA review
    - Generate greater investment capital for infrastructure financing and realign investment to current priorities

Due to significant growth and cost escalations over the past five years, the 2011 levy rates have fallen behind as far as collecting the proportionate share of the cost of off-site infrastructure attributable to new growth. As well, the impact on infrastructure from redevelopment projects had not been fully considered in previous off-site levy calculations. There has been an increase in redevelopment activity in the existing areas of the city in recent years. This supports The City's vision set out in the Municipal Development Plan (MDP) and Calgary Transportation Plan (CTP). At the same time, the impact of all growth on infrastructure costs should be considered when determining the funding strategies.

To meet the time commitment made in 2011, and to address the changing impacts on growth related costs, the Build Calgary team identified the preparation of a new off-site levy bylaw as one of its key initiatives. The process began in 2015 February and this report presents the resulting recommendations. The implementation phase and other related work will continue into 2016.

During the process it was identified, that Bylaw 41M2010 for the West Pine Creek Sanitary Trunk Off-site Levy Bylaw should be repealed. In 2010, Bylaw 41M2010 was approved by Council. The purpose of this bylaw was to cover the cost of the land purchase for the required sanitary trunk that would connect to the Pine Creek Wastewater Treatment Plant. Bylaw 41M2010 is no longer required as the West Pine Creek Sanitary Trunk off-site Levy Bylaw rates have been captured in the proposed bylaw. Having both bylaws would be redundant, so repealing this bylaw is proposed.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

To develop the proposed off-site levy bylaw, Administration built on previous approaches while expanding the focus on transparency, data analysis, diligent calculations, collaboration with a variety of stakeholders, and learning from best practices research.

The first step of the off-site levy process was to develop a framework to establish timelines and a work plan, and to ensure that a variety of alternatives would be analyzed. Internal and external committees were established to ensure cross-corporate collaboration and broad stakeholder engagement throughout the process.

The project framework included six phases:

1. Understand/Principles
2. Options Identification
3. Analysis and Assessment
4. Calculations
5. Final Consultation and Council Approval
6. Implementation

Additional details on the phases of the process are provided in the background report on pages 4 and 5 (Attachment 1-Schedule C).

A committee structure, including various working groups and teams, was also developed. The External Advisory Committee, made up of internal and external stakeholders, created guiding principles to provide direction to the process. Additional details on the guiding principles are provided in the background report on page 7 (Attachment 1-Schedule C). The principles are as follows:

- Guiding Legislation
- Certainty
- Policy Alignment
- Financial Sustainability
- Benefit Allocation
- Fairness and Equity
- Clarity and Transparency
- Accountability
- Collaboration
- Efficiency
- Competitiveness

The map below (Figure 1) shows where the proposed levies and charges would apply. The map is divided into the Established Area and six Greenfield Areas defined by watersheds.

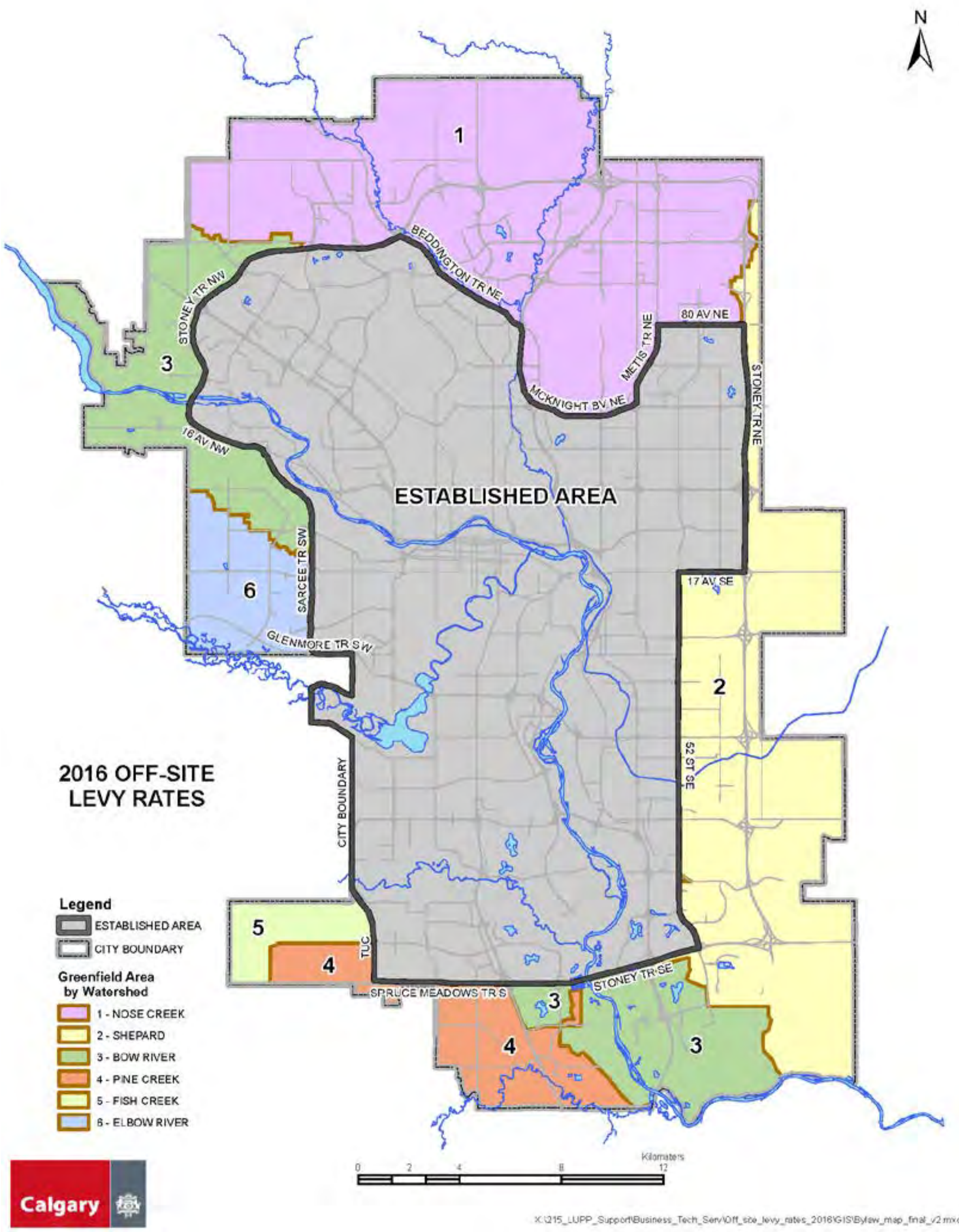


Figure 1 2016 Proposed Off-site Levy Bylaw Map

Calculation Overview

The following highlights the key points of the calculation methodology for the proposed levies.

Generally, levies are calculated as follows:

1. Determine the projected population growth for a specific timeframe and the land area that will be absorbed by the population growth in that same timeframe.
2. Determine the infrastructure required to service that land area and estimate the infrastructure costs.
3. Determine the benefit allocation for each project attributable to the projected new population, the existing population and the regional population.
4. Determine the levy rate by dividing the estimated infrastructure costs attributable to the future growth by the total hectares required to serve the projected population.

The population forecasts were obtained from Corporate Economics and the distribution of this projected population was determined by the Geodemographics group. From these projections, each department reviewed their long range planning documents and determined what infrastructure would be needed to service this growth.

Project lists and costs estimates were then developed. These were thoroughly vetted with the working groups and a number of changes were made during the iterative review process. The type of infrastructure included in the levies is as follows:

a) Water Resources:
    - Water and wastewater treatment plants and upgrades
    - Water and wastewater linear infrastructure
    - Drainage (storm) infrastructure

b) Transportation:
    - Major roads
    - intersections
    - traffic signals
    - bridges

c) Community Services:
    - Emergency Response Stations
    - Recreations Facilities
    - Libraries
    - Transit buses
    - Police stations

The levy rates were calculated once the infrastructure requirements were finalized. Details of the calculations are shown in the background report (Attachment 1-Schedule C) including the methodology, population projections, and infrastructure lists.

Off-site Levy Rates

The resulting levy rates for water and wastewater treatment will be charged in all areas of the city (both Greenfield and Established). In addition to treatment, the Greenfield Area rates include components for water distribution, wastewater collection, drainage, transportation and community services charges components.

Treatment plants provide service to the entire city rather than to a specific area, therefore, growth occurring anywhere in the city impacts treatment facilities.

In order to fairly allocate treatment costs to all areas and types of growth, a different methodology was used to calculate the levy for water and wastewater treatment plants. Essentially, the cost to provide additional capacity for each additional person and job was determined. The rate for treatment will be applied on a per hectare basis in the Greenfield Areas to be consistent with all other Greenfield Levies, where the development is typically in the form of multi-lot subdivisions. For the Established Areas, where development is generally brought on in the form of individual development permits, the levy will be applied on an incremental per unit basis for residential development and on a gross floor area basis for non-residential development.

Established Area Rates

In the Established Areas, if a new development replaces development which existed on the site within the last 10 years, the levy will only be charged for the net impact of the new development.

According to the MGA, off-site levies can only be charged once for the same type of infrastructure on the same parcel of land. Levies were not paid by any development prior to 1963 since the legislation was not in place at that time. Detailed analysis shows that the majority of parcels of land currently undergoing redevelopment have not previously been charged the water and wastewater off-site levies, and would therefore be eligible for payment of these new charges.

From 2000 to 2010 Development Agreements did not include charges for water and wastewater. During this period, Council decided that funds typically collected for the water and wastewater components would be allocated to Transportation, and that utility rates would be used to fund the costs of water/wastewater infrastructure. Lands subject to agreements during this timeframe will not be subject to the new off-site levy charges.

The Established Areas rates for residential development are based on $2,161 per equivalent population (EP), and on the expected occupancy of each residential unit type. For commercial and institutional development in the Established Areas, the rate is based on the expected jobs per square meter of development which results in a rate of $36.62 per square meter of commercial floor area and $17.52 per square meter of industrial floor area.

OFF-SITE LEVY BYLAW

Table 1 Off-site Levy Rates - Established Area

Levy Component	Residential ($/Unit)					Non-Residential ($/m² gross floor area)	
	Single	Semi /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedrooms or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)	Commercial Buildings	Industrial Buildings
Water Treatment	$1,137	$1,019	$706	$588	$470	**$36.62**	**$17.58**
Wastewater Treatment	$5,130	$4,599	$3,184	$2,654	$2,123		
Total	**$6,267**	**$5,619**	**$3,890**	**$3,242**	**$2,593**		

This new charge in Established Areas will not resolve concerns raised by inner city developers regarding the need for understanding what local infrastructure upgrades and/or expansions are needed to provide more certainty to redevelopment proposals. These local infrastructure needs are sometimes unknown in the early stages of planning, and can be cost prohibitive. Administration has been consulting with Established Area developers during this process to better understand these concerns, and will be undertaking a redevelopment strategy in 2016 as part of the work plan (Attachment 3) to explore solutions for addressing these and other concerns.

Concerns were also raised during the process by the inner city developers that imposing off-site levies in Established Areas for the treatment portion of the off-site levy was a new cost and could be a disincentive to high density redevelopment which would be counter to the policies in the MDP. Intensification in existing communities through redevelopment maximizes the use of existing infrastructure while often generating significant uplifts in the tax base. Some redevelopment projects have increased revenues by as much as 10 to 15 times the property taxes collected from the previous uses of the land.

In response to these concerns, a density incentive program was created to offset the cost of these new charges. Proposed developments that are at a density above 285 equivalent people per hectare will pay a maximum rate of 285 equivalent people per hectare. This is less than would be paid should the rate be calculated on the total number of development units or square metres for these high density developments. The cost of the impact on water and wastewater treatment beyond this density rate will be covered by property taxes in recognition of the uplift realized from this type of development. An Established Areas Redevelopment Incentive Budget (EARIB) is proposed to cover the costs of the Density Incentive Program. Funding for this budget will be provided by the property tax uplift arising from intensification in Established Areas. A number of meetings were held specifically with developers who specialise in redevelopment, including residential, mixed-use, commercial and industrial segments (details in Attachment 3 – Schedule C). This solution was based on the input from these developers.

Administration will monitor the trends as these new levy rates are applied, to track any changes to redevelopment patterns, and to identify how many parcels were ineligible to be charged this levy.

Greenfield Rates

The Greenfield Areas will be charged a levy rate for the components eligible in the MGA and also a community services charge.

The proposed rates in the Greenfield Areas range from $422,073 to $464,777 with an average of $443,425. The range is due to the cost of the infrastructure in the various watersheds. These new rates reflect an increase over 2015 rates of between $122,269 and $135,381 per hectare. Details, that include the current 2015 and proposed 2016 rates, are shown in Table 2.

Table 2 Off-site Levy Rates and Community Services Charge – Greenfield Areas

Off-site Levy Greenfield Rates			2015 Rate ($/ha)			2016 Rate ($/ha)
Transportation Total			**$130,289**			**$136,789**
Water Resources Total	**$75,315**	**to**	**$131,131**	**$206,434**	**to**	**$249,138**
Water and Wastewater Linear			$38,006			$76,774
Water and Wastewater Treatment			$36,967			$129,660
Drainage by Watershed						
1 Nose Creek Watershed			$10,315			$11,325
2 Shepard Watershed			$56,158			$42,704
3 Bow River Watershed			$3,980			$6,983
4 Pine Creek Watershed			$3,939			$16,812
5 Fish Creek Watershed			$634			$0
6 Elbow River Watershed			$342			$0
Off-site Levy Total Rate	**$205,604**	**to**	**$261,420**	**$343,223**	**to**	**$385,927**
Community Services Charge			**2015 Charge**			**2016 Charge**
Emergency Reponses Facilities			$22,275			$19,545
Calgary Public Library (Libraries)			$6,389			$5,971
Calgary Police Service (District Stations)			$8,633			$7,648
Recreation Facilities			$37,985			$41,679
Calgary Transit (Buses)			$5,806			$4,007
Community Services Total Charge			**$81,088**			**$78,850**
Total Off-site Levy Greenfield Rate and Community Service Charge	**$286,692**	**to**	**$342,508**	**$422,073**	**to**	**$464,777**

The Greenfield Areas are shown on Figure 1, where they are defined by watersheds, the city boundary and the Established Area. These areas were determined as part of the calculation methodology and the boundaries were further refined for the bylaw map.

Implementation Plan

The new rates are proposed to take effect on 2016 February 01.

The off-site levy rate components in the Established Area will only apply to new development permit applications received on or after 2016 February 01, provided levies have not previously been paid. The rate will be phased in over two years (2016 to 2018). Development permit applications received in 2016 and approved prior to 2017 January 01 will be required to pay a levy amount that is 33% of the total. Application approvals in 2017 will be charged a levy rate of 66% of the total. In 2018, the full amount (100%) of the levy rate will be applied to development permit approvals.

These phased in amounts will be applied after the credit for previous development has been accounted for and the density incentive adjustments have been made. The amount of the levies owing will be set at the time of development permit approval and will be paid at the time of Development Completion Permit (DCP). This implementation plan will allow for developers to take into consideration these new charges in development decisions and will also allow for market land values to adjust to this change affecting the cost of development.

For the Greenfield Areas, the off-site levy rates and community service charges will come into effect on 2016 February 01. Subdivision applications that are approved prior to this date, and have an executed Interim Indemnity Agreement by 2016 February 15, will be subject to the 2015 rate.

To offset the impacts resulting from the increase in the Greenfield levy rates, the timing of payment will be changed to allow for a longer period of time over which to pay the levies. The levy rate is set at the time of subdivision approval. Currently the levies are paid as building permits are issued and must be paid in full by the end of the following year. On average, developers currently have about 18 months to pay the levies in full. A new payment schedule will be implemented with four specific payment dates that will extend the timing of full payment to three years. The payment plan will begin with 0% owing when the Interim Indemnity Agreement is signed, and then 30%, 30%, and 40% in the following years, on the anniversary date of the signing of the agreement.

Concerns were raised that increases in the new rates could impact house prices since these costs can be passed on to homebuyers, potentially affecting affordability. Housing affordability is influenced by many factors such as supply and demand, construction and land prices, economic conditions, and interest rates. The increase in the rates equates to about 1% of the cost of a new home. As of October 2015, according to CMHC, the median price of a new single detached home in Calgary is $660,000.

The timing of payment schedule proposed reduces the impact of the rate increase by reducing developer carrying costs and tying the payment of levies closer to the time of home occupancy.

This new approach to the payment schedule also achieves an internal process improvement since the levies will no longer be collected on individual building permits but rather according to a pre-determined payment schedule.

Changes Resulting from the Alternatives Analysis

Administration conducted extensive research on best practices in other municipalities which contributed ideas to the alternatives analysis. Various alternatives were explored resulting in new and innovative approaches to the calculations. Industry stakeholders were consulted on all options and their input was used to help determine the recommendations.

Catchments

Throughout this process, moving to a catchment based system (area specific charges) was considered. A significant amount of time was spent analyzing what infrastructure is suitable for catchment based calculations. Catchments are generally used when one type of infrastructure can clearly be defined as serving only one area, and when the costs of that type of infrastructure vary greatly from one community to another, due to factors such as differing topography. Currently drainage infrastructure levies are calculated on a catchment basis since it meets these criteria. No additional types of infrastructure are being recommended to move to catchments since they did not meet the criteria. Both industry and City representatives agreed with this approach, although agree that further study is needed.

Transportation

The changes made to the transportation component of the levy include determining what infrastructure should be included and the benefit allocation. Based on the work with industry, non-residential traffic signals were added to the levy rates. Specific projects were identified for pedestrian bridges and bus rapid transit. These two changes provide more certainty to developers. Also, during the methodology review it was determined that trips originating from the surrounding municipalities should not be included in the levy calculations since these trips are considered a regional benefit. These revisions more accurately represent the benefit allocation of growth infrastructure costs. Without these revisions, the rates would have increased by approximately 20%, however, with these revisions the rate is increasing by 5%.

Community Services

The revisions to the Community Services components resulted in an overall reduction in the charges from 2011. This is due to the projection and costing improvements on how the charges were calculated, what is included and how the funds will be spent. The methodology was refined to use projected population and then the cost of the infrastructure was determined based on where the population is projected to locate in the next 30-years in the Greenfield Areas. From this clearly defined method, the infrastructure costs were allocated to the Greenfield Area. The cost estimates were compared to actual project costs and were reviewed by Administration and the industry and refined as necessary. The result was improved accuracy on the cost of the infrastructure to support Greenfield growth, which resulted in a slight reduction from the current rate.

Water Resources
Two significant changes to the calculation of off-site levies for treatment plants were made through this process. Changes to the calculation methodology and amortization term both result in improved allocation of the benefit to new growth. The new calculation methodology is based on a cost per person. This approach ensures that the levy will be applied on an equitable basis related to the degree of benefit to both the Greenfield and Established Areas, even though they develop differently. The amortization period for new treatment plant infrastructure was changed from twenty-five years to ten years, to better allocate costs to the benefiting growth areas that will use the infrastructure capacity. By using the shorter amortization period it resulted in a lower levy rate than if the longer timeframe had been used in the calculations.

The changes made to the Water Resources methodology are significant. These changes will contribute to the ability of the Water Resources business unit to decrease debt and continue to achieve financial targets by 2018. The increase in forecasted revenue from off-site levies in 2019 to 2022 could have an offsetting effect on utility rates in the 2019-2022 budget cycle.

If the proposed rates are approved, the Greenfield Area water and wastewater levy charges will increase by roughly 2.75 times compared to the 2015 rate. This increase is because the infrastructure allocated to growth within the ten year Water Infrastructure Investment Plan (WIIP) increased from $650 million to $1.5 billion, an increase of 2.3 times. Treatment plant upgrades are the primary driver of the increases to this investment plan, because higher growth rates accelerated major investments in treatment plant capacity. Additionally, the proposed rates reflect the proportionate share of growth related costs whereas in 2011, Council approved a 50% reduction in the off-site levy component for water and wastewater infrastructure to lower the overall levy rate.

Timeframe of the New Off-site Levy Rates and Community Services Charges

Amendments to the off-site levy bylaw and community service charges may be required from time to time to keep the calculations current. For example, adjusting the numbers may be necessary to account for the receipt of unanticipated specific grants, or to support changes required to facilitate developer funding arrangements, or to correct errors that may be identified. The overall methodology will not be reviewed for five years to provide certainty to the industry. Required amendments will be brought forward to Council for consideration following a public hearing at an appropriate time.

Process Transparency
Early in the process, transparency was identified as being the most important principle to meet, which was reinforced at the stakeholder workshops. Transparency was achieved by soliciting meaningful and informed input from industry members, interested stakeholders and members of the public. Three workshops were held, a public hearing was arranged (2016 January 11), and a number of members of the industry participated on the working committees. All information, calculations and methodologies were openly shared and discussed, and were developed in consultation with the working committees. The information was provided to the industry representatives, to distribute to their broader memberships. The presentations and summary of input from the stakeholder workshops was made available on Calgary.ca. A number of changes

were made as a result of the valuable input. The background report was prepared to improve transparency by providing details on the calculation methodology.

Transparency has also been improved over the past year through the preparation of the 2011 to 2013 Off-site Levy Report, provided to industry in 2015 May. The 2014 report has been completed and is ready for circulation. These reports outline the levies collected during that time period and how they were used. Administration is committed to annual reporting to industry on the collection of levies and how they have been spent. One of the results of preparing these reports has been an increased internal understanding of the importance of this required accountability, resulting in the identification of levy tracking improvements that are being implemented. Should any discrepancies arise that indicate the allocation of unspent monies from previous years was not appropriately accounted for in the new calculations, Administration will prepare a proposed bylaw amendment for Council, to ensure the change is reflected.

To ensure the opportunity for broad consultation, a new step in this process was also to hold a non-statutory public hearing to provide an additional opportunity for the public and industry to be involved in order to ensure opportunity for broad consultation. Holding a public hearing on the off-site levy bylaw also aligns engagement efforts with the spirit and intent of the legislation.

Related Issues

Throughout the off-site levy bylaw process, a number of issues that are not part of off-site levy calculations, but are related to certainty and the cost of growth, were discussed with industry stakeholders. They expressed their interest in continuing to work collaboratively with Administration to explore the best solutions to these issues.

In response to these discussions, a work plan for 2016 was created with input from industry. Senior Administration has made a commitment to this plan (Attachment 3).

These initiatives would include but are not limited to:

1. Establish an Industry/City Collaboration Committee
2. Phasing Growth/Land Supply Strategy
3. Established Area Strategy (redevelopment)
4. Funding Growth Strategy
5. Process Improvements
6. Industrial/Commercial Strategy

Conclusions

In conclusion, the proposed off-site levy rates and community services charges are based on a sound and transparent methodology that was subject to rigorous review and scrutiny by industry members. The calculations included a thorough investigation of growth projections, infrastructure projects and cost estimates, and using new methodologies identified through best practices research. The process included broad stakeholder engagement and a number of changes were made as a result of the input received. Internal administrative process improvements related to the collection of and reporting on off-site levies, were identified and will be implemented.

The new rates will result in capturing 100% or the proportionate share of costs attributable to growth in the Greenfield Areas. If this share is not captured through off-site levies an alternative funding source such as utility rates or property taxes would need to be used. Charging off-site levies (for the treatment component) will be implemented in Established Areas. The industry is continuing to support the community services charges.

The collaborative approach with industry throughout this process increased trust and set the stage for ongoing work that will continue to provide additional certainty and cost effectiveness in regards to growth related issues for both the industry and The City.

These new levy rates and community services charges will contribute to achieving complete communities and financial sustainability.

Stakeholder Engagement, Research and Communication

To ensure that broad stakeholder engagement was achieved and met the goal of Build Calgary to "work with partners to create a transparent approach," a comprehensive communication and engagement strategy was developed. The plan included an engagement process, a committee structure and outlined specific tactics for each audience to help meet the communications goals.

There were five committees that met at various times throughout the year. Each committee had a specific role and membership that included both internal and external stakeholders:

- Internal Working Group: **32 meetings** since January 29
- External Advisory Group: **12 meetings** since March 11
- Sub-committee Group: **20 meetings** since May 5
- Established Area Group: **12 meetings** since June 11

To reach the broader community, the engagement process included three workshops held on April 30, June 24 and October 15. There were a number of attendees at each of these workshops including representatives from:

- Administration (subject matter experts)
- The Engage! business unit
- Development and construction industry (residential and industrial/commercial)
- Homebuilders
- Financial institutions
- Community associations
- Affordable housing groups
- Real estate organizations

Each of the workshops included round table discussions to ensure the process was open and transparent. Attendees had the opportunity to ask questions, provide input into the process and to be kept up to date on timelines. Surveys were circulated at the conclusion of each workshop and The City of Calgary received very positive reviews on the workshops; over 88% of respondents provided positive feedback. The information collected at the three workshops (which is outlined in the "What We Heard Report") was used to inform the final off-site levy bylaw and community services charges. These summaries, and the presentations from the workshops, are posted on Calgary.ca at this link http://www.calgary.ca/CS/build-calgary/Pages/Build-Calgary---Updates.aspx.

To ensure Council, industry and the general public were informed, updates were presented at Council Strategic Sessions that occurred on January 16, April 6, May 4, June 22 and September 21. These provided Council with an opportunity to be updated on progress and to provide input. There were also numerous meetings with Members of Council, to answer questions and provide further information as required.

Further details on the process, engagement and community strategy are detailed in the background report (Attachment 1-Schedule C).

Strategic Alignment

The recommendations will contribute to the strategic alignment of the Build Calgary's corporate goals and The City's long-term vision through the imagineCALGARY plan. The project and resulting recommendations were influenced by information on key trends and emerging issues anticipated in the Action Plan 2015 - 2018 budget and in the Council approved departmental long-term plans, specifically the MDP and the CTP. The City's financial projections and funding opportunities and constraints were also taken into account including:

- Incorporating longer-term financial focus through multi-year business plans and budgets, and understanding long-term revenues and costs.
- Strategically managing debt and reserves to support municipal growth and infrastructure requirements.
- Diversifying funding sources for greater municipal control and flexibility to address growing needs.

Social, Environmental, Economic (External)

The off-site levy rates and community services charge will help facilitate investment in the community by contributing to the cost of infrastructure that supports physical and social wellbeing, safety and personal development. The off-site levies will also help to support the economy through the investment in transportation and utilities required to serve the industrial, commercial and institutional sectors.

Financial Capacity

Current and Future Operating Budget:

Off-site levies may only be used to fund capital expenditures; therefore there will be no impact on the property tax rate or operating budget.

Current and Future Capital Budget:

If the proposed new off-site levies and community services charges are implemented, approximately $50 million in additional revenue could be generated annually from Greenfield Areas development. The actual amount will depend on growth trends.

Imposing the water and wastewater treatment levy in Established Areas is anticipated to generate approximately $5 million to $8 million annually after netting out the density incentive program. The Established Areas Redevelopment Incentive Budget (EARIB) will fund approximately $3 million to $4 million annually to offset the revenue shortfall arsing from the density incentive program. Since the Established Area charge is new, it is somewhat challenging to accurately forecast the revenue from this new aspect of the levy regime until it has been in place for a few years to track the trends.

The increase in forecasted revenue from off-site levies in 2019 to 2022 could have an offsetting effect on utility rates in the 2019-2022 budget cycle.

The proposed changes will increase funding support for infrastructure that is necessary to service growth. It also ensures that new development will contribute its proportionate cost share of the infrastructure on which levies are imposed. The higher levy rate will increase capital funding over the long-term, which will provide capital dollars for additional projects and help close the infrastructure funding gap. This will contribute to achieving the goal of financial sustainability.

Adjustments will be made to allocate the increased off-site levy funding to capital projects as part of the 2016 budget adjustment process.

Risk Assessment
There are a number of risks if the proposed levy rates and community services charges are not approved. The industry would not be funding their proportionate share of infrastructure costs attributable to growth. This would result in increasing utility rates or property taxes, or utilizing other sources of revenue to fund the gap resulting in delay or deferral of other municipal priorities.

The Community Services charges are not enabled through legislation and are therefore adopted by Council Resolution and are voluntary in nature. If developers chose not to pay, there is a risk that sufficient funding will not be available to provide community infrastructure needed to service growth. Administration will continue to seek changes to the Municipal Government Act and creation of a Charter for The City of Calgary to enable broader authority for municipalities to create and impose off-site levies to contribute to the funding of infrastructure necessary for the construction of complete communities.

There is potential financial risk if growth patterns and/or costs change significantly and the methodology for calculations is not revisited for five years. This risk will be mitigated by monitoring changing trends. To manage potential shortfalls resulting from changing growth patterns, Water Resources will use internal borrowing from The Corporation rather than relying on utility rate revenue to pay for growth related debt servicing.

REASON(S) FOR RECOMMENDATION(S):
To seek approval of the proposed off-site levy bylaw, and the resolution supporting the community services charges that will be paid through the development or subdivision process.

To establish new off-site levy rates that will contribute to the long term financial sustainability of The City that capture the proportionate share of the capital cost of infrastructure attributable to new growth.

To establish an Established Area Redevelopment Incentive Budget (EARIB) to offset reduced revenues from the density incentive program.

ATTACHMENT(S)

1. Off-site Levy Bylaw 2M2016 (includes Background Report – Schedule C)
2. Community Services Charges
3. 2016 Work Plan
4. Letters Received

BYLAW NUMBER 2M2016

BEING A BYLAW OF THE CITY OF CALGARY TO ESTABLISH OFF-SITE LEVIES PURSUANT TO SECTION 648 OF THE MUNICIPAL GOVERNMENT ACT

* *

WHEREAS pursuant to s.648 of the *Municipal Government Act*, R.S.A. 2000, c.M-26, as amended, Council may provide for the imposition and payment of an off-site levy in respect of land that is to be developed or subdivided and to authorize agreements to be entered into in respect of the payment of the levy;

AND WHEREAS pursuant to s.648 of the *Municipal Government Act* an off-site levy may be used to pay for all or part of the capital cost of new or expanded facilities or land required for or in connection with any new or expanded facilities for:

(a) the storage, transmission, treatment or supplying of water;

(b) the treatment, movement or disposal of sanitary sewage;

(c) storm sewer drainage; or

(d) roads required for or impacted by a subdivision or development;

AND WHEREAS The City of Calgary requires developers to contribute to the funding of the above-noted infrastructure;

AND WHEREAS following an extensive engagement and consultation process, The City of Calgary has calculated levies that are based on the application of the principles and criteria set out in the *Principles and Criteria for Off-site Levies Regulation*, AR 48/2004, , as outlined in The City of Calgary Off-site Levy & Community Services Charges Background Report, contained as Schedule “C” of this bylaw;

AND WHEREAS notice of this Bylaw has been provided pursuant to the provisions of section 606 and 648 of the *Municipal Government Act*;

NOW, THEREFORE, THE COUNCIL OF THE CITY OF CALGARY ENACTS AS FOLLOWS:

1. This bylaw may be cited as the “Calgary Off-site Levies Bylaw”.

OBJECT OF THE LEVY

2. This bylaw creates off-site levies to pay for all or part of the capital cost of new or expanded facilities or land required for or in connection with any new or expanded facilities for:

    (a) the storage, transmission, treatment or supplying of water;

    (b) the treatment, movement or disposal of sanitary sewage;

    (c) storm sewer drainage; or

    (d) roads required for or impacted by a subdivision or development.

DEFINITIONS AND INTERPRETATION

3. (1) In this bylaw, the following definitions apply:

"*approving authority*" means a person or body appointed as a development authority or subdivision authority in accordance with the *Municipal Government Act,* and does not include an appeal board;

"*commercial development*" means the uses described in Table 3 of Schedule "B";

"*Established Area*" means the area identified as "Established Area" on the map in Schedule "A";

"Greenfield Area" means collectively the areas identified as "Greenfield Area by Watershed" on the map in Schedule "A";

"*industrial development*" means the uses described in Table 3 of Schedule "B";

"*Interim Indemnity Agreement*" means the standard City of Calgary Interim Indemnity Agreement;

"*levy*" or "*levies*" means either individually or collectively the *sanitary sewer levy*, *storm sewer levy*, *transportation levy*, *treatment plant levy*, or *water levy* imposed pursuant to this bylaw;

"Manager, Growth Management" means *The City* employee appointed to the position of Manager, Growth Management, or the individual authorized to act in that person's place;

"*residential development*" means the uses described in Table 3 of Schedule "B";

"*sanitary sewer levy*" means an off-site levy created and imposed under this bylaw to pay for all or part of the capital costs of new or expanded facilities required for the movement or disposal of sanitary sewage;

"site development area" means any portion of land that is the subject of a subdivision or development permit application, and may be portions of, or all of, one or more areas of land described in a certificate of title or described in a certificate of title by reference to a plan filed or registered in a land titles office;

"*storm sewer levy*" means an off-site levy created and imposed under this bylaw to pay for all or part of the capital costs of the construction of new or expanded storm sewer drainage facilities;

"*The City*" means the municipal corporation of The City of Calgary;

"*transportation levy*" means an off-site levy created and imposed under this bylaw to pay for all or part of the capital costs of the construction of new or expanded roads required for or impacted by a subdivision or development;

"*treatment plant levy*" means an off-site levy created and imposed under this bylaw to pay for all or part of the capital costs of the construction of water and sanitary sewage treatment facilities;

"*unit*" means a Dwelling Unit or a Live Work Unit, but does not include a Secondary Suite or Backyard Suite, as those terms are defined in The City of Calgary Land Use Bylaw, 1P2007;

"*water levy*" means an off-site levy created and imposed under this bylaw to pay for all or part of the capital costs of new or expanded facilities required for the storage, transmission, or supply of water.

(2) Headings or sub-headings are inserted for ease of reference and guidance purposes only and do not form part of this bylaw.

(3) Each provision of this bylaw is independent of all other provisions and if any provision is declared invalid for any reason by a Court of competent jurisdiction, all other provisions of this bylaw remain valid and enforceable.

(4) Where this bylaw cites or refers to any other Act, bylaw, regulation, agreement or publication, the citation or reference is to the Act, bylaw, regulation, agreement or publication as amended, whether amended before or after the commencement of this bylaw, and includes reference to any Act, bylaw, regulation, agreement or publication that may be substituted in its place.

(5) All schedules attached to this bylaw form a part of this bylaw.

CALCULATION

4. (1) The city is divided into geographical areas as shown in Schedule 'A' for the purpose of calculating the *levies* to be imposed.

(2) The *levies* were determined according to the calculations set out in The City of Calgary Off-site Levy & Community Services Charges Background Report, attached to this bylaw as Schedule "C".

LEVIES

5. (1) Subject to subsections (4), (5) and (6), the following *levies* shall be imposed on all land within the *Greenfield Area* that is to be subdivided or developed for which such a *levy* has not previously been paid:

(a) *sanitary sewer levy,*
(b) storm sewer levy,
(c) transportation levy,
(d) *water levy*, and
(e) *treatment plant levy.*

(2) Subject to subsections (4), (5) and (6), the *treatment plant levy* shall be imposed on all land within the *Established Area* that is to be subdivided or developed for which a *levy* for water or sanitary sewers has not previously been paid.

(3) For the purpose of this bylaw only, despite subsection (2), the *treatment plant levy* must not be imposed on land that:

(a) was the subject of a City of Calgary Master Development Agreement executed between January 1, 2000 and December 31, 2010,

(b) was the subject of a City of Calgary Master Development Agreement executed between January 1, 2011 and December 31, 2011 and paid a 2010 levy rate, or

(c) is the subject of a development permit for the addition of floor area for *commercial* or *industrial development* and the gross floor area is less than 150 square metres.

(4) Despite subsections (1) and (2), a *levy* must not be imposed on land that is designated as environmental reserve or that is a skeletal road.

(5) Despite subsections (1) and (2), where only portions of a parcel are subject to a subdivision or development permit approval, nothing shall prevent the imposition of a *levy* on the remaining land, or portions thereof, on subsequent subdivision or development.

(6) Despite subsections (1) and (2), the *Manager, Growth Management* may defer the imposition of a *levy* on all or part of a parcel where, in his or her sole discretion, there will be opportunity to collect the *levy* on future subdivision or development.

AMOUNT OF LEVIES

6. (1) Subject to the following subsections and section 9, the rates and amounts of the *levies* to be imposed pursuant to this bylaw are the rates and amounts indicated in Schedule “B”.

(2) Subject to subsection 5(4), in the *Greenfield Area,* the *levies* to be imposed pursuant to this bylaw are calculated at the rates per hectare, based on the watershed in which the lands are located as shown in Schedule “A” if applicable, multiplied by the number of hectares in the *site development area.*

(3) Subject to subsection 5(4), in the *Established Area*, for *industrial developments,* or a combination of *industrial* and *commercial developments* on a development permit application, the *levy* to be imposed pursuant to this bylaw is the total gross floor area of *industrial* and *commercial development* approved in the development permit, multiplied by the rate for *industrial* and *commercial development*.

(4) Subject to subsection 5(4), in the *Established Area*, for *residential*, *commercial,* or a combination of *residential* and *commercial development* on a development

permit application, the amount of the *levy* to be imposed pursuant to this bylaw is:

(a) the total number of *units* and the total gross floor area of *commercial development* approved in the development permit, multiplied by the rates for each type of *unit* and the rate for *commercial development*; or

(b) where the combined equivalent population per hectare for *residential* and *commercial development* proposed in the development permit is greater than or equal to 285 equivalent population per hectare, the lesser of:

i. the calculation as set out in subsection (4)(a), or

ii. $615,885.00 multiplied by the number of hectares in the *site development area*.

(5) For the purpose of subsection (4), the equivalent population per hectare for *residential* and *commercial development* is calculated using the equivalent population formula indicated in Table 2 of Schedule "B" per type of development for the total number of *units* and the total gross floor area of *commercial development* on the *site development area*, divided by the *site development area.*

(6) For the purpose of subsections (3) and (4), the number of *units* or gross floor area used to calculate the *levy* must exclude any *units* or gross floor area of *commercial* or *industrial development* that:

(a) are demolished or will be demolished, provided the development existed within ten years prior to the development permit application and was connected to both the water and sanitary sewer systems, or

(b) will be retained on site.

(7) The amounts of the *levies* indicated in Schedule "B" will be automatically adjusted every year on January 1 by *The City* without amendment to this bylaw:

(a) for the *sanitary sewer levy, storm sewer levy, water levy,* and *treatment plant levy* by 3.3 per cent; and

(b) for the *transportation levy*, by the percentage equal to the average Statistics Canada's non-residential construction price index for Calgary for the previous 4 published quarters.

(8) Subject to section 5(6), the amounts of the *levies* to be imposed pursuant to this bylaw are determined:

(a) in the case of a development permit, on the date of the *approving authority's* decision on a development permit, and

(b) in the case of a subdivision, on the date of execution of an *Interim Indemnity Agreement*.

PAYMENT OF LEVIES

7. (1) A *levy* that has been imposed on a subdivision pursuant to this bylaw must be paid as follows:

(a) 30 (thirty) per cent within one year of the date of execution of an *Interim Indemnity Agreement*,

(b) 30 (thirty) per cent within two years of the date of execution of an *Interim Indemnity Agreement*, and

(c) the remaining 40 (forty) per cent within three years of the date of execution of an *Interim Indemnity Agreement*.

(2) A *levy* that has been imposed on a development pursuant to this bylaw must be paid on or before the release of the development completion permit.

(3) Despite section 6 and subject to section 9, the amount of a *treatment plant levy* that has been imposed on land in the *Established Area* must only be paid as follows:

(a) 1/3 of the amount calculated pursuant to this bylaw, where the *approving authority*'s decision on the development permit was made between February 1, 2016 and December 31, 2016,

(b) 2/3 of the amount calculated pursuant to this bylaw, where the *approving authority*'s decision on the development permit was made between January 1, 2017 and December 31, 2017, and

(c) the full amount calculated pursuant to this bylaw, where the *approving authority*'s decision on the development permit was made on or after January 1, 2018.

(4) Interest on any outstanding *levy* or portion of a *levy* will be calculated from the time of the payment at the rate of one and one half per cent (1.5%) per month (18% per annum) or as otherwise provided by Bylaw 104/75.

AGREEMENTS

8. *The City* may enter into agreements with respect to the payment of *levies.*

TRANSITION

9.

(1) This bylaw applies to all subdivision or development approvals made on or after February 1, 2016.

(2) Despite subsection (1), a *treatment plant levy* must not be imposed on land in the *Established Area* on a development permit application which was received on or before January 31, 2016 and approved on or before January 31, 2018.

(3) Despite subsection (1), the provisions of previous bylaws imposing off-site levies continue to apply to all subdivision and development where:

(a) in the case of a development permit, the date of the *approving authority's* decision occurs on or before January 31, 2016, or

(b) in the case of a subdivision, the date of the *approving authority's* decision occurs on or before January 31, 2016 and the date of execution of a *Interim Indemnity Agreement* for that approval occurs on or before February 15, 2016.

(4) Except as provided for in subsection (3), Bylaw 34M2011 is hereby repealed.

(5) Bylaw 41M2010 is hereby repealed.

OTHER LEVIES AND CHARGES

10. (1) In addition to the *levies* pursuant to this bylaw, the Centre City Levy Bylaw, Bylaw 38M2009, shall continue to apply.

(2) Nothing in this bylaw prevents *The City* from imposing or collecting further or different levies or charges on any land subject to this bylaw.

ENACTMENT

11. This bylaw comes into force on February 1, 2016.

READ A FIRST TIME THIS ___ DAY OF __________________, 2016.

READ A SECOND TIME THIS ___ DAY OF __________________, 2016.

READ A THIRD TIME THIS ___ DAY OF ___________________, 2016.

____

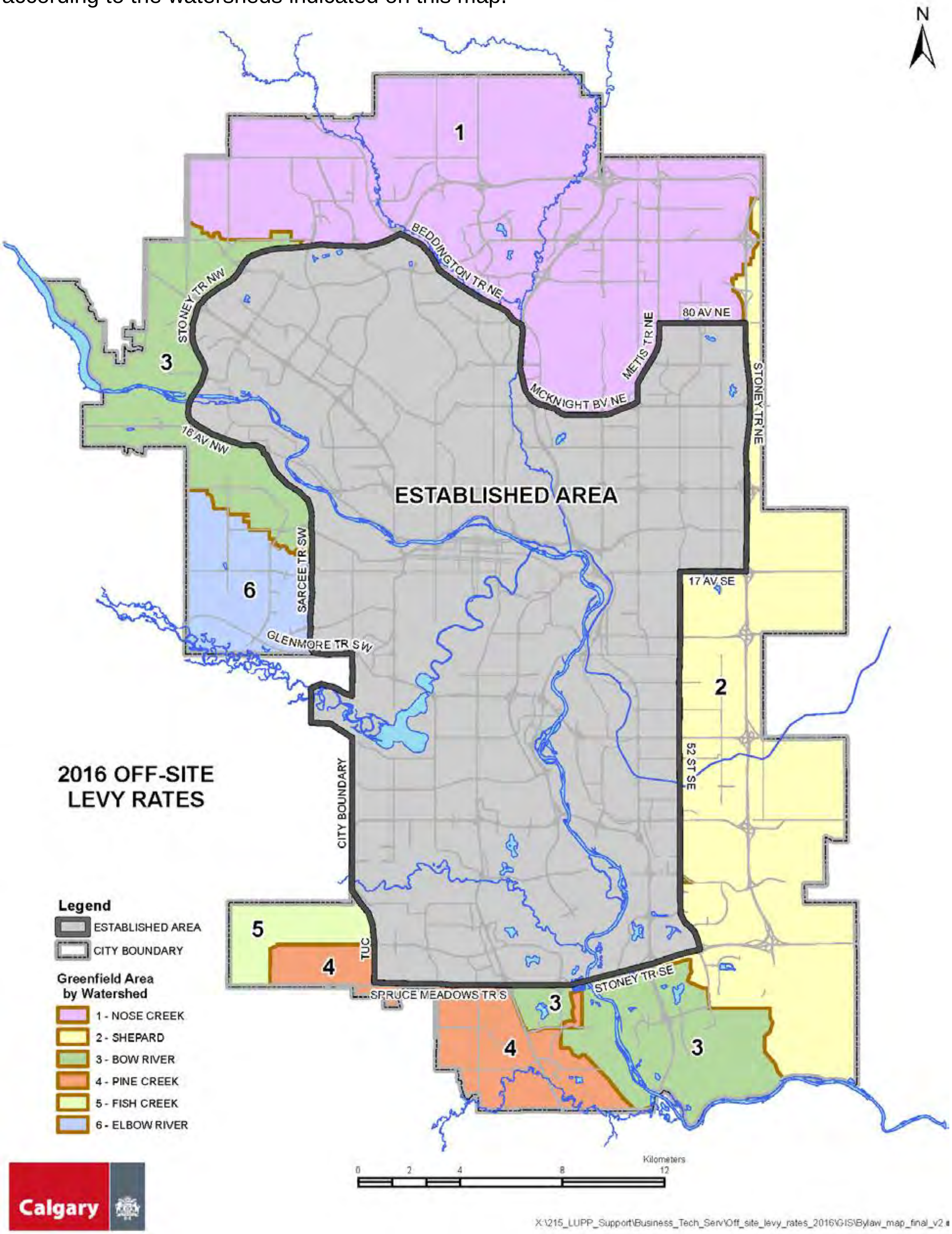
MAYOR
SIGNED THIS ___ DAY OF ___________, 2016.

____

CITY CLERK
SIGNED THIS ___ DAY OF ___________, 2016.

SCHEDULE "A"

The following map illustrates the geographic areas and watersheds. Despite any changes made to grades or changes to natural drainage courses that might occur, the *levies* will be imposed according to the watersheds indicated on this map.



SCHEDULE "B"

TABLE 1 - Levy Rates in the Greenfield Area

LEVY		**Rate($/ha)**
Transportation levy		$136,789.00
storm sewer levy (by watershed)	Bow River	$6,983.00
	Elbow River	$0
	Fish Creek	$0
	Nose Creek	$11,325.00
	Pine Creek	$16,812.00
	Shepard	$42,704.00
sanitary sewer levy		$44,449.00
water levy		$32,325.00
treatment plant levy		$129,660.00

TABLE 2 - Levy rates for *treatment plant levy* in the *Established Area*

TYPE		LEVY RATE	Equivalent Population (EP)
Residential development	**Single Detached** development with only one *unit*	\$6,267.00 per *unit*	*units* × 2.9 EP/*unit*
	Semi-detached/Duplex development with only two *units*	\$5,619.00 per *unit*	*units* × 2.6 EP/*unit*
	Multi-Residential Grade-Oriented development with three or four *units*, regardless of the form, or five or more *units*, where the *units* are provided in a Cottage Housing Cluster*, Townhouse* or Rowhouse Building*	\$3,890.00 per *unit*	*units* × 1.8 EP/*unit*
	Multi-Residential Non Grade-Oriented development with five or more *units*, where the *units* are provided in a Multi-residential Development* but are not provided in a Cottage Housing Cluster*, Townhouse* or Rowhouse Building*	\$3,242.00 per *unit* if a *unit* contains 2 or more bedrooms	*units* × 1.5 EP/*unit*
		\$2,593.00 per *unit* if a *unit* contains less than 2 bedrooms	*units* × 1.2 EP/*unit*
Commercial development		\$36.62/m^2 of gross floor area	gross floor area × 0.017 EP/m^2
Industrial development		\$17.58/m^2 of gross floor area	gross floor area × 0.008 EP/m^2

* The terms “Cottage Housing Cluster”, “Townhouse”, “Rowhouse Building”, and “Multi-Residential Development” have the same meanings as provided for in the City of Calgary Land Use Bylaw, 1P2007 and include any similar uses defined in a Direct Control District.

TABLE 3 – Residential, Commercial and Industrial Development

1. *Residential development* means a use identified on a development permit, and any use that is ancillary to the principal use listed on a development permit, listed in the following City of Calgary Land Use Bylaw 1P2007 Schedule A Group of Uses, in place on the date of passage of this bylaw:
    a. Residential Group, with the exception of Hotel.

2. *Industrial development* means a use identified on a development permit, and any use that is ancillary to the principal use listed on a development permit, that is one of the following:
    a. a use listed in the following City of Calgary Land Use Bylaw 1P2007 Schedule A Group of Uses, in place on the date of passage of this bylaw:
        i. Direct Control Uses, with the exception of the following:
            1. Adult Mini-theatre,
            2. Emergency Shelter,
            3. Gaming Establishment – Casino,
            4. Jail;
        ii. General Industrial Group,
        iii. Industrial Support Group, with the exception of the following:
            1. Artist's Studio,
            2. Health Services Laboratory – Without Clients,
        iv. Storage Group; or
    b. one of the following specific uses:
        i. Auction Market – Other Goods,
        ii. Auction Market – Vehicles and Equipment,
        iii. Bulk Fuel Sales Depot,
        iv. Fleet Service,
        v. Large Vehicle Service,
        vi. Large Vehicle and Equipment Sales,
        vii. Large Vehicle Wash,
        viii. Recreational Vehicle Sales,
        ix. Recreational Vehicle Service, or
        x. Restored Building Products Sales Yard.

3. *Commercial development* means a use identified on a development permit, and any use that is ancillary to the principal use listed on a development permit, that is neither *residential development* nor *industrial development*.

SCHEDULE "C"

The City of Calgary Off-site Levy & Community Services Charges Background Report, December 2015 (82 pages)

TAB A-2

C2016-0023
ATTACHMENT 1

Calgary

The City of Calgary

Off-Site Levy & Community Services Charges Background Report

December 2015

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EXECUTIVE SUMMARY

This Background Report forms part of the Off-Site Levy Bylaw. In addition to outlining the infrastructure included in the Bylaw, the Background Report describes how the review was undertaken and details the growth assumptions, infrastructure projects and cost estimates underpinning the levies. It offers transparency on how the levies were calculated and outlines how the levies will be used in the future.

The review of the Off-Site Levy Bylaw has been a transparent and collaborative effort between The City and Industry from the outset. This approach is consistent with the Principles and Criteria for Off-Site Levies Regulation within the *Municipal Government Act* (MGA), which requires that "calculation of the levy is to be determined in consultation with affected landowners and developers" (Alberta Regulation 48/2004).

The proposed Off-Site Levy Bylaw itemizes the new or expanded off-site infrastructure that is necessary to serve growth in the city. The following types of infrastructure are included in the Off-Site Levy Bylaw:

- Water and wastewater treatment facilities
- Water distribution and wastewater collection infrastructure
- Drainage infrastructure
- Transportation Infrastructure

The following types of infrastructure are included in the Community Services Charges resolution:

- Emergency response stations;
- Recreations centres;
- Public libraries;
- Transit buses; and
- Police district stations.

For all infrastructure projects included in the levies, analysis of benefit is determined and ensures that costs included in the levies and charges are based on the benefit allocated to growth in the development areas of the city.

Table 1 provides the proposed off-site levy rates and community services charges for growth in The City's Greenfield Area.

Table 1 - Proposed Off-Site Levy Rate for Greenfield Area

Infrastructure	2016 Proposed Rate ($/Ha)
Transportation	$136,789
Water Resources - Water and Wastewater	$206,434
Water Resources - Drainage by Catchment	
Nose Creek	$11,325
Bow River	$6,983
Pine Creek	$16,812
Shepard	$42,704
Fish Creek	-
Elbow River	-
Community Services	$78,850
Total	**$422,073 to $464,777**

Table 2 summarizes the proposed off-site levy rates for growth in The City's Established Area.

Table 2 - Off-Site Treatment Plant Levy Rate for Proposed Established Area Developments

	Residential $/Unit				
	Single Detached	Semi-Detached /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)
Total Treatment Off-site Levy per Unit Type	**$6,267**	**$5,619**	**$3,890**	**$3,242**	**$2,593**
Commercial Development Levy Rate: $36.62/ m² of Gross Floor Area					
Industrial Development Levy Rate $17.58/ m² of Gross Floor Area					
Maximum Rate for Density ≥ 285 Equivalent Population/Hectare: $615,885/Ha.					

For the Established Area levy, credits at the above rates will be applied for existing or recent developments on the proposed development site that have been or will be demolished.

Contents

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CHAPTER 1 – INTRODUCTION

1.1 Background

Calgary is one of the fastest growing municipalities in North America – increasing by 100,000 people in the last three years. To meet the ever-changing demands driven by growth, The City of Calgary established a collaborative cross-corporate team called *Build Calgary* in 2014. The Build Calgary team was tasked with the following two goals:

1) Implement a funding approach that provides the necessary infrastructure to accommodate projected growth; and

2) Work with partners to create a transparent approach to sustainable infrastructure funding for the orderly, economic and beneficial development of land.

The Off-Site Levy Bylaw project is one of the key initiatives of Build Calgary. In 2011, The City of Calgary approved an Off-Site Levy Bylaw and resolution to establish charges for off-site infrastructure impacts related to growth. In 2015, The City of Calgary initiated a review and major update of its transportation, water resources and community services charges for development. The need for a significant update to the Off-Site Levy Bylaw and community services charges was triggered by a number of factors, including:

- The amount of new greenfield development being driven by strong population growth;
- Demand for new infrastructure driven by anticipated growth in established areas;
- The need for a best practice approach to fund future infrastructure that balances financial impact on capital budgets, Calgary's competitive advantage, fairness to taxpayers and utility customers and impacts on affordability; and
- The levies be kept current with infrastructure needs and costs.

The proposed Off-Site Levy Bylaw itemizes the new or expanded off-site infrastructure that is necessary to serve growth in the city. The following types of infrastructure are included in the Off-Site Levy Bylaw:

- Water and wastewater treatment facilities
- Water distribution and wastewater collection infrastructure
- Drainage infrastructure
- Transportation Infrastructure

The following types of infrastructure are included in the Community Services Charges resolution:

- Emergency response stations
- Recreations centres
- Public libraries
- Transit buses
- Police district stations

The proposed off-site levy and community services charges ensure that those who will use and benefit from the infrastructure pay their share of the costs in a fair and equitable manner. The proposed off-site levy and community services charges create certainty by providing stable charges to the development industry and by allowing the orderly and timely construction of infrastructure as determined by The City.

1.2 Purpose of the Background Report

This Background Report forms part of the Off-Site Levy Bylaw (the Bylaw). In addition to outlining the infrastructure included in the Bylaw, this report provides the background to determine growth driven costs related to other community infrastructure not included in the Bylaw. These other community services needs are brought to Council in the form of a council resolution and are not included in the Bylaw.

The Background Report describes how the review was undertaken and details the growth assumptions, infrastructure projects and cost estimates underpinning the levies. It offers transparency on how the levies were calculated and outlines how the levies will be used in the future.

The Background Report includes the following elements:

- **Chapter 1** provides the need and purpose of the off-site levy review as well as the key guiding principles and legislative context guiding its preparation.
- **Chapter 2** describes the stakeholder engagement process adopted for the review.
- **Chapter 3** outlines the relationship of the Off-Site Levy Bylaw to other municipal documents, timeframe for the off-site levy programs, allocation of costs between existing and new development, application of the levies in different areas of the city, and the unit of charge.
- **Chapter 4** presents the growth projections and land absorption assumptions used in calculating the off-site levy.
- **Chapters 5, 6 and 7** summarize the costs of each off-site levy programs (i.e. transportation, water resources and community services) and shows how the levy rates are calculated.
- **Chapter 8** includes a summary of how and when the levies will be collected, exemptions to the off-site levy, grace periods and how the levies will be monitored and reviewed.

1.3 Legislative and Regulatory Background

This section outlines the legislative and regulatory framework underpinning The City of Calgary's Off-Site Levy Bylaw and Background Report. Section 648 of the *Municipal Government Act* (MGA) allows municipalities to impose a levy to help pay for the capital costs for new or improved infrastructure identified in Section 648 of the MGA that is required to service growth. When establishing an off-site levy, The City must comply with the MGA and Principles and Criteria for Off-Site Levies Regulation, (Alberta Regulation 48/2004) which provides in part:

3(1) In determining the levy costs, the municipality is to retain the flexibility to negotiate the levy in good faith and in a manner that recognizes the unique or special circumstances of the municipality.

3(2) There is to be full and open disclosure of all levy costs and payments.

3(3) There is a shared responsibility between the municipality and developers for addressing and defining existing and future infrastructure requirements and all beneficiaries of development are to be given the opportunity to participate in the cost of providing and installing infrastructure in the municipality on an equitable basis related to the degree of benefit.

3(4) Where necessary and practicable, the municipality is to coordinate infrastructure provisions and services with neighbouring municipalities.

3(5) There is to be a correlation between the levy and the impacts of new development.

3(6) The methodology for determining the levy is to be consistent across the municipality, while recognizing variations among infrastructure types.

3(7) The method of calculation for the levy is to be clear.

3(8) The information used to calculate the levy is to be kept current.

3(9) The calculation of the levy is to include, but is not limited to:

- description of the specific infrastructure facilities,
- description of the benefiting areas,
- supporting technical data and analysis, and
- estimated costs and mechanisms to address cost increases over time.

3(10) Calculation of the levy is to be determined in consultation with affected landowners and developers.

3(11) The levy is subject to annual reporting requirements.

Although the MGA is currently under review by the Province of Alberta, the Bylaw has been developed to adhere with current legislation.

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CHAPTER 2 – PROJECT APPROACH AND STAKEHOLDER PARTICIPATION

2.1 Process for Reviewing the Off-Site Levy Bylaw

The approach to reviewing the Off-Site Levy Bylaw follows six phases. Each of the phases is described below and illustrated in Figure 1.

- **Understand/Principles Phase** – The first phase sought to understand the current assumptions around off-site levies, the current process for determining infrastructure needs and the current approach to allocating who builds, funds and finances infrastructure.
- **Options Identification Phase** – The second phase identified options for where and when growth will occur, alternate service levels and timeframes for providing infrastructure and different ways infrastructure might be built, funded and allocated. This phase included the first stakeholder engagement session.
- **Analysis and Assessment Phase** – The third phase required finalizing the growth assumptions, analysing infrastructure needs and assessing the aforementioned options from a financial and legislative perspective. This phase included the second stakeholder engagement session.
- **Calculations Phase** – The fourth phase involved developing the financial model for the new off-site levies. During this process numerous iterations were created and analysed, considering alternate methodologies.
- **Consultation and Council Process** – The fifth phase included the final stakeholder engagement session, preparing the Background Report and presenting the outcomes of the project at a Council Public Hearing.
- **Implementation Phase** – The implementation phase is on-going and ensures the processes are in place to begin charging the new levy rates and charges.

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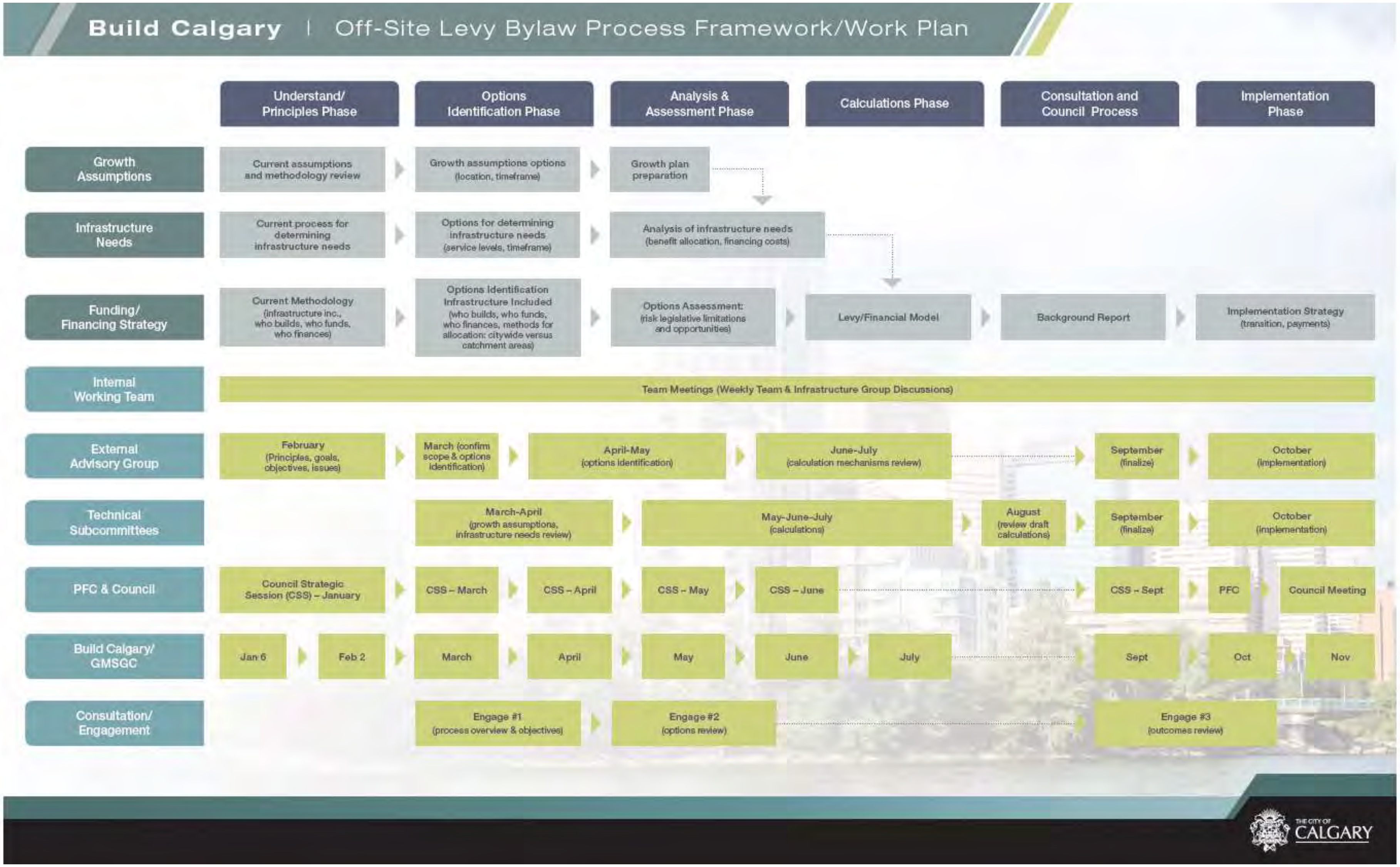
__Figure 1 - Off-Site Levy Bylaw & Community Services Charges Process__



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2.2 Stakeholder Engagement

The review of the Off-Site Levy Bylaw has been a collaborative effort between The City and Industry from the outset. This approach is consistent with the *Principles and Criteria for Off-Site Levies Regulation* within the MGA, which requires that "calculation of the levy is to be determined in consultation with affected landowners and developers" (Alberta Regulation 48/2004).

The extent of stakeholder engagement during the Off-Site Levy Bylaw process is illustrated in Table 3. The following table provides a summary of the engagement process with further detail provided in Appendix A.

Table 3 - Stakeholder Engagement Summary

Engagement Group	Members	Purpose	Frequency of Meetings
Internal Working Team	Predominantly city staff from various departments	• Developed guiding principles and framework of the work plan • Defined infrastructure projects, timing, cost estimates and options for funding	• Weekly • 32 meetings since Jan 29
External Advisory Group	City staff and external representatives from various sectors of the development industry including greenfield, inner-city and industrial	• Acted as Industry sounding board • Developed guiding principles for the project • Finalized the scope of the project • Reviewed options related to methodology, calculation of levy, funding	• Every 3 weeks • 14 meetings since Mar 11
Technical Subcommittee	City staff, external industry representatives and technical consultants	• Undertook technical analysis • Finalized the methodology and calculations	• Weekly • 20 meetings since May 5
Council	City staff and Council	• Updated on progress of project • Receive feedback	• Bi-monthly
Build Calgary /GMSGC/ALT	Build Calgary, General Managers Strategic Growth Committee (GMSGC) and Administrative Leadership Team (ALT)	• Weekly meetings with Build Calgary and monthly updates with GMSGC/ALT	• Monthly
Stakeholder Information Sessions	Developers (Greenfield and Established Area), community leaders, consultants, various committees and interest groups	• First session - overview of the Off-Site Levy Bylaw project and its objectives. • Second session -review of options • Third session - review project outcomes.	• Quarterly • Sessions in Apr, Jun & Oct

Established Area – Initial Group	City staff, large and small infill developers and interest groups that are related to Established Area of the city.	• Provided status of the work plan and receive relevant feedback • Acted as an Industry sounding board • Reviewed options related to the methodology and calculation of levy unique to the established areas of the city.	• 4 meetings since June 11
Established Area – Stakeholder Group	Established Area developers, consultants, and industry representatives	• Sessions were held in November and December with attendance of 40 to 55 industry representatives	• 2 meetings since November
Established Area – Working Group	Established Area developers, consultants, and industry representatives	• Ad hoc committee of representatives of Established Area group to develop strategy for Established Area levies	• 5 meetings since November
One on Ones	City staff and developers	• City staff met with members of the development industry at various occasions to discuss the Off-Site Levy Bylaw and the process.	• At least 21 meetings since January

2.3 Guiding Principles

An important early output from the stakeholder engagement process was a set of eleven principles to guide the preparation of the new Off-Site Levy Bylaw. The principles were jointly created by Industry and City staff to ensure the interests of stakeholders were considered throughout the project.

- **Guiding Legislation** – Understand the current legislation and risks associated with off-site levies and charges. Seek opportunities to manage or mitigate the risks and to identify opportunities for agreed upon legislative changes, whether by City Charter or amendments to the MGA, or both.
- **Certainty** – The Off-Site Levy Bylaw should contribute to overall growth management and infrastructure processes that provide cash flow, cost and infrastructure certainty. The funds collected should be used as intended.
- **Policy Alignment** – Promote achievement of goals within the Municipal Development Plan, Calgary Transportation Plan and The City of Calgary planning and financial policies.
- **Financial Sustainability** – Create an off-site levy bylaw that contributes to a sustainable financial framework for growth-related infrastructure that is in the best interest of current and future citizens of Calgary.

- **Benefit Allocation** – Costs of off-site infrastructure should be borne by those who benefit. The benefit allocation should be determined using a defined methodology that appropriately allocates infrastructure costs to growth, existing residents and/or regional customers.
- **Fairness and Equity** – Fairness and equity will be a primary consideration when determining benefit allocation, and costs, which should be distributed equitably including considerations for existing and future development.
- **Clarity and Transparency** – Methodologies and calculations used to determine the amount of the off-site levy will be clear and transparent.
- **Accountability** – Information supporting the off-site levies will be disclosed, including annual reporting on the collection and allocation of levies.
- **Collaboration** – Opportunities for collaboration with a diverse set of stakeholders will be provided during this process and in the future.
- **Efficiency** – Strive to create an off-site levy bylaw that can be easily administered.
- **Competitiveness** – Ensure that economic competitiveness for The City of Calgary is of primary consideration, especially as it relates to competition within the Calgary region and for each type of residential, commercial and industrial development.

CHAPTER 3 – DEVELOPING THE OFF-SITE LEVY PROGRAM

3.1 Relationship to Legislation and Municipal Documents

Several sources have been consulted in order to develop this off-site levy program, including the following:

- *Municipal Government Act* (MGA)
- Principles and Criteria for Off-Site Levies Regulation, (Alberta Regulation 48/2004)
- Calgary Municipal Development Plan (MDP)
- Calgary Transportation Plan (CTP)
- Route Ahead: A Strategic Plan for Transit in Calgary (Transit's 30 year Strategic Plan)
- Investing in Mobility: 10 year Transportation Infrastructure Investment Plan
- Investing in Communities: 10 year Community Services & Protective Services Infrastructure Investment Plan
- Water Infrastructure Investment Plan: 10 Year Water Resources Capital Plan
- Calgary Recreation Master Plan 2010 - 2020
- Team Spirit: Advancing Amateur Sport for All Calgarians, A 10 year Strategic Plan for Sport Facility Development and Enhancement
- Calgary Fire Department 30 Year Infrastructure Master Plan
- Calgary Fire Department Infrastructure Requirement: Proposed Plan for Growth Related Stations
- Employment Areas Growth and Change
- Calgary Public Library 2010 Library Master Facility Plan

3.2 Timeframe for Off-Site Levies

The timeframe or cost recovery window used for calculating the off-site levies for transportation, water resources and community services programs varies by infrastructure categories considering long-term capital planning and financing horizons for the various infrastructure types.

The timeframe for the transportation program is 60 years, while the water resources program is 10 years for all water resources infrastructure except treatment facilities. Treatment facilities levies are not tied to a fixed program timeframe, but use a cost of capacity model to allocate costs. This model considers recently constructed projects with available capacity for growth along with projects planned in the next 10 years. The community services programs are based on the average cost of facilities needed to serve development with an estimate of costs provided for 30 years. Further information on population and growth projections is provided in Chapter 4.

3.3 City-wide versus Area-Specific Off-Site Levies

In a city-wide off-site levy, the same levy rate is applied regardless of the location of the development. An area-specific off-site levy typically divides the community into different areas according to geographic areas or other distinctive characteristics based on technical reasons.

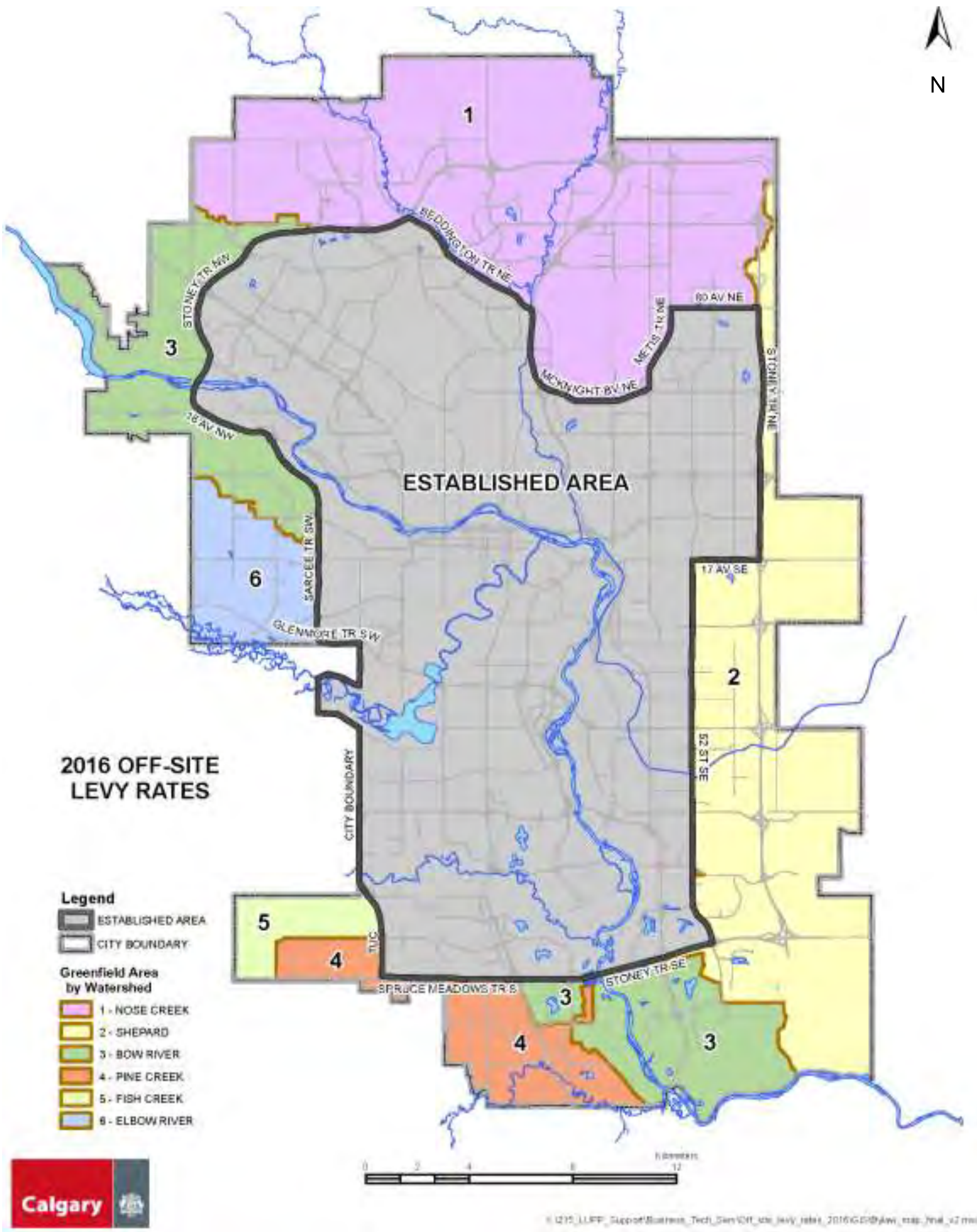
As part of the off-site levy review the impact of projected growth on infrastructure was reviewed to determine if the charges should be levied on a city-wide or area-specific basis. The following table summarizes the outcome of the review and where the levies are applied.

Table 4 - City-wide versus Area-Specific Off-Site Levies and Community Services Charges

Area	Infrastructure Type	City-wide or Area-Specific
Greenfield Area	• Water Resources – Water Distribution & Wastewater Collection • Transportation • Community Services	***City-Wide (Greenfield Only)*** The same rate is levied across the Greenfield Area as infrastructure benefits and impacts are evenly distributed.
	• Water Resources - Drainage	***Area-Specific (Greenfield Only)*** The levy for drainage is applied to specific greenfield catchments as benefits and impacts are attributed to specific catchments of the Greenfield Area.
Established Area & Greenfield Area	• Water Resources - Water Treatment and Wastewater Treatment	***City-Wide (Established & Greenfield)*** The levy rates differ by development type based on development impact. Levy is applied to all areas based on equivalent population.

Figure 2 illustrates The City's Established Area and the six catchments within the Greenfield Area. Those Greenfield catchments are: Bow River, Elbow River, Fish Creek, Nose Creek, Pine Creek and Shepard.

Figure 2 - Off-Site Levy Bylaw Areas



3.4 Units of Charge

Off-site levy rates in The City's Greenfield Area is levied per hectare for all development types and for all infrastructure types.

In the Established Area, the off-site levy rate applied is only for water and wastewater treatment infrastructure. In order to apply the levy on a consistent basis for both Greenfield Area development and Established Area development, impact on treatment infrastructure capacity is determined based on equivalent population added for each type of development. For the Greenfield Area, the average equivalent population per hectare of development is determined and the corresponding levy per hectare calculated. For the Established Area, the equivalent population impact is determined based on the type of development proposed. For residential development in the Established Area, off-site levy rates are calculated based on equivalent population added by a single detached, semi-detached/duplex, and multi-residential units based on the incremental number of units added. For non-residential development in the Established Area, a rate is determined based on the average equivalent population (employees) added per square metre of gross floor area for non-residential development based on the amount of floor space added. For the Established Area, a credit will be applied based on the existing development that existed on the redevelopment of the site prior to the current proposed development. Details of the determination of the credit is included in Section 6.4.

3.5 Allocation of Benefit

For each proposed infrastructure project, costs are allocated between existing development, new growth and regional benefit. The methods to allocate the benefit of projects vary by infrastructure type and specific details are provided in the specific infrastructure sections. Considerations in determining allocation of benefit include:

- Improvement above current level of service to which all benefit
- Resolution of existing deficiencies
- Regional benefit provided
- Renewal or replacement of existing infrastructure which benefits existing users
- Capacity provided
- Projects that are required solely to accommodate new growth

The method used to determine greenfield needs for community services infrastructure is based solely on greenfield demand for libraries, fire halls, recreation centres, police district stations and transit buses. Therefore, the facilities and infrastructure costs determined through this method are 100% allocated to greenfield.

3.6 Determination of Carry-Forward Levy Fund Balances

When off-site levies and community services charges are updated, current account balances for the various levy funds should reflect whether expenditures, in the previous collection window, have exceeded or lagged amounts collected. If expenditures exceed collections, then the fund will have a surplus balance and if expenditures lag collections then the fund will have a deficit balance. To determine appropriate fund balances, expenditures should be based on the levy project actual costs and the percentage of those costs to be covered by levy funds as determined by the previous levy calculations. Often, municipalities will use other funds available to advance the levy portion of projects until sufficient levy funds are collected. As a result, the actual expenditures of levy funds may not always reflect the theoretical allocation of costs to be covered by levies.

The requirement to carry-forward surplus and deficit balances into the new levy or charge calculations depends on the model used to calculate the levies or charges. For off-site levies and charges that are calculated based on the cost of capacity or cost of facilities required to serve incremental development or population, carry-forward fund balances from previous levy programs are not credited toward the calculation. This cost of capacity method, in principle, determines the appropriate amount to charge new development for additional capacity. Any previous funds collected were collected to provide capacity for previous development or growth. For the current levy and charges calculations in this report, the cost of capacity model applies to all the community service charges and the water and wastewater treatment levies.

For all other infrastructure categories included in this report (transportation and non-treatment related water resources), calculations are timeframe based cost recovery models. These models are based on recovering identified projects costs over a defined development area determined by the timeframe for recovery. As the development timeframe advances, projects are built and levies are collected, however, these amounts are never exactly the same. Therefore, when levies are recalculated based on a new development window, the levy fund will either have a deficit or a surplus balance. Carry forward of deficit fund balances into the new levy calculation ensures that the municipality receives the total amount of projects allocated to be recovered through off-site levies. Carry forward of surplus funds ensures that development receives the benefit of amounts pre-collected for projects that remain on the project list and that surplus amount is credited toward the new levy calculation.

CHAPTER 4 – GROWTH PROJECTIONS

This chapter provides an overview of growth projections that support the Bylaw. Growth projections are important to the process as they provide the information needed to determine the infrastructure required to support identified development windows. The growth projections also identify the benefitting population and area over which infrastructure costs are allocated. Dividing the growth infrastructure costs by the growth projection areas or the growth population equivalents produces the levy per hectare or unit amounts referenced in the Bylaw.

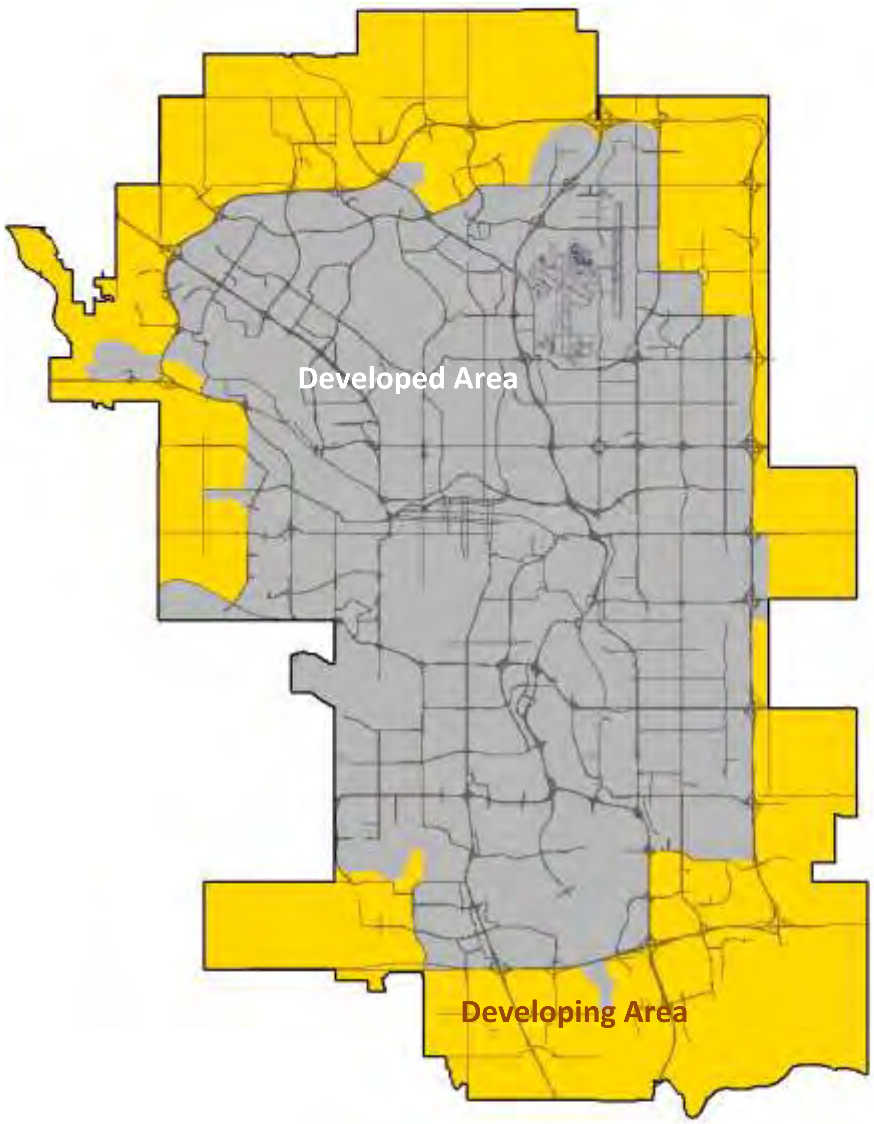
4.1 Projected Population Growth – Amount and Distribution

Projecting Based on Policy and Trend

The population growth projections used for the levies and charges are based on Calgary's MDP. Approved by City Council in 2009, this plan sets the vision for growth in the city over the next 60 years including both the amount and the location of growth. The MDP projects that Calgary's population will grow by 1.2 million people between 2006 and 2076, increasing from 1.0 million to 2.2 million. As this projection was prepared in 2009, the projection has been adjusted to meet actual socio-economic circumstances that have affected actual growth rates since 2009. The current 60 year forecast for the off-site levy calculations has been revised up by an additional 342,000 people to reflect the higher growth trend in recent years.

The MDP contains a range of policies intended to achieve the vision for the pattern of Calgary's growth over time. In particular, the MDP provides a vision for the estimated growth in the city to occur in The City's Established and Greenfield Areas at the time the MDP was prepared. The MDP refers to the Established and Greenfield areas as the Developed Area and Developing Area respectively. The Developed Area is considered to be all communities that were completely constructed prior to the approval of the MDP in 2009 and as shown in Figure 3. The Developing Area is considered to be all communities that had no or only partial urban development prior to approval of the MDP. The MDP vision includes an increasing share of growth in the Developed Area, specifically 33 percent of growth by 2039 and 50 percent of growth over the next 60 to 70 years.

Figure 3 – The City of Calgary MDP - Developed and Developing Areas



In addition to the MDP's vision for the split of growth between Developed and Developing Areas, projecting the location of future growth also takes into consideration The City's corporate forecast for population growth and development data such as the suburban lot inventory, subdivision plans and permitting activity that reflect market conditions.

In establishing a population for 2076, population growth and distribution have been projected for five year windows out to 2043. The result is a comprehensive, high resolution forecast that incorporates present day growth patterns, near term development intentions, emerging demographic trends, and the vision of the MDP. Table 5 provides the population projections for the development windows.

Table 5 - Population Projections

Areas (as defined in the MDP)	Total Population				
	2006 (actual census pop.)	2014 (actual census pop.)	2024	2039	2076
Developed Area	849,967	882,241	949,691	1,179,480	1,589,520
Developing Area	141,792	312,953	523,896	730,332	920,064
City Total	991,759	1,195,194	1,473,586	1,909,812	2,509,584

Table 5 demonstrates how the overall projection assumes that the share of growth in Developed Areas increases through the time period. Recent census data shows that the share in Developed Area growth is shifting towards this projection with 16% of population growth experienced since 2006 occurring in the Developed Areas.

4.2 Greenfield Growth Area Projections

Land area is the basis for allocating growth infrastructure costs for greenfield development. To determine levies and charges for greenfield development starting in 2016, the developable Greenfield Area is determined for each levy program timeframe. The developable Greenfield Area does not include areas with development agreements in place as the levies and charges have already been determined and fixed for those areas. Furthermore environmental reserve and skeletal roads are excluded from the determination of the developable Greenfield Area.

To determine the Greenfield Area, growth is categorized as follows: residential growth, non-residential growth supporting residential development and industrial growth.

Projections for Residential Greenfield Growth

The amount and location of future growth in greenfield areas is guided by land-use patterns and intensity standards (people and jobs per hectare) in the MDP and are further refined through Area Structure Plans (ASPs) and planning applications. Greenfield development is tracked through The City's Suburban Residential Growth report which provides information on achieved densities and corresponding people and jobs per hectare.

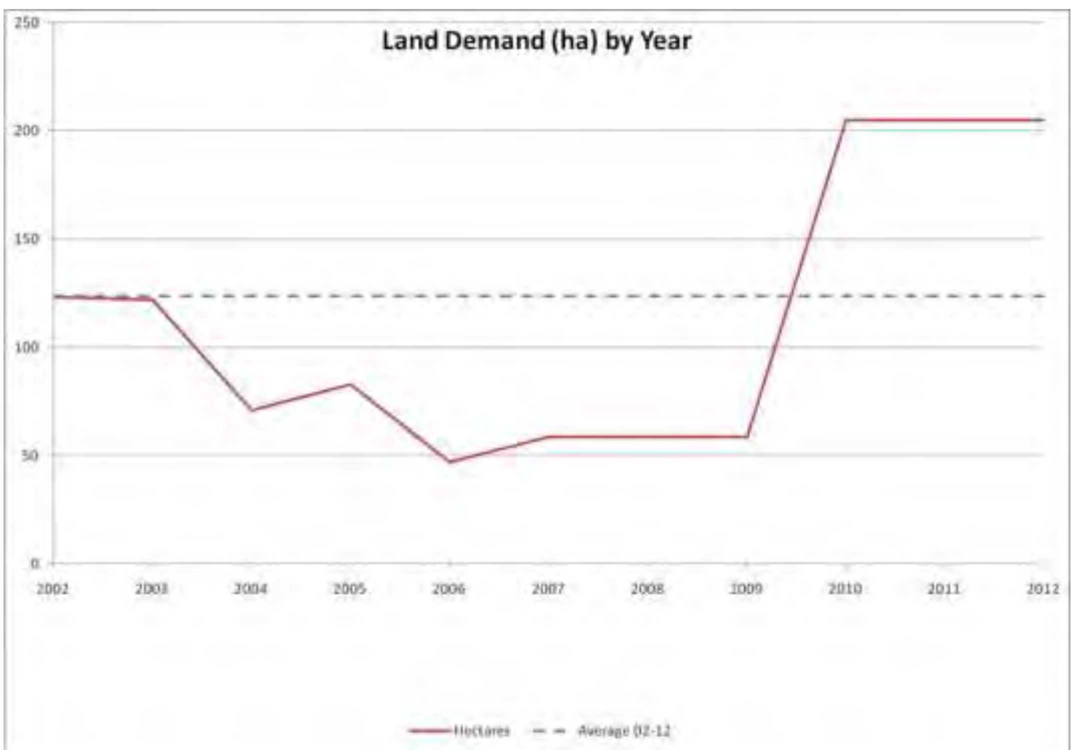
Projections for Non-Residential Greenfield Growth Supporting Residential Growth

Supporting non-residential uses include: retail centres, institutional uses, high schools, public lakes/water bodies and regional open spaces. The amount of this type of development area is estimated at 15% to the residential greenfield growth area projection. If ASPs are available, supporting non-residential area estimates provided in the ASP are used in place of the 15% estimate.

Projections for Greenfield Industrial Growth

Industrial greenfield development includes new development built under an industrial use in one of the city's industrial areas. The projection for industrial lands is based on the actual industrial land development experienced between 2002 and 2012. However, industrial land development is variable over time as illustrated in Table 6. The annual development of industrial land varied from a low of 50 hectares to a high of over 200 hectares per year.

Table 6 - Historic Industrial Land Demand in Calgary by Year



The City uses the average industrial land development over this time period of 125 hectares per year for projecting the demand for industrial land over the development window forecasts. This is a reasonable approximation over an extended timeframe of city growth.

Table 7 provides a summary of Greenfield Area projections for residential, supporting non-residential and industrial development, for the development windows used to determine the levies and charges. The numbers reflect developable land, which is total land less environmental reserve and skeletal roads.

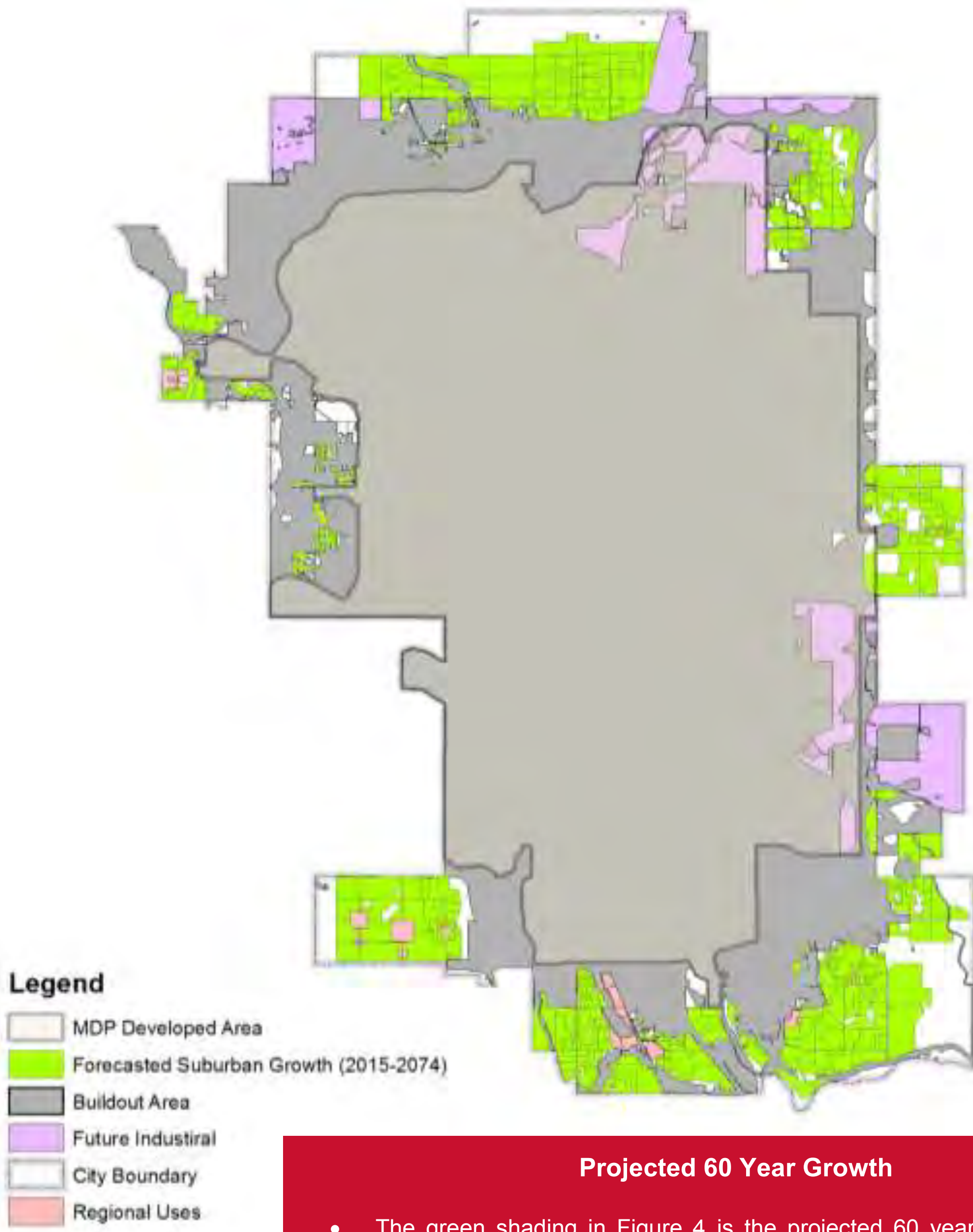
Table 7 - Estimated Greenfield Land Development Projections

Year	Residential (ha)	Non-Residential (ha)	Industrial (ha)	Total Greenfield Area for Levies and Charges
2016-2024 (9 years)[1]	2,418	70	1,125	3,613
2015-2024 (10 years)	2,687	78	1,250	4,015
2015-2044 (30 years)	6,341	371	3,750	10,462
2015-2074 (60 years)	10,307	538	7,500	18,345

1 –9 year horizon is used in some of the utilities calculations, as Water Resources is already one year into their 2015-2024 Water Infrastructure Investment Plan (WIIP)

Figure 4 illustrates where future growth is anticipated to occur within The City's Greenfield Area for the 60 year horizon. The size of the growth areas corresponds to the data provided in Table 7.

Figure 4 - Projected 60 Year Growth in Developing Areas



Projected 60 Year Growth

- The green shading in Figure 4 is the projected 60 year residential growth in The City's Greenfield Area and represents 10,307 ha.
- The purple and pink shading represents a further 8,038 ha of land that is expected to be developed for industrial and supporting non-residential uses during the same period.
- The total levy-eligible land estimated to be absorbed for all uses over the next 60 years is 18,345 ha.

CHAPTER 5 – TRANSPORTATION PROGRAM

5.1 Introduction

The City's MDP and related CTP sets out a clear framework for development over approximately a 60 year timeframe with mobility and development intrinsically linked. The future growth patterns envisioned in the plans create more compact and connected communities through a capital program which supports the increased use of active modes and transit while also maintaining auto mobility into the future. The transportation off-site levy provides a mechanism for greenfield growth to contribute to the increasing cost to provide transportation infrastructure to support the growth of the city.

The basis of the transportation levy is that future transportation infrastructure costs are levied to greenfield development based on the benefit allocated to greenfield development. As such, the benefit that existing development and growth in the Established Area will receive from future transportation infrastructure is not included in the levy.

The costs of the following types of transportation infrastructure are included in the levy

- Interchanges
- Structures over major geographic barriers (rail/creeks/ravines)
- Skeletal Roads (Expressways)
- Transportation Utility (TUC) Road connections
- Pedestrian Overpasses
- All Greenfield Traffic Signals
- Additional lanes and facilities for the purpose of Bus Rapid Transit (BRT)

Costs for operating, lifecycle or maintenance of transportation infrastructure, and roads/transit operations are not included in the levy. No costs associated with Light Rail Transit (LRT) are included in the levy.

The City of Calgary's Municipal Development Plan and Transportation Plan set out a clear framework for development growth over a 60 year timeline with associated transportation infrastructure requirements to build out the plans, as envisioned. As such, the timeframe for examining long term infrastructure needs was chosen to be 60 years.

5.2 Determining Transportation Infrastructure Needs

The City of Calgary's *Regional Transportation Model*, was used to determine the transportation infrastructure required to build out the growth patterns envisioned over 60 years within the CTP. In order to determine benefit to the Greenfield Area, the model was broken down into two areas: Greenfield Area (those areas without development at the time of the analysis) and Established Area (areas that have been predominantly developed already). As the travel patterns and transportation choices differ for the two areas, it is reasonable to determine infrastructure needs and benefit based on the two areas over the chosen timeframe.

The following table provides a summary of infrastructure and costs to support build out of the city over 60 years. A detailed project list and maps showing the location of the projects is included in Appendix B.

Table 8 - Total Transportation Infrastructure Costs

Infrastructure	Total Transportation Infrastructure Costs ($millions)	
	Established Areas Projects	Greenfield Areas Projects
Interchanges	$4,161.7	$1,911.0
Greenfield Traffic Signals	$0	$81.4
Major Structures	$600.0	$263.0
Expressway/Ring Rd Connections	$0	$233.3
Road Widening	$824.0	$0
Pedestrian Overpasses	$84.0	$42.0
Bus Rapid Transit Infrastructure	$392.0	$90.0
Total	**$6,061.7**	**$2,620.6**

These costs include the capital costs of construction of new infrastructure required to support greenfield growth. Estimates are generally based on Class V cost estimates, as per the Corporate Project Management Framework definitions. For near term projects where additional design work has been undertaken and more refined cost estimates are available, these estimates are used in the calculations. Where grants or provincial highway funding are provided from other levels of government for a specific project and obtained only to be applied to that specific project, those amounts are applied to the project costs above. Should project specific funding be received, grant amounts will be taken into consideration for future calculations.

5.3 Allocation of Benefit

The City of Calgary's *Regional Transportation Model* (RTM) was used to determine the allocation of benefit to greenfield growth for both Greenfield and Established Area infrastructure. Within the RTM, Vehicle Kilometres Travelled (VKT) were analyzed as a reflection of use (benefit) of the various pieces of infrastructure and then broken out for traffic generated from greenfield areas and traffic generated from the Established Area on the two categories of infrastructure. Based on the Established Area in the model in 2011, the greenfield benefit of Established Area infrastructure was found to be 17% and for greenfield area infrastructure the benefit to greenfield was 67%. This analysis considers regional traffic and provides an adjustment of benefit for regional traffic.

The final percentage of benefit to greenfield growth is provided in Table 9.

Table 9 - Allocation of Benefit

Transportation Infrastructure Category	% Benefit to Greenfield Development
Greenfield Area Transportation Infrastructure	67%
Established Area Transportation Infrastructure	17%

The following table summarises the allocation of transportation infrastructure costs to greenfield growth.

Table 10 - Allocation of Transportation Infrastructure Costs to Greenfield Growth

Infrastructure	Transportation Infrastructure Costs ($millions) Allocated to Greenfield Growth	
	Established Area Projects	Greenfield Area Projects
Interchanges	$707.5	$1,280.4
Greenfield Traffic Signals	$0	$54.5
Major Structures	$102.0	$176.2
Expressway/Ring Road Connections	$0	$156.3
Road Widening	$140.1	$0
Pedestrian Overpasses	$14.3	$28.1
Bus Rapid Transit Infrastructure	$66.6	$60.3
Total	**$1,030.5**	**$1,755.9**

Through development of greenfield lands since 2011, the Greenfield Area has decreased in size, while the Established Area has increased in size over the same build-out window. The allocation of benefit, therefore, needs to be adjusted to reflect the impact of growth from the smaller Greenfield Area. As of 2015, approximately 10% of the Greenfield Area growth has developed and shifted to the Established or existing development area. As a result, a reduction of 10% benefit is applied to the greenfield levy calculation provided in Section 5.5.

5.4 Levy Calculations

The proposed off-site levy for transportation infrastructure has been calculated according to the principles, assumptions and approach discussed in this Background Report. The basic calculation is shown in the following figure.

Figure 5 - Transportation Off-Site Levy Calculation

$$\text{Levy Rate} = \frac{\text{GF Area Reduction(\%)} \times \left[\left(\text{GF Costs(\$)} \times \text{GF Benefit(\%)}\right) + \left(\text{Established Costs(\$)} \times \text{GF Benefit(\%)}\right) \right]}{\text{60 year GF Developable Area(Ha)}}$$

$$\text{Levy Rate} = \frac{0.9 \times \left[\left(\$2{,}620M \times 67\%\right) + \left(\$6{,}061M \times 17\%\right) \right]}{18{,}345 \text{ Ha}} = \$136{,}789/\text{Ha}$$

5.5 Transportation Levy Summary

Table 11 provides a summary of the transportation levy information provided.

Table 11 - Proposed Transportation Off-Site Levy

Proposed Transportation Off-Site Levy	Totals
Total Growth Infrastructure Cost	$8.68 Billion
Greenfield Area (Ha)	18,345 Ha
Greenfield Levy Allocation of Cost	$2.5 Billion
City Allocation of Cost	$6.18 Billion
Proposed Transportation Levy ($/Ha)	**$136,789**

CHAPTER 6 – WATER RESOURCES PROGRAM

6.1 Introduction

Growth can be challenging for The City to ensure that water, sanitary and storm infrastructure requirements are met with available funding. The City endeavours to maintain service levels while supporting new development infrastructure needs. Growth related infrastructure is required to treat and distribute water to new developments, transport sewage from homes to treatment plants, and to drain storm water from the point of origin to the appropriate release point in one of our rivers in order to pre-treat storm water and prevent flooding.

The Water Resources off-site levy program is divided into the following three components:

- **Water Distribution & Wastewater Collection** – including upgrades and extensions to water distribution infrastructure and wastewater collection infrastructure.
- **Drainage Systems** – including new and upgraded drainage facilities and collection systems
- **Water and Wastewater Treatment** – including new plants, upgrades and capacity for wastewater and water treatment

The City's 10 year capital plan for water resource infrastructure is approximately $350 million per year with half this attributable to growth related infrastructure. Treatment plants account for 60% of the growth related capital budget, with the majority of these costs related to wastewater plant upgrades and expansions. The remaining 40% of the growth related costs are associated with linear networks for infrastructure such as pipe extensions and upgrades.

The water distribution and wastewater collection projects included in the water resource off-site levy program are identified in either the Water Long Range Plan, the Sanitary Long Range Plan, or ASPs for greenfield areas and associated technical studies, such as Master Drainage Plans. Treatment plant upgrades are identified in the Water Treatment Plant Master Plan and Sanitary Long Range Plan. For near term upgrades, conceptual and/or preliminary design studies have been undertaken and are used as a basis for the costs to determine the off-site levies.

In developing the water resources levy program there were four of the Guiding Principles, as described in Section 2.3 above, that were particularly important:

- **Certainty** – A primary objective of the water resources program is to provide revenue assurance to the utilities.
- **Financial Sustainability** – Long term financial sustainability of the utilities is extremely important. There are two parts to this objective. The first is resiliency to ensure that the framework for funding and financing of growth infrastructure is responsive to changing growth levels. The second part is to manage financial risks in the business.
- **Fairness and Equity** – Fairness and equity ensures that those benefiting from the infrastructure are paying for that benefit.
- **Efficiency** – Finally, the water resources program provides an efficient levy process that is simple to administer and understand.

6.2 Water Distribution & Wastewater Collection

Water Distribution & Wastewater Collection Projects & Costs

The water distribution and wastewater collection projects for the levy program are determined for a 10 year timeframe based on The City's 10 year capital planning process. As 2016, is year two of The City's current 10 year capital plan, the levy calculations cover the remaining nine years of that plan.

The water distribution and wastewater collection off-site levy is applied across all greenfield areas and represents trunk main and other capacity improvements required to support development. The following table summarises the new water distribution and wastewater collection projects required to accommodate The City's nine year growth projections. Further details on costs are provided in Appendix C.

Table 12 - Water Distribution & Wastewater Collection Infrastructure Costs

Infrastructure	**Total** Future Water Distribution & Wastewater Collection Infrastructure Costs ($millions)
Water distribution (Upgrades)	$129.6
Water distribution (Extensions)	$136.8
Wastewater collection(Upgrades)	$356.9
Wastewater collection (Extensions)	$140.1
Total	**$763.4**

Cost estimates used in the levy calculation are assumed to be Class V cost estimates, as per the Corporate Project Management Framework definitions. These estimates include engineering, contingency and project administration. The cost estimates for the projects were taken from the Spending Plan, the 2015-2018 Water Infrastructure Investment Plan and the Proposed Water Infrastructure Investment Plan for 2019-2024.

Water Distribution & Wastewater Collection Allocation of Benefit

Water distribution and wastewater collection projects are divided into two categories – upgrades and extensions. All sanitary linear extensions and water linear extensions are the extension of pipes to serve new development areas and are 100% attributable to new growth. Sanitary and water upgrades are located within the Established Area of the city and may provide some benefit to existing development or customers. The costs allocated to growth for upgrades are undertaken on a project by project basis and the detailed allocations can be found in Appendix C. For both upgrades and extensions, the costs determined to benefit growth are further allocated to established, greenfield and regional growth based on the forecasted population and jobs for these areas within the infrastructures overall catchment area. The allocation benefit is based and the Established and Greenfield Areas as of 2015 and the associated allocation of benefit determined accordingly.

Table 13 summarises the allocation of water distribution and wastewater collection infrastructure costs to greenfield growth.

Table 13 - Greenfield Allocation of Water Distribution & Wastewater Collection Infrastructure Costs

Infrastructure	Greenfield Water Distribution & Wastewater Collection Infrastructure Costs ($m)
Water distribution (Upgrades)	$16.8
Water distribution (Extensions)	$76.7
Wastewater collection(Upgrades)	$62.4
Wastewater collection (Extensions)	$140.1
Total	**$296.0**

Water Distribution & Wastewater Collection Levy Calculation

The water distribution and wastewater collection levies include all infrastructure costs allocated to greenfield over the nine year timeframe. As all distribution and collection projects are debt financed, the costs to be recovered from development include all the principal and interest costs within the nine years. This includes previously constructed projects where debt payments are still outstanding and future debt payments from projects planned to be constructed in the nine year program. All forecasted projects assume financing over a 25 year debenture term which spreads the costs over a longer window of development. The rate is calculated by taking the aforementioned costs and dividing them by the forecasted developable, non-levied lands for the next nine years. The basic calculation is shown in the following figure.

Figure 6 - Water Distribution & Wastewater Collection Off-Site Levy Calculation

Debt Servicing for Greenfield Growth Related Capital Costs (9 yrs.) = **Cost Base Future Value**

$$\frac{\text{Cost Base Future Value}}{(1+\text{Discount Rate})^{n1....n9}} = \textbf{Cost Base Present Value}$$

n=timeline for capital investment

$$\frac{\text{Cost Base Present Value}}{\text{Greenfield Developable Land Forecast (9 yrs.)}} = \textbf{Off-site Levy}$$

Table 14 - Proposed Water Distribution and Collection Off-Site Levy

Water Distribution	
Proposed Water Distribution Levy ($/Ha)	**$32,325 / Ha.**
Water Collection	
Proposed Wastewater Collection Levy ($/Ha)	**$44,449 / Ha.**

6.3 Drainage System

Drainage System Projects & Costs

Drainage system projects are determined for a ten year timeframe based on The City's ten year capital plan. This timeframe is the basis for the off-site levy program for drainage systems projects. As 2016, is year two of the ten year program, the levy calculations covers only nine years of the program.

The drainage system off-site levy that applies to any subject lands depending on which of the six major watershed catchments areas the subject lands are located within. Those catchments are: Bow River, Elbow River, Fish Creek, Nose Creek, Pine Creek and Shepard. The total cost of drainage system projects required to accommodate The City's nine year growth projections is $67.9 million. Further details on costs are provided in Appendix C.

Cost estimates used in the levy calculation are assumed to be Class V cost estimates, as per the Corporate Project Management Framework definitions. These estimates include engineering, contingency and project administration. The cost estimates for the projects were taken from the 2015-2018 Spending Plan, 2015-2018 Water Infrastructure Investment Plan and the proposed Water Infrastructure Investment Plan for 2019-2024.

Drainage System Allocation of Benefit

Projects included in the drainage system off-site levy provide benefit to both greenfield growth and growth in the established areas of The City's six major watershed catchments areas. None of the drainage projects included in the levy calculation benefit existing development or regional areas. As such drainage system costs are allocated completely to either Greenfield Area development or Established Area development in the six catchments. Drainage off-site levies are only calculated and applied in the Greenfield Area and include only the project costs determined to benefit the Greenfield Area of the drainage catchment.

Drainage System Growth Infrastructure Needs

The following table summarises the allocation of drainage system infrastructure costs to greenfield growth and established areas growth.

Table 15 - Allocation of Drainage System Costs to Growth

Infrastructure	Drainage System Infrastructure Costs ($millions)
Greenfield Area	$44.5
Established Area	$23.4
Total	**$67.9**

Drainage System Levy Calculation

The drainage system levies include all infrastructure costs allocated to greenfield development over the nine year timeframe. All project costs to be recovered from development may include a combination of principal and interest costs, cash funded project costs and any cash payments required under Construction Financing

Agreements (CFAs) within the nine year timeframe. This includes costs from previously constructed projects where debt payments are still outstanding and future debt payments from projects to be constructed in the nine year program. All forecasted projects assume financing over a 25 year debenture term which spreads the costs over a longer window of development.

Determining the financing option to use is driven by available funds. The following table shows the financing option applied to each catchment.

Table 16 – Finance Option by Catchment

Catchment	Financing Option
Nose Creek	Cash (CFAs)
Bow River	Cash/Debt
Pine Creek	Cash/Debt
Shepard	Debt

The rate is calculated by taking the aforementioned costs and dividing them by the forecasted developable lands in each catchment for the next nine years. The simplified calculation is shown in the following figure.

Figure 7 – Drainage System Off-Site Levy Calculation

Debt Servicing for Greenfield Growth Related Capital Costs (9 yrs.) = **Cost Base Future Value**

$$\frac{\text{Cost Base Future Value}}{(1+\text{Discount Rate})^{n1\ldots n9}} = \textbf{Cost Base Present Value}$$

n=timeline for capital investment

$$\frac{\text{Cost Base Present Value}}{\text{Greenfield Developable Land Forecast (9 yrs.)}} = \textbf{Off-site Levy}$$

The proposed off-site levy for drainage systems is shown in the following table.

Table 17 – Proposed Drainage System Levy by Catchment

Catchment	$ per Hectare
Nose Creek	$11,325
Bow River	$6,983
Pine Creek	$16,812
Shepard	$42,704
Fish Creek	-
Elbow River	-

6.4 Water & Wastewater Treatment

Water & Wastewater Treatment Project Costs

The water and wastewater treatment off-site levy is applied to growth across The City's Greenfield and Established Areas and is based on allocating capacity costs for treatment upgrades to the expected equivalent population served. It is assumed that capital costs related to existing and future expansion will serve the expected equivalent population growth up to 2035 for wastewater and 2025 for water. The following table summarises the total costs of the water and wastewater treatment projects that are triggered in the ten year Water Infrastructure Investment Plan. Further details on costs are provided in Appendix C.

Table 18 – Water & Wastewater Treatment Infrastructure Costs

Infrastructure	**Total** Water & Wastewater Treatment Infrastructure Costs ($millions)
Water Treatment Plants	$97.5
Wastewater Treatment Plants	$1,302.4
Total	**$1,399.9**

Cost estimates used in the levy calculation are assumed to be Class V cost estimates, as per the Corporate Project Management Framework definitions. These estimates include engineering, contingency and project administration. The cost estimates for the projects were taken from the Spending Plan, Approved 2015-2018 Water Infrastructure Investment Plan and the Proposed Water Infrastructure Investment Plan for 2019-2024.

Water & Wastewater Treatment Projects Allocation of Benefit

Allocation of benefit to existing customers in the city is determined on a project by project basis and include costs associated with regulatory requirements to serve the existing equivalent population. Included in the portion of the projects allocated to growth is an allocation for regional growth. The portion of water and wastewater treatment growth infrastructure that benefits the regional areas is allocated based on the forecasted population and jobs for each of those areas. Further detail on the allocation of benefit for each project is provided in Appendix C.

The following table summarises the allocation of water and wastewater treatment infrastructure costs to growth in the city including both Greenfield and Established Areas growth

Table 19 - Allocation of Water & Wastewater Treatment Infrastructure Costs to Growth

Infrastructure	Water & Wastewater Treatment Infrastructure Costs ($m)
Water Treatment Plants	$76.6
Wastewater Treatment Plants	$941.4
Total	**$1017.7**

Water & Wastewater Treatment Levy Calculation

The approach to calculating the water and wastewater treatment off-site levy was to distribute capital costs to new and existing customers in proportion to the customer's usage of the facilities and the investment required to develop the facilities.

The result is an off-site levy that reflects the costs of providing the capacity needed by customer growth. For the purpose of the calculation, it was assumed that future capital investments are to be financed by a 10 year debt term. The financing costs for existing capacity are based on existing finance terms with debentures ranging between 15, 20 and 25 year terms.

The water and wastewater treatment off-site levy for all areas of the city is calculated by taking the aforementioned costs and dividing them by the total capacity available expressed in equivalent population to obtain a charge per equivalent population.

Figure 8 - Calculation for Value of Capacity per Equivalent Population (EP) for Water & Wastewater Treatment Off-Site Levy

Debt Servicing Costs for Existing and Future Capacity Future Values = **Available Capacity Future Value**

$$\frac{\text{Available Capacity Future}}{(1+\text{Discount Rate})^{n1\ldots n}} = \textbf{Present Value of Available Capacity}$$

n=forecasted years to reach available capacity

$$\frac{\text{Present Value of Available Capacity}}{\text{Equivalent Population (EP) Served}} = \textbf{Value of Capacity per EP = \$2161/EP}$$

Greenfield Area Levy for Treatment

The Levy is applied to the Greenfield Area based on the average equivalent population density of 60 EP/hectare as this is the current average density of EP achieved in greenfield developments.

Figure 9 - Calculation for Greenfield Water & Wastewater Treatment Infrastructure Off-Site Levy

Value of Capacity per EP **X** Average EP per Hectare = **Greenfield Off-Site Levy Present Value**

$2161/EP **X** 60 EP per Hectare = $129,660/Hectare = **Greenfield Off-Site Levy Present Value**

Established Area Levy for Treatment

For the Established Area, the off-site levy is applied by dwelling type for residential development, and by gross floor area (sq.m.) for commercial and industrial developments. For residential developments, one resident or occupant is equal to one equivalent population. For non-residential developments, one employee is equal to 0.61 of an equivalent population. Equivalent population ratios are determined through analysis of system flow data.

Expected average equivalent population (EP) or occupancy per dwelling type is derived from The City of Calgary census data (2010-2014), research of comparable municipalities along with other stakeholder information provided.

Table 20 – Residential Equivalent Population by Unit Type

Single Detached	Semi-Detached /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)
2.9 EP/Unit	2.6 EP/Unit	1.8 EP/Unit	1.5 EP/Unit	1.2 EP/Unit

For commercial developments, the expected average number of employees is based on the current estimated city employment intensity rate of 36 sq.m./employee. For industrial developments, the average rate of 75 sq.m./employee is derived from employment intensity assumptions in *The Guide to the MDP and CTP*. Based on these average intensities of employment for non-residential land-uses, Table 21 provides the calculation for equivalent population per square meter of gross floor area for non-residential development.

Table 21 - Non-Residential Equivalent Population per Square Metre of Gross Floor Area

Commercial Development	Industrial Development
EP/employee ÷ m^2/employee = EP/ m^2 0.61 EP/employee÷36 m^2/employee = **0.017 EP/m^2 gross floor area**	EP/employee ÷ m^2/employee = EP/ m^2 0.61 EP÷75 m^2/employee = **0.008 EP/m^2 of gross floor area**

Based on the above equivalent population calculations, Table 22 provides the calculation for the Established Area levy before any credit is applied for existing development.

Table 22 - Calculation for Established Area Water & Wastewater Treatment Infrastructure Off-Site Levy

	Single Detached	Semi-Detached /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)
Average EP per unit	2.9 EP/Unit	2.6 EP/Unit	1.8 EP/Unit	1.5 EP/Unit	1.2 EP/Unit
Water Treatment Off-site Levy per Unit Type	$1,137	$1,019	$706	$588	$470
Wastewater Treatment Off-site Levy Per Unit Type	$5,130	$4,599	$3,184	$2,654	$2,123
Total Treatment Off-site Levy per Unit Type	**$6,267**	**$5,619**	**$3,890**	**$3,242**	**$2,593**
Commercial Development Levy Rate: $36.62/ m^2 of Gross Floor Area					
Industrial Development Levy Rate $17.58/ m^2 of Gross Floor Area					

Established Area - Credit for Existing Development

Developments in the Established Area may have existing development to be demolished or recently demolished buildings that were previously allocated capacity for water and wastewater treatment. Where new development in the Established Area replaces previous development, a reduction in the levy will be determined based on the levy unit and floor area rates included in Table 22. The reduction will be applied if development previously existed on the site within the last 10 years and was connected to both the water and wastewater systems.

Established Area Maximum Levy Rate For High Density Residential & Commercial Development:

To provide incentive for high density developments, The City is setting a maximum levy rate for high density residential, mixed use or commercial development that achieve a density for the proposed development of 285 EP/Hectare or greater. The proposed development density is calculated as follows.

Proposed Density = Proposed EP ÷ Site Development Area (Ha.)
Proposed EP = [(Units × EP/Unit) + (Sq. M. Commercial Gross Floor Area × 0.017 EP/Sq. M.)]

The maximum levy rate for developments that achieve a density of 285 EP/Hectare or greater will pay the maximum rate of $2161/EP x 285 EP/Hectare: The levy calculation for developments achieving this density is:

$2161 /EP x 285 EP/Ha x Site Development Area (Ha) = $615,885/Ha x Site Development Area (Ha)

6.4 Water & Resources Levy Summary

The following table summarizes the proposed water resources off-site levy rates in The City's Greenfield Area as shown in Figure 2.

Table 23 - Proposed Off-Site Levy Rate for Greenfield Area

Infrastructure	2016 Proposed Rate ($/Ha)
Water Resources - Water and Wastewater	$206,434
Water Resources - Drainage by Catchment	
Nose Creek	$11,325
Bow River	$6,983
Pine Creek	$16,812
Shepard	$42,704
Fish Creek	-
Elbow River	-
Total	**$206,434 to $249,138**

The following table summarizes the proposed water resources off-site levy rates for growth in The City's Established Area as shown in Figure 2.

Table 24 - Off-Site Levy Rate for Proposed Established Area Development

	Single Detached	Semi-Detached /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)
Water Treatment Off-site Levy per Unit Type	$1,137	$1,019	$706	$588	$470
Wastewater Treatment Off-site Levy Per Unit Type	$5,130	$4,599	$3,184	$2,654	$2,123
Total Treatment Off-site Levy per Unit Type	**$6,267**	**$5,619**	**$3,890**	**$3,242**	**$2,593**
Commercial Development Levy Rate: $36.62/ m^2 of Gross Floor Area					
Industrial Development Levy Rate: $17.58/ m^2 of Gross Floor Area					
Maximum Rate for Density ≥ 285 EP/Ha: $615,885/Ha x Site Development Area (Ha)					

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CHAPTER 7 – COMMUNITY SERVICES PROGRAM

7.1 Introduction

Infrastructure included in the community services charges are public libraries (Calgary Public Library), emergency response stations (Calgary Fire Department), police district offices (Calgary Police Service), recreation centres (Recreation) and transit buses (Transit). The growth timeframe used to calculate the community services program costs is 30 years. This chapter presents the proposed community services charge for each infrastructure category and explains how each was calculated. A summary of the proposed charge amounts is shown in the Table 25. Further information on levels of service and infrastructure costs are provided in Appendix D.

Table 25 - Proposed Community Services Charges

Community Services	($/Ha)
Public Libraries (Calgary Public Library)	$5,971
Emergency Response Stations (Calgary Fire Department)	$19,545
District Offices (Calgary Police Service)	$7,648
Recreation Centres (Recreation)	$41,679
Transit Buses (Transit)	$4,007
Total	**$78,850**

7.2 Public Libraries (Calgary Public Library)

Growth Infrastructure Needs

The provision of new library services will be driven by growth in The City's Greenfield Areas. To meet future demand, 0.36 ft^2 of public library space will need to be provided per person. During this 30 year window (2015-2044), the greenfield growth population is projected to be 340,918, which would require approximately 122,730 ft^2 of library space, totalling an infrastructure need of $62,469,814.

Charge Calculations

The proposed community services charge for public library infrastructure has been calculated according to the principles, assumptions and approach discussed in this Background Report. The details and assumptions are provided in Appendix D. The basic calculation is shown in the following table.

Table 26 - Public Libraries: Community Services Charge Calculation

Greenfield population (2015-2044)	340,918
Library Requirements per person (sf)	0.36
Library 2015 Costs per sf	509
Total Infrastructure Cost	62,469,814
Greenfield Area (Ha)	10,462
Proposed Levy – Public Libraries ($/Ha)	**$5,971**

7.3 Emergency Response Stations (Calgary Fire Department)

Growth Infrastructure Needs

The Calgary Fire Department has determined on average that an emergency response station will serve a greenfield development area containing 30,000 persons. During the 30 year window (2015-2044), the greenfield growth population is projected to be 340,918, which would require approximately 11.4 emergency response stations be provided, totalling an infrastructure need of $204,480,000.

Charge Calculations

The proposed community services charge for fire infrastructure has been calculated according to the principles, assumptions and approach discussed in this Background Report. The details and assumptions are provided in Appendix D. The basic calculation is shown in the following table.

Table 27 - Emergency Response Station: Community Services Calculation

Greenfield Population	340,918
Emergency Response Station per person	30,000
Infrastructure Need / # Facilities	11.36
Cost per Emergency Response	18,000,000
Total Infrastructure Cost	204,480,000
Greenfield Area (Ha)	10,462
Proposed Levy – Emergency Response Stations	**$19,545**

7.4 Police District Offices (Calgary Police Service)

Growth Infrastructure Needs

The Calgary Police Service has determined on average that a police district office will serve a catchment area containing 149,000 persons. During the 30 year window (2015-2044), the greenfield growth population is projected to be 340,918, which would require approximately 2.29 new police district offices totalling an infrastructure need of $80,016,035.

Charge Calculations

The proposed community services charge for police infrastructure has been calculated according to the principles, assumptions and approach discussed in this Background Report. The details and assumptions are provided in Appendix D. The basic calculation is shown in the following table.

Table 28 - Police District Offices: Community Services Calculation

Greenfield Population	340,918
District Office per person	149,000
Infrastructure Need / # Facilities	2.29
Cost per District Office	$34,941,500
Total Infrastructure Cost	$80,016,035
Greenfield Area (Ha)	10,462
Proposed Levy – Police District Offices ($/Ha)	**$7,648**

7.5 Recreation Centres (Recreation)

Growth Infrastructure Needs

Identification of future regional recreation centres is guided through the development of ASPs.. The catchment for a small regional recreation facility is 63,000 people. During this 30 year window (2015-2044), the greenfield growth population from 2015- 2044 is projected to be 340,918, which would require approximately 5.4 recreation centres be provided, totalling an infrastructure need of $435,046,000.

Charge Calculations

The proposed community services charge for recreation infrastructure has been calculated according to the principles, assumptions and approach discussed in this Background Report. The details and assumptions are provided in Appendix D. The basic calculation is shown in the following table.

Table 29 - Recreation Facilities: Community Services Calculation

Greenfield Population	340,918
Average ASP Population	63,000
Infrastructure Need / # Facilities	5.41
Cost per Recreation Centre	80,600,000
Total Infrastructure Cost	436,046,000
Greenfield Area (Ha)	10,462
Proposed Levy – Recreation Facilities ($/Ha)	**$41,679**

7.6 Transit Buses (Transit)

Growth Infrastructure Needs

During the 30 year window (2015-2044), the greenfield growth population is projected to be 340,918, which would require approximately 102 transit buses be provided, totalling an infrastructure need of $41,922,000.

Charge Calculations

The proposed community services charge for transit buses has been calculated according to the principles, assumptions and approach discussed in this Background Report. The basic calculation is shown in the following table.

Table 30 - Transit Buses: Community Services Calculation

Greenfield Population	340,918
Transit Buses per person	6/20,000
Infrastructure Need / # Buses	102
Cost per Bus	$411,000
Total Infrastructure Cost	$41,922,000
Greenfield Area (Ha)	10,462
Proposed Levy – Transit Buses ($/Ha)	**$4,007**

8.0 SUMMARY OF OFF-SITE LEVIES

8.1 Summary of Proposed Off-Site Levy Rates

The following tables summarize the proposed off-site levy rates for growth in The City's *Greenfield Area* as shown in Figure 2.

Table 31 - Proposed Off-Site Levy Rate for Greenfield Area

Infrastructure	2016 Proposed Rate ($/Ha)
Transportation	$136,789
Water Resources - Water and Wastewater	$206,434
Water Resources - Drainage by Catchment	
Nose Creek	$11,325
Bow River	$6,983
Pine Creek	$16,812
Shepard	$42,704
Fish Creek	-
Elbow River	-
Community Services	$78,850
Total	**$422,073 to $464,777**

The following tables summarize the proposed off-site levy rates for growth in The City's *Established Area* as shown in Figure 2.

Table 32 - Proposed Off-Site Levy Rate for Established Area

	Single Detached	Semi-Detached /Duplex	Multi-Residential Grade-Oriented	Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Multi-Residential Non Grade-Oriented (1 Bedroom or Less)
Total Treatment Off-site Levy per Unit Type	**$6,267**	**$5,619**	**$3,890**	**$3,242**	**$2,593**
Commercial Development Levy Rate: $36.62/ m² of Gross Floor Area					
Industrial Development Levy Rate: $17.58/ m² of Gross Floor Area					
Maximum Rate for Density ≥ 285 EP/Ha: $615,885/Ha x Site Development Area (Ha)					

8.2 Exemptions to the Off-Site Levy

The only land area to be exempt from off-site levies payable are:

- Environmental Reserve
- Skeletal roads

8.5 Monitoring and Accounting

There is currently a process in place that will continue to be refined for the accounting of levy funds. Administration will continue to improve the reporting process to provide off-site levy fund annual reporting which is reconciled with *The City of Calgary Annual Report* (financial statements). Administration will continue to collaborate with industry on this work to ensure the annual Off-Site Levy Fund Report is clear and transparent on how the levy funds are collected and spent.

8.6 Reviewing the Off-Site Levy Bylaw and the Community Services Charges

Amendments to the Off-Site Levy Bylaw may be required from time to time to keep the calculations current. Adjusting the numbers may be necessary to account for the receipt of unanticipated specific grants, or to support changes required to facilitate developer funding arrangements, or to correct errors that may be identified. The overall methodology will not be reviewed for five years to provide certainty and minimize administrative costs. Amendments required would likely be identified at the time of the preparation of the Annual Levy Report and would be brought forward to Council at the appropriate time and as close as possible to the anniversary of the effective date of the Bylaw.

APPENDIX A – STAKEHOLDER ENGAGEMENT

The following table provides greater detail on those who participated in the stakeholder engagement process.

Table 33 - Stakeholder Engagement Process

Engagement Group	Members	Purpose	Frequency of Meetings
Internal Working Team	Predominantly city staff from various departments - Kathy Dietrich, Sarah Alexander, Matthew Sheldrake, Kathy Davies Murphy, Tom Hopkins, Scott Pickles, Nazrul Islam, John Kwong, Jill Floen, Joel Armitage, Oyinola Shyllon, Mauro Ficaccio, Lesley Kalmakoff, Ed Lem, Lesia Luciuk and Lynda Cooke (Urban Systems).	• Developed guiding principles of the project • Developed framework of the work plan and implement • Defined infrastructure projects, timing, cost estimates and options for funding	• Weekly • 32 meetings since Jan 29
External Advisory Group	City Staff and external representatives from various committees and interest groups of the development industry – Kathy Dietrich, Sarah Alexander, Joel Armitage, Beverly Jarvis, Chris Plosz, Colin Campbell, Grace Lui, Dennis Inglis, Jill Floen, Greg Bodnarchuk, Guy Huntingford, Jay German, John Kwong, Mike Selinger, Nazim Virani, Paul Battistella, Paul Derksen, Ryan Boyd, Robert A. Homersham.	• Acted as Industry sounding board • Developed guiding principles for the project • Finalized the scope of the project • Reviewed options related to methodology, calculation of levy, funding	• Every 3 weeks • 14 meetings since Mar 11
Technical Subcommittee	City Staff, external industry representatives and technical consultants – Kathy Dietrich, Sarah Alexander, Amie Blanchette, Joel Armitage, Alexandra E. Burdeyney, Kathy Davies Murphy, Greg Bodnarchuk, Guy Huntingford, Tom Hopkins, Sarah Huber, Jay German, Jayden Tait, Lynda Cooke, Paul Derksen, Ryan Boyd, Tony Pasquini, Scott Pickles.	• Developed the framework and analysis of the options considered • Undertook technical analysis • Finalized the methodology and calculation of the Off-Site Levy Bylaw.	• Weekly • 20 meetings since May 5
Council	City Staff and Council	• Updated on progress of project • Receive feedback	• Bi-monthly
Build Calgary /GMSGC/ALT	Build Calgary and General Managers Strategic Growth Committee	• Weekly meetings with Build Calgary and monthly updates with GMSGC/ALT	• Monthly
Stakeholder Information Sessions	Attendees included: Developers and home builders from both greenfield and established areas; various financial institutions; community associations; tax watch groups; real estate and affordable housing groups	• The first session presented an overview of the Off-Site Levy Bylaw project and its objectives. The second session reviewed the available options and the third reviewed the project outcomes.	• Quarterly • Sessions in April, June & • October

Established Area – Initial Group	Members external to The City representing the large and small infill developers and interest groups that are related to the redevelopment areas of the city. Internal departmental representatives were brought in when appropriate –David White, Amie Blanchette, Ryan Bosa, Eileen Stan, Chris Elkey, Nazim Virani, Jayden Tait, Beverly Jarvis, Paul Battistella, Oliver Trutina, Kate Thompson, Aaron Vimy, Jennifer Dobbin, Annie MacInnis, Travis Oberg, George Trutina, Iain McCorkindale, James Robertson	• Provided status of the work plan and receive relevant feedback • Acted as an Industry sounding board • Reviewed options related to the methodology and calculation of levy unique to the established areas of the City.	• 4 meetings since June 11
Established Area – Stakeholder Group	Established Area developers, consultants, and industry representatives	• Sessions were held in November and December with attendance of 40 to 55 industry representatives	• 2 meetings since November
Established Area – Working Group	Members external to The City representing the large and small infill developers and interest groups that are related to the redevelopment areas of the city. Internal departmental representatives were brought in when appropriate –David White, Amie Blanchette, Eileen Stan, Beverly Jarvis, Paul Battistella, Oliver Trutina, Mike Brander, Chris Ollenberger, Jaydan Tait, Guy Huntingford, Josh White, Richard Morden and Paul Derksen	• Ad hoc committee of representatives of Established Area group to develop strategy for Established Area levies	• 5 meetings since November
One on Ones	City Staff and developers	• City staff met with members of the development industry at various occasions to discuss the Off-Site Levy Bylaw and the process.	• At least 21 meetings since January

A.1 Engagement Sessions Summary

There were three city-wide engagement session held during the Off-Site Levy Bylaw initiative:

- The first session was on April 30. This session was attended by approximately 80 people and included a presentation on the overall process and the, understand/principles phase. The principles and project deliverables were discussed. Attendees provided input by responding to questions and providing comments. The response was generally positive.
- The second session was on June 24. This session was attended by approximately 80 people and included a presentation on the progress since April 30. It started with an update of work done to that point including: guiding principles were established, issues were identified, project scope was defined, understanding of previous (2011 - current) levy regime, completion of the growth assumptions, initial list of projects and their cost estimates, weekly technical subcommittee meetings, looking at various options (options identification phase). We then described the upcoming work including the calculations phase and the scenario analysis. We also gave a high level view of how levies are calculated that included the growth assumption and initial project lists and their cost estimates. The attendees were then asked to provide general comments and ask questions. The feedback was generally positive.
- The third session was held on October 15 and attended by approximately 80 people. It was the final stakeholder session and the main focus was on presenting the proposed rates and to receive feedback on the rates and any further outstanding questions. The date of the public hearing was provided to participants and feedback from the industry was collected in the same manner as the previous sessions.

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APPENDIX B – TRANSPORTATION PROGRAM

Table 34 - Transportation: Infrastructure Project List

Established Area Transportation Infrastructure List		
Category	**Project Name**	**Total Cost (millions)**
Interchanges	14 ST SW / Anderson Rd I/C	$70.0
	Deerfoot Tr / Glenmore Tr Interchange Improvements	$80.0
	Deerfoot Tr / Beddington Tr /11 ST NE I/C (Ultimate)	$80.0
	Deerfoot Tr / 16 AV NE - Add 3rd Level for Through Movements and basket weaves	$130.0
	Deerfoot Tr / Memorial Dr - ultimate	$100.0
	Deerfoot Tr / Peigan Tr / Barlow Tr Ultimate I/C	$100.0
	Deerfoot Tr / Glenmore Tr / Blackfoot Tr Ultimate I/C	$130.0
	Deerfoot Tr / Anderson Rd / Bow Bottom Tr Ultimate I/C	$100.0
	Anderson / Macleod Directional Ramps	$80.0
	Deerfoot Tr / 17 AV SE EBL Directional and Basket weaves btw Memorial and 17 AV SE	$150.0
	Deerfoot Tr new CD System between Glenmore Tr and Peigan Tr (Inc twin Calf Robe bridge)	$300.0
	16 AV NE / 19 ST NE I/C (with Revisions to 16 AV NE / Barlow Tr I/C)	$72.0
	McKnight Blvd / Aviation Blvd (12th St) I/C	$50.0
	TCH/Bowfort Road I/C	$71.7
	Macleod Tr / 162 AV SW I/C	$65.0
	Sarcee Tr / Richmond Rd I/C	$77.0
	Macleod Tr / Heritage Dr I/C	$80.0
	Macleod Tr / Lake Fraser Gate I/C	$50.0
	Crowchild Tr / Flanders AV I/C Upgrade	$20.0
	Macleod Tr/25 Avenue IC	$70.0
	Glenmore Tr: west of Ogden Road to Barlow Trail (widening plus 2 I/C's)	$180.0
	Glenmore Tr / 52 ST SE I/C including widening 4 - 6 lanes to 52nd St)	$101.0
	McKnight Blvd / Barlow Tr I/C	$70.0
	McKnight Blvd / 19th St I/C	$50.0
	Sarcee Tr / Bow Tr I/C	$100.0
	Shaganappi Tr / John Laurie Blvd I/C	$70.0
	Glenmore Tr / Richard Rd I/C	$50.0
	Anderson Rd / 24 ST SW I/C	$70.0
	Anderson Rd / Woodpark Blvd I/C	$70.0
	Anderson Rd / Elbow Dr I/C	$70.0
	Anderson Rd / Bonaventure Dr I/C	$70.0
	Anderson Rd / Acadia Dr I/C	$70.0
	Peigan Tr / 26 ST NE I/C	$70.0
	Peigan Tr / 36 ST NE I/C	$70.0

Established Area Transportation Infrastructure List		
Category	**Project Name**	**Total Cost (millions)**
	Crowchild Tr / 24 AV NW - I/C and C/D System (Inc New Bridge over University Dr)	$150.0
	Crowchild Tr / University Dr / 16 AV NW - Upgrade/Revise I/Cs	$150.0
	Deerfoot Tr / 32 AV NE I/C Revs (4 lanes EB to 12 ST SE (East Int), 3 thru lights, taper to 2)	$45.0
	Deerfoot Tr / 50 AV SW I/C	$70.0
	Deerfoot Tr / McKnight Blvd - Upgrade I/C	$70.0
	McKnight Blvd/68th St NE	$70.0
	26 AV SW Connector / Blackfoot Tr I/C	$100.0
	Grade Separation at Railway Crossing: 52nd Street (23rd Ave to Hubalta Road)	$25.0
	Grade Separation at Railway Crossing: Peigan Tr (CN)	$25.0
	Grade Separation at Railway Crossing: 52nd Street & 50th Ave (CN)	$25.0
	Grade Separation at Railway Crossing: Barlow at 50th Ave (CN)	$25.0
	14 ST NW / Country Hills Blvd I/C	$70.0
	Shaganappi Tr / Country Hills Bv I/C	$70.0
	Shaganappi Tr / Northland Dr I/C	$70.0
	Shaganappi Tr / Edgemont Bv I/C	$70.0
	McKnight Blvd / 47 ST NE I/C	$70.0
	McKnight Blvd / Falconridge Bv I/C	$70.0
	Total	**$4,161.7**
Major Structures	Glenmore Causeway - Widen to 8 Core Lanes with CD System	$300.0
	Crowchild Tr - Bridge over Bow River - Widen from 6 to 8 Lanes	$300.0
	Total	**$600.0**
Road Widenings	Glenmore Tr - Widen from 4 to 6 Lanes - Crowchild Tr to Sarcee Tr	$17.0
	Peigan Tr - Widen from 2 to 4 Lanes - Barlow Tr SE to Stoney Tr	$35.0
	Anderson Road: Bonaventure Dr to Deerfoot Tr (widen EB lanes 2-3)	$3.0
	Country Hills Blvd: Barlow Tr to Coventry Blvd (widen 4-6 lanes)	$20.0
	McKnight Blvd - Widen from 4 to 6 Lanes - Edmonton Tr to 4 ST NW	$37.0
	Trans Canada Highway: Crowchild Tr. To Shag Tr. (widen 4-6 lanes)	$17.0
	16 AV NE - Widen from 4 to 6 Lanes - Barlow Tr to East Freeway	$35.0
	Beddington Tr - Widen from 4 to 6 Lanes - CHB to Stoney Tr	$14.0
	Anderson Rd - Widen from 4 to 6 Lanes - 24 ST SW to 14 ST SW	$10.0
	Sarcee Tr: Glenmore to Bow Tr (widen 4-6 lanes), + major utilities	$50.0
	Sarcee Tr: Bow Tr to TCH (widen 4-6 lanes), (due to slope stability)	$40.0
	Barlow Tr - Widen from 4 to 6 lanes - Memorial Dr to 16 Av NE	$15.0
	McKnight Blvd - Widen from 4 to 6 Lanes - 19th St to Barlow Tr	$5.0
	16 AV NW - Widen 4 to 6 Lanes - Shaganappi to Sarcee, 6 lane bridge, CPR underpass	$150.0
	Bow Tr - 37 St W to Sarcee Tr - Widen to 6 lanes	$50.0
	50 AV SW - New 4 Lane Road from Macleod Tr to Deerfoot Tr SE	$70.0
	14 ST SW - Widen from 2 to 4 Lanes - Anderson Rd to Canyon Meadows Dr	$15.0
	Shaganappi Tr - Widen from 6 to 8 Lanes - Stoney Tr to Country Hills Blvd	$10.0
	114 Avenue SE, widen 2 to 4 lanes - 52 Street to 68 Street	$15.0

Established Area Transportation Infrastructure List		
Category	**Project Name**	**Total Cost (millions)**
	130 Avenue SE - 4 lanes from McIvor Bv to Stoney Tr (& 2-4 lanes 52 st to McIvor Bv)	$16.0
	Deerfoot Tr - Widen from 6 to 8 Lanes - Memorial to Stoney Tr, (major median structures)	$200.0
	Total	**$824.0**
Pedestrian Overpasses	Marquis of Lorne Tr, east of Macleod Tr	$6.0
	LRT/CPR tracks, from Shalom Wy to Shawmeadows Rise SE	$6.0
	Deerfoot Tr, 600 Douglas Woods Place SE to Douglasdale Business Park	$6.0
	Macleod Tr, north of 25 Avenue, Erlton to LRT station	$6.0
	16 Avenue NW, Stadium Shopping Centre to Foothills Hospital	$6.0
	Nose Creek, 32 Avenue NE	$6.0
	Deerfoot Tr N, at 40 Avenue NE	$6.0
	McKnight Bv NE, west of 52 St NE	$6.0
	Deerfoot Tr, at Beddington Tr NE	$6.0
	Beddington Tr, from Country Hills Cl to Sandstone	$6.0
	17 Avenue SW, from Aspen Landing to future Springbank Hill lands	$6.0
	Anderson Station, across Macleod Tr at north end of site	$6.0
	Chinook mall, across Macleod Tr at 61 Avenue S	$6.0
	Canada Olympic Park, across 16 Avenue to Bowness Community	$6.0
	Total	**$84.0**
BRT Infrastructure	17 Avenue SE Transit way, Blackfoot Truck Stop to Stoney Trail	$203.0
	South Crosstown	$20.0
	North Crosstown	$50.0
	South West Crosstown	$40.0
	Route 305 Improvements	$10.0
	Shaganappi HOV	$35.0
	52 Street E, Saddleridge to Seton	$38.0
	Connecting Westbrook to NW MAC	$60.0
	162 Avenue SW, Shawnessy to SW Ring Road	$75.0
	Green Trip Provincial funding for BRT Projects (EB1 to EB4)	-$139.0
	Total	**$392.0**
	Established Area Transportation Infrastructure List: TOTAL	**$6,061.7**

Greenfield Transportation Infrastructure List		
Category	**Project Name**	**Total Cost (millions)**
Interchanges	Métis Tr / Airport Tr I/C	$70.0
	Airport Tr / Stoney Tr NE (Ultimate)	$60.0
	Macleod Tr / 194 AV SE I/C	$70.0
	Macleod Tr / 210 AV SE I/C	$70.0
	West 22X/53 St SW Interchange	$70.0
	West 22X/ 85th St W Interchange	$70.0
	West 22X/69 St W interchange	$70.0
	Deerfoot Tr / 212 AV SE I/C	$16.0
	104 St / Marquis of Lorne (Fly Over) SE	$30.0
	120 St / Marquis of Lorne I/C SE	$70.0
	East Freeway/130th Ave SE I/C (To/from the North)	$40.0
	East Freeway/106th Ave Trail Fly Over	$30.0
	Glenmore Tr / 68 ST SE I/C	$70.0
	Glenmore / Garden Rd SE	$70.0
	Glenmore / 116th E I/C Se (Second Structure and Upgrade requirements)	$70.0
	Peigan Tr / 52 ST NE I/C	$70.0
	Peigan Trail/68th St I/C	$60.0
	East Freeway / Memorial Dr Flyover	$30.0
	16 AV NE / 68 ST NE I/C	$70.0
	East Freeway/ 32 AV NE Flyover	$30.0
	64 Ave / East Freeway Flyover	$30.0
	Airport Trail/36th St NE I/C	$40.0
	Airport Trail/60th St NE I/C	$75.0
	Métis Tr / 64 AV NE I/C	$70.0
	Metis Trail/128th Ave NE I/C	$70.0
	60 St / Stoney Tr I/C NE	$50.0
	Deerfoot Tr / 128 AV NE I/C	$60.0
	Deerfoot Tr / Country Hills Blvd I/C (second structure)	$30.0
	Deerfoot Tr/Airport Trail Ultimate	$50.0
	160 Ave / Hwy 2 NE (second structure and upgrade requirements)	$30.0
	11th Street/Stoney Trail I/C	$50.0
	Centre St / Stoney Tr (second structure and upgrade requirements)	$15.0
	14 St / Stoney I/C	$40.0
	Shaganappi Tr/Stoney Tr (second structure and upgrade requirements)	$15.0
	Centre St / Hwy 566 I/C	$80.0
	Crowchild Tr / 12 Mile Coulee Rd I/C	$70.0
	Total	**$1,911.0**

Greenfield Transportation Infrastructure List		
Category	**Project Name**	**Total Cost (millions)**
Road Structures over Rail/Creek	CP Rail at 194th Ave SW	$25.0
	CP Rail at 210th Ave SW	$25.0
	210 Ave SW at Pine Creek	$20.0
	Pine Creek Crossing in South Macleod	$25.0
	CP Rail at 114th Ave SE	$25.0
	WID Canal Crossing at Glenmore Trail SE	$20.0
	144th Ave at West Nose Creek	$25.0
	160th Ave at West Nose Creek	$25.0
	160th Ave at Rail and Creek Crossing (6 Lane X-section over creek, rail, service road)	$53.0
	11th St at Nose Creek/CPR Rail Crossing	$20.0
	Total	**$263.0**
Expressways	Airport Tr - Barlow Tr, Airport - 19 St interchanges and widening 36 St to 60 St NE	$83.0
	88 Street SE skeletal road extension	$17.0
	Total	**$100.0**
Ring Road Connections	SW and West Ring Road Connections	$133.3
	Total	**$133.3**
Greenfield Traffic	296 signals required	$81.4
	Total	**$81.4**
Pedestrian Overpasses	Stoney Tr, between Centre St and 14 St NW	$6.0
	Stoney Tr, between Centre St and 11 St NE	$6.0
	Airport Tr, east of Metis Tr, between Cityscape and Savannah	$6.0
	Country Hill Bv NE, west of Stoney Trail, between North Cornerstone and South Cornerstone	$6.0
	52 Street SE, between Auburn Bay and Mahogany	$6.0
	Bow River, between Legacy and Cranston	$12.0
	Total	**$42.0**
BRT Infrastructure	162 Avenue SW, SW Ring Road to west side of Providence	$90.0
	Total	**$90.0**
	Greenfield Transportation Infrastructure List: TOTAL	**$2,620.7**

Figure 10 - CTP Road Interchange Infrastructure

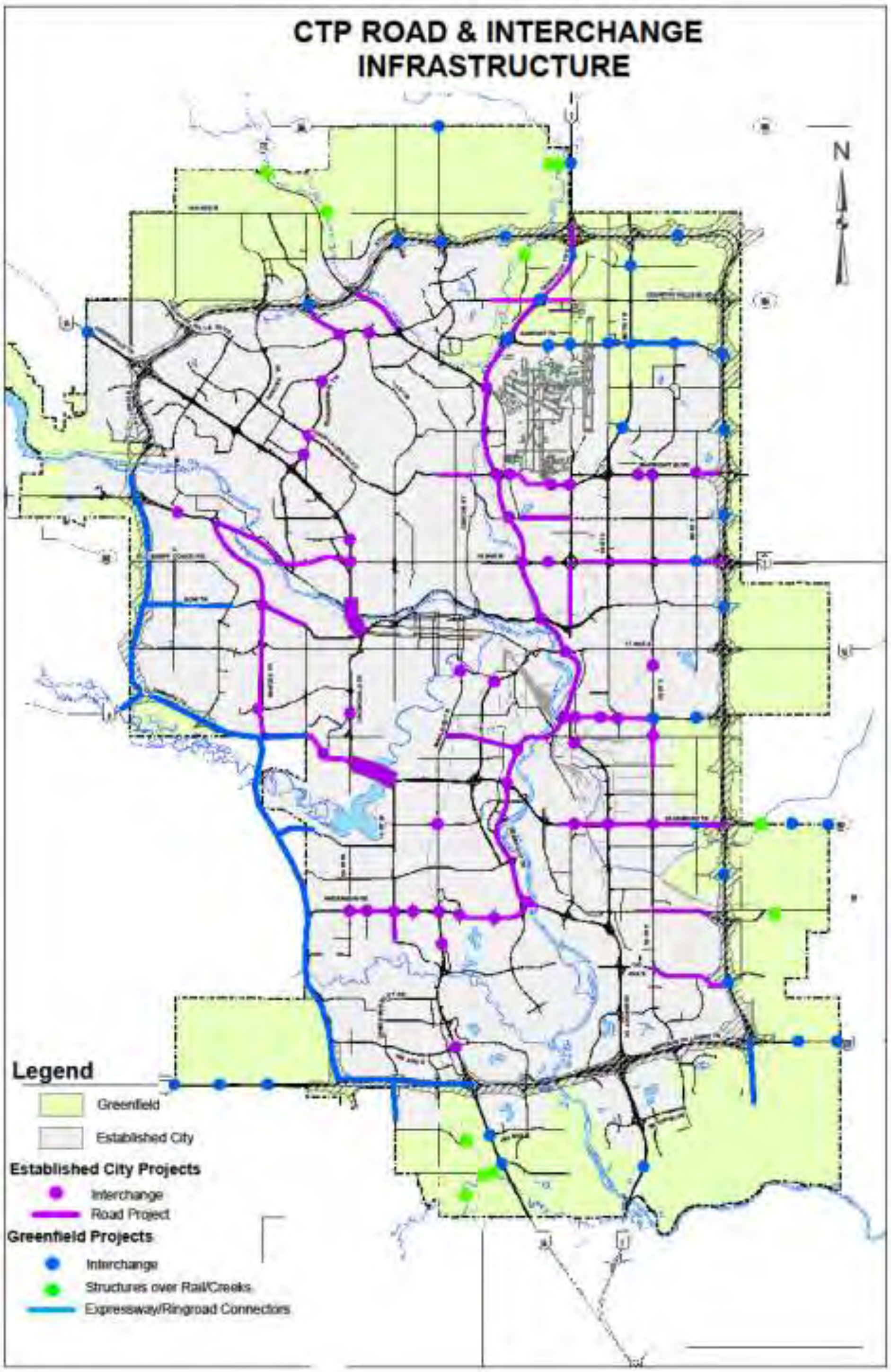

Figure 11 - BRT & Pedestrian Overpass Infrastructure

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APPENDIX C – WATER RESOURCES PROGRAM

Table 35 - Water Resources Infrastructure Project Lists

Category	Project Name	Allocation				Total Cost (millions)
		% Growth	% Greenfield	% Established	% Regional	
Water Distribution & Wastewater Collection						
Water Linear Extension Infrastructure	Ogden Feeder Main	100.0%	27.9%	55.0%	17.1%	$38.5
	Lower Sarcee Feeder Main	100.0%	71.1%	15.7%	11.8%	$30.9
	210 Ave SW Pump Station	100.0%	69.1%	17.8%	13.0%	$15.0
	210 Ave Feeder Main	100.0%	69.1%	17.8%	13.0%	$12.0
	East McKenzie FM	100.0%	29.8%	54.6%	15.6%	$6.4
	Northridge FM Ph 1 and 2	100.0%	83.2%	16.8%	0.0%	$30.7
	Northridge Reservoir	100.0%	83.2%	16.8%	0.0%	$3.2
					Total	**$136.8**
Sanitary Linear Extension Infrastructure	North Ridge Macdonald Trunk	100.0%	100.0%	0.0%	0.0%	$7.1
	West Pine Creek Sanitary Trunk Ph 2	100.0%	100.0%	0.0%	0.0%	$46.6
	Seton Tunnel Ph 1	100.0%	100.0%	0.0%	0.0%	$31.8
	Seton Tunnel Ph 2	100.0%	100.0%	0.0%	0.0%	$18.8
	144 Ave NE San Trunk	100.0%	100.0%	0.0%	0.0%	$24.1
	North Beddington San Ph 2 CFA	100.0%	100.0%	0.0%	0.0%	$8.9
	Beddington Creek II East Leg	100.0%	100.0%	0.0%	0.0%	$2.7
					Total	**$140.1**
Sanitary Upgrade Infrastructure	Redevelopment	TBD	0.0%	100.0%	0.0%	$20.9
	Saddle Ridge Sanitary Upgrade	100.0%	46.2%	53.8%	0.0%	$5.1
	Bowness Trunk Upgrade	87.0%	19.3%	40.5%	40.2%	$48.6
	Shouldice Trunk Upgrade	61.0%	11.6%	69.3%	19.1%	$24.0
	Nose Creek Trunk Upgrade	88.0%	48.4%	18.3%	33.3%	$87.7
	Inglewood Trunk Upgrade	87.0%	24.0%	57.4%	18.7%	$55.9
	McKenzie Siphon Upgrade	38.0%	40.5%	59.5%	0.0%	$7.4
	17th Ave Trunk Upgrade	TBD	0.0%	100.0%	0.0%	$4.6
	Beltline Trunk Upgrade	TBD	0.0%	100.0%	0.0%	$1.5
	Forest Lawn LS Sewer Upgrading 1	55.0%	0.0%	100.0%	0.0%	$6.7
	Forest Lawn LS Sewer Upgrading 2	68.0%	0.0%	100.0%	0.0%	$6.6
	Fish Creek West Sub Trunk	TBD	0.0%	TBD	TBD	$14.3
	Tsuu Tina Connection Upgrade	TBD	0.0%	TBD	TBD	$9.4
	Elbow Drive Trunk Upgrade 1	TBD	0.0%	100.0%	0.0%	$1.4
	Elbow Drive Trunk Upgrade 2	TBD	0.0%	100.0%	0.0%	$16.1
	Penbrooke Trunk Upgrades	89.0%	0.0%	100.0%	0.0%	$46.7
					Total	**$356.9**

Category	Project Name	Allocation				Total Cost (millions)
		% Growth	% Greenfield	% Established	% Regional	
Water Upgrade Infrastructure	Airdrie FM Tie-in and Meter Chamber Relocation	100.0%	100.0%	0.0%	0.0%	$1.4
	Pump Station 36 Installation	100.0%	83.2%	16.8%	0.0%	$0.2
	Redevelopment	TBD	0.0%	100.0%	0.0%	$11.5
	South Glenmore Reservoir Basin II	60.0%	29.8%	54.6%	15.6%	$40.4
	Bearspaw Pump Station STN012 Upgrade	37.0%	28.3%	40.6%	31.1%	$6.6
	Bearspaw Pump Station STN020 Upgrade	37.0%	28.3%	40.6%	31.1%	$2.0
	Nose Hill Feedermain	37.0%	28.3%	40.6%	31.1%	$37.8
	Country Hills Blvd Uptown Feedermain	37.0%	28.3%	40.6%	31.1%	$29.8
					Total	**$129.6**
Drainage Facilities & Network						
Drainage Facilities & Network	North Ridge Macdonald Trunk	100.0%	100.0%	0.0%	0.0%	$7.5
	Redevelopment	TBD	0.0%	100.0%	0.0%	$20.8
	Priddis Storm Trunk Outfall	100.0%	100.0%	0.0%	0.0%	$23.8
	144 Av NE Storm Trunk 4	100.0%	100.0%	0.0%	0.0%	$0.0
	North Beddington Storm Trunk	100.0%	100.0%	0.0%	0.0%	$1.7
	Riverbend Trunk Pond	TBD	0.0%	100.0%	0.0%	$2.6
	Seton Storm Trunk	100.0%	100.0%	0.0%	0.0%	$8.0
	Seton Storm Trunk Ph 2	100.0%	100.0%	0.0%	0.0%	$3.5
					Total	**$67.9**
Water & Wastewater Treatment						
Wastewater Treatment Plants	BB WWTP Blower Upgrades	100.0%	44.3%	32.3%	23.5%	$23.1
	BB WWTP 13.2&5kV System Expansion	100.0%	44.3%	32.3%	23.5%	$44.5
	Bonnybrook Capacity Upgrade	100.0%	44.3%	32.3%	23.5%	$128.0
	BBWWTP Plant D Expansion	100.0%	44.3%	32.3%	23.5%	$552.0
	Power Management System	100.0%	44.3%	32.3%	23.5%	$3.6
	Power Distribution Upgrades	50.0%	44.3%	32.3%	23.5%	$2.6
	600V System Upgrades	50.0%	44.3%	32.3%	23.5%	$3.1
	BB Struvite Recovery	20.0%	44.3%	32.3%	23.5%	$20.2
	BB Dewatering Building	50.0%	44.3%	32.3%	23.5%	$88.5
	BB Centrate / Supernatant Treatment	80.0%	44.3%	32.3%	23.5%	$31.0
	FC WWTP Capacity Assessment	100.0%	31.5%	44.3%	24.2%	$89.7
	South Catchment Capacity Upgrade	100.0%	31.5%	44.3%	24.2%	$316.2
					Total	**$1,302.4**
Water Treatment Plants	GM WTP Capacity Expansion	100.0%	56.6%	23.5%	20.0%	$64.5
	BPWTP Capacity Upgrades	100.0%	44.8%	35.4%	19.8%	$4.9
	Bearspaw RTF Fourth Thickener	20.0%	56.6%	23.5%	20.0%	$2.4
	Glenmore UV Disinfection	100.0%	56.6%	23.5%	20.0%	$22.4
	Bearspaw UV Disinfection	100.0%	44.8%	35.4%	19.8%	$3.4
					Total	**$97.5**

Table 36 - Greenfield Allocation of Historical Debt Servicing for Water Distribution, Wastewater Collection & Drainage

As of 2014 Dec 31st (in million $)	Outstanding Debt	Debt Servicing
Water Distribution	$ 130.1	$ 174.6
Wastewater Collection	$ 123.1	$ 165.3
Drainage	$ 69.0	$ 87.7

Table 37 - Wastewater Treatment (Costs in Thousands $)

Treatment Plant	Forecasted Capital Costs (2015-2024)	Borrowing Cost	Total Forecasted Costs (Future Value)	Historical Costs	Total Costs for Available Capacity	Net Present Value	Available Capacity (Equiv. Pop.)
Bonnybrook	$ 614,700	$ 132,434	$ 747,134	$ -	$ 747,134	$ 567,263	321,479 EP
Pine Creek + Fish Creek	$ 326,704	$ 80,336	$ 407,040	$ 91,236	$ 498,276	$ 352,050	189,498 EP
Pine Creek Historical				$ 46,369	$ 46,369	$ 39,287	30,830 EP
					TOTAL	**$ 958,600**	**541,807 EP**

Table 38 - Water Treatment Plants (Costs in Thousands $)

Treatment Plant	Forecasted Capital Costs (2015-2024)	Borrowing Cost	Total Forecasted Costs FV	Historical Costs	Total Costs for Available Capacity	NPV	Available Capacity (Equiv. Pop.)
Glenmore	$ 69,552	$ 16,111	$ 85,664	$ -	$ 85,664	$ 64,148	
Bearspaw	$ 7,003	$ 1,708	$ 8,710	$ -	$ 8,710	$ 6,504	
Total Future WTP						**$ 70,652**	**185,846 EP**
Historical Capacity				$ 47,350	$ 47,350	$ 40,847	98,301 EP
					TOTAL	**$ 111,499**	**284,147 EP**

Cash Flow Analysis and Assumptions Used

A cash flow analysis was undertaken to account for the timing of projects and receipt of off-site levies. Interest earnings or borrowing costs are, therefore, accounted for in the calculation as allowed under the MGA. Based on the development forecast, the analysis calculated the off-site levy rate that is required to finance the discounted development related capital spending plan including provisions for any borrowing. The 10 year forecast for Municipal Price Index (3.3%) was used for discounting and escalation rates. The following tables summarize the assumptions used in the calculation of the water and wastewater off-site levies.

Table 39 - Interest Rates Used

Projected Borrowing	25 Year Term	10 Year Term
2016	3.50%	2.5%
2017	4.00%	3.0%
2018	4.50%	3.5%
2019	4.75%	3.8%
2020	5.00%	4.0%
2021	5.25%	4.3%
2022	5.50%	4.5%
2023	5.50%	4.5%
2024	5.50%	4.5%

Table 40 - Land Forecast in Hectares

Projected Borrowing	Residential	Industrial / Commercial	Total
2016	276	125	401
2017	276	125	401
2018	276	125	401
2019	276	125	401
2020	276	125	401
2021	276	125	401
2022	276	125	401
2023	276	125	401
2024	276	125	401

Figure 12 - Wastewater Collection Projects

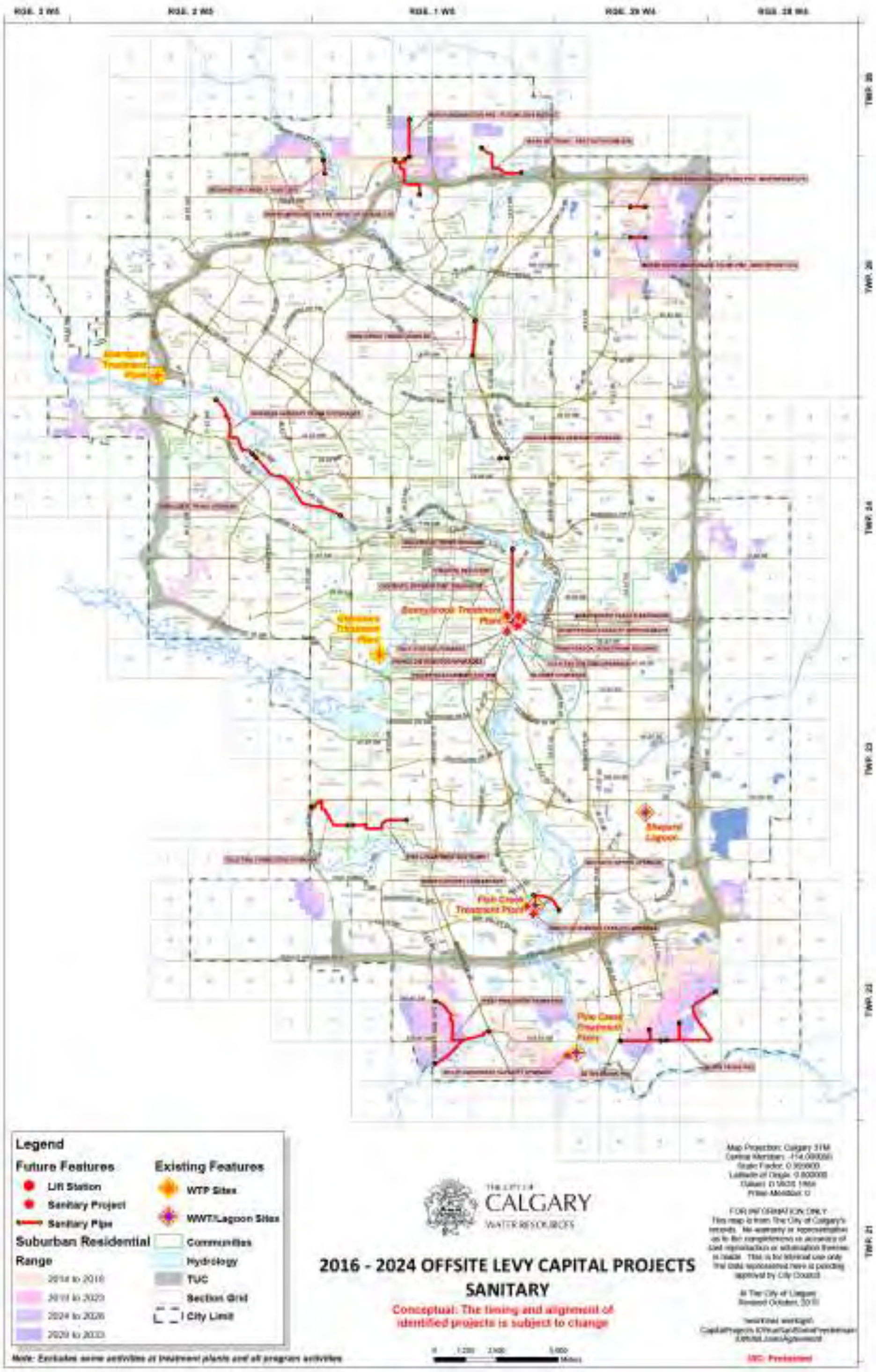


Figure 13 - Water Distribution Projects

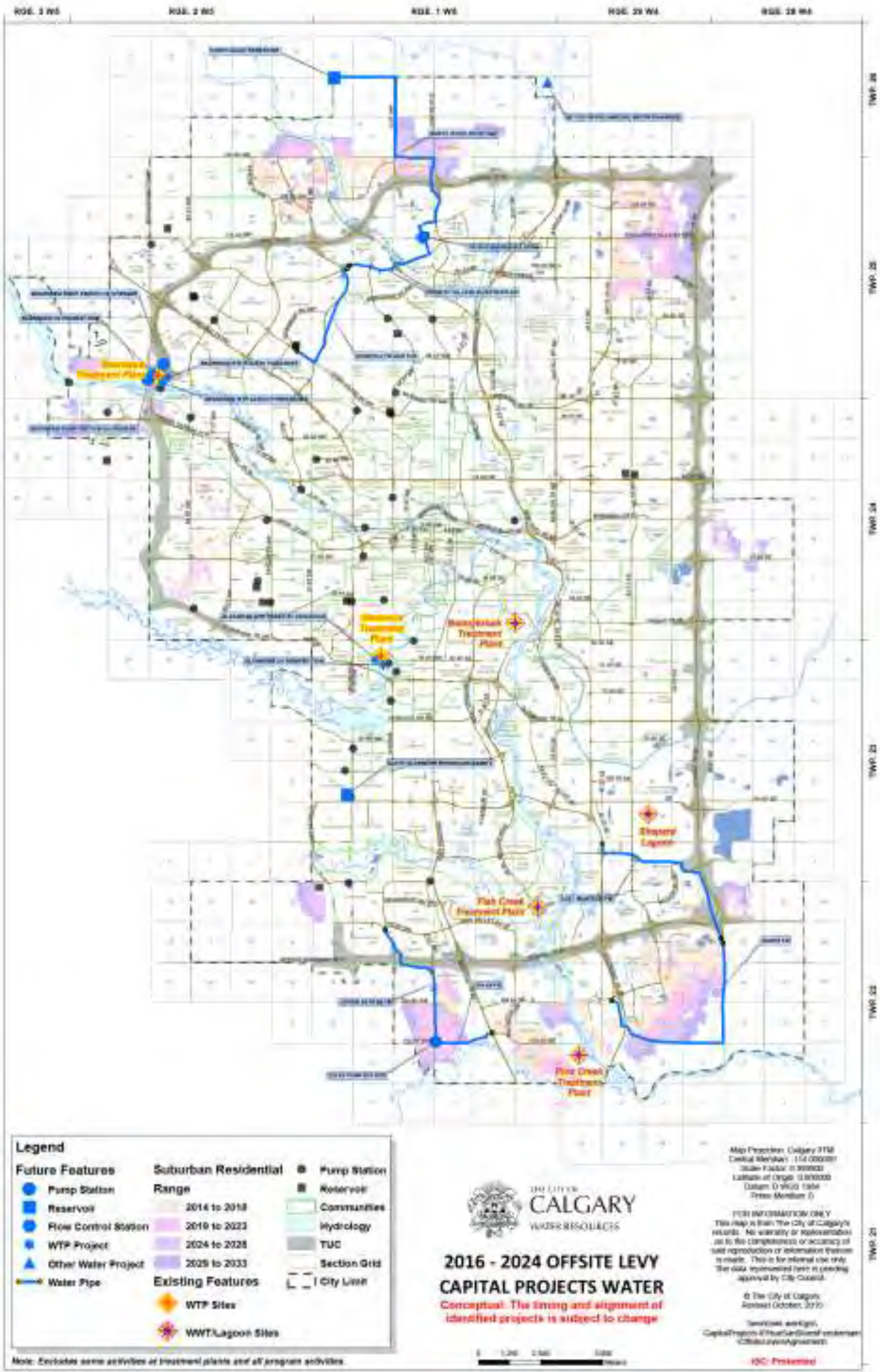
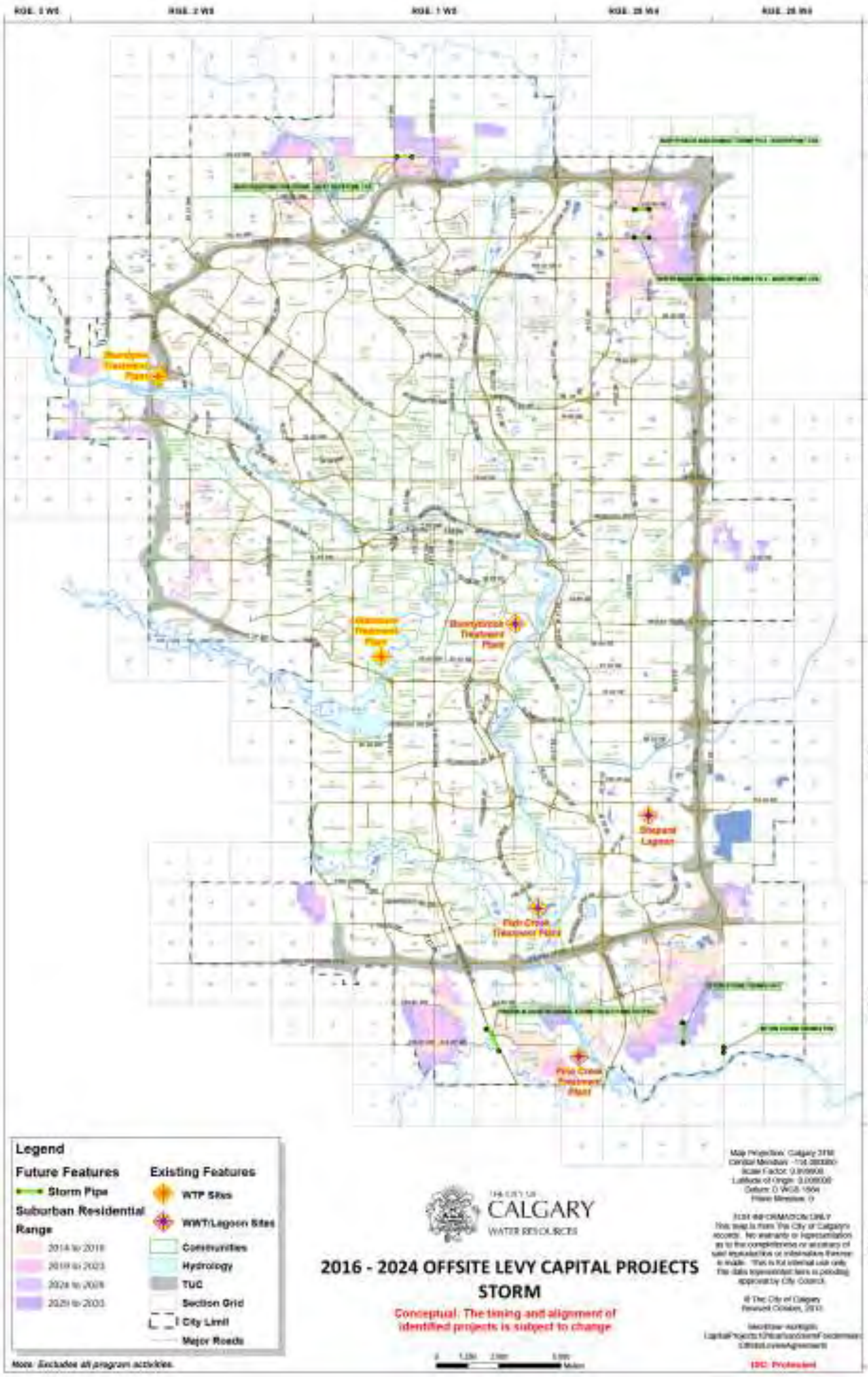


Figure 14 - Drainage Projects



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APPENDIX D – COMMUNITY SERVICES PROGRAM

D.1 Public Libraries (Calgary Public Library)

The key strategic document used to develop this off-site levy for public libraries was the Calgary Public Library (CPL) Master Facility Plan, Beyond the Box (2010).

Level of Service

There exists a number of methods to measure the amount of library service provided by municipalities to citizens. The most common method is square feet per capita which is used by The City of Calgary. Information collected by the Canadian Urban Library Council (CULC) notes the average sq ft per capita of participating members (approximately 32 Canada wide members who reported into CULC for 2013) as 0.54 sq ft per capita[1].

Library Trends

Library sizes have increased as libraries have added technology and additional formats of materials to their more traditional fare. Libraries have also added more meeting and gathering space to reflect the expanding role of public libraries as centers of community life. The amount of space required by a public library depends on the unique needs of the individual community. In traditional library planning methodology, libraries use a variety of standards to calculate required building size for an area.

Library Sizing

The location and size of a library are dependent on a number of variables, including the distance to other libraries, the presence of natural or man-made travel barriers, the availability of suitable sites and the interest of complementary site partners. User penetration has been shown to decline significantly with distance. CPL combines these factors with the population of the proposed service area when determining location and size of library projects. CPL recognizes the financial benefits and end-user convenience of co-locating but it is not a requirement.

Over the last 15 years, most new libraries have been co-located with recreation amenities and have averaged nearly 18,000 sq ft. This is a size that balances operating costs for the CPL and travel distances for users in a suburban setting. Calgary and other municipalities have a great deal of similarities when it comes to programming pieces between libraries across Canada. The CULC identifies its member's average branch library size as 16,722[2] Sq ft.

For greenfield development areas, library infrastructure costs are based on the baseline library size of 18,000 sf and 0.36 sf of library required per capita

[1] Based on 2013 Canadian Public Library Statistics, http://www.culc.ca/cms_lib/2013%20CULC%20Library%20Statistics.pdf

[2] From Canadian Urban Library Council – 2013 KPIs, http://www.culc.ca/cms_lib/2013%20CULC%20Branch-Level.pdf

Infrastructure Costs

The following table identifies costing from a variety of co-located libraries based on budgeted (B) and actual (A) costs.

Table 41 - Precedent Costs from a Variety of Co-located Libraries

Library	CPL Land (acres)	Gross Library Size (per sf)	Library Development Costs			Total	Total Cost per sf
			Building Development	Furniture, Fixtures & Equipment	Site Development		
Genesis Phase 1 **(2011)**	1.89	18,783	$ 5,100,000 (A)	$ 1,165,240 (A)	$ 1,140,000 (A)	$ 7,405,240	$ 394
Seton **(2018)**	1.45	24,100	$ 8,630,000 (B)	$ 2,200,000 (B)	$1,820,000 (B)	$ 12,650,000	$ 525
Quarry Park **(2016)**	1.26	13,455	$ 4,670,000 (A)	$ 800,000[3] (B)	$ 860,000 (A)	$ 6,330,000	$ 470
Average	1.54	18,799	$ 6,133,333	$ 1,388,413	$ 1,273,333	$ 8,795,080	$ 463
Contingency (10%)							$ 46
Revised Average							$ 509

*** FFE does not include costs associated with materials, books etc.*
**** includes purchase cost, acreage assessment, off-site servicing, on-site servicing & improvements*

The projected costing for a co-located library in 2015 is shown in the following table (rounded / priced per sf).

Table 42 - Projected Cost for a Co-located Library in 2015

Component	2015 Costs
Building Development	$ 327 per sf
Furniture, Fixtures and Equipment	$ 74 per sf
Site Development (acquisition & development cost) per acre	**$826,839 / acre**
Total Costs per sf	**$509 per sf**

[3] Quarry Park FFE was reduced due to the transfer of FFE from Glenmore Square Branch in Ogden

The following tables outline the projected forecasted infrastructure costs for the Greenfield Area of the City.

Table 43 - Greenfield Forecasted Infrastructure Costs (2015-2044)

Sector	Population Change	Library Requirement (pop x 0.36 sf)	2015 Cost (library x $509 sf)
Total	340,918	122,730	62,469,814

D.2 Emergency Response Stations (Calgary Fire Department)

The key strategic document used to develop this community services charge for fire services was the Calgary Fire Department's 30 year Infrastructure Plan (2014-2043).

Level of Service

Identification of a need for an emergency response station is dependent on many different factors including, but not limited to, actual and forecasted incident volumes, actual and simulated response times, existing and/or proposed population sizes, geographic layout and geographic size, identified risks (existing and, if possible, proposed), and area land use zoning.

Given Calgary's risk environment and to measure its level of preparedness to respond to emergencies, Calgary Fire Department (CFD) identified in its Service Level and Response Time Targets plan, the number of fire stations per capita would be at or near comparable Canadian cities[4]. The population protected per station is a rough indicator of the workload the Calgary Fire Department (CFD) can expect and is based on the resident population protected (it does not include visitors or non-resident workers).

In 2008, the fire station per capita comparisons equalled approximately 25,000 persons. CFD chose to use the population protected per station for every 30,000 persons as a measure for communities on the periphery.

[4] Comparable cities include but are not restricted to: Mississauga, Vancouver, Regina, Ottawa, Edmonton, Toronto and Montreal.

Infrastructure Costs

The following table outlines the cost of providing a new facility and how this was determined.

Table 44 - Emergency Response Station Facility Costs (Actuals)

Component	2015 Costs	
	3-Bay Station (Seton[5], 23,842 sf[6])	
Building Construction	$14,354,930	
Construction		11,012,623.90
Consulting		1,801,888.04
Contingency (10%)		1,281,450
Equipment (Machinery, Duty Gear, Installation)		13,412.09
FFE (i.e. furniture / equipment)		82,615.57
Misc		162,939.81
Land (serviced)	$2,606,265	2.74 acres[7]
Apparatus	$1,027,350	
Engine		840,000
Equipment		187,350
Total Costs	**$17,988,545**	

D.3 District Office (Police)

The key strategic document used to develop this community services charge for future district offices was the Calgary Police Service's (CPS) Facilities Master Plan 2016–2025 / 2025-2035 (anticipated completion 2016).

Level of Service

Utilizing current information coupled with the findings from the future CPS Facilities Master Plan, it is determined that the average of 149,000 people are served by one district station

[5] Seton Emergency Response is shared with four City of Calgary business units. Other space allocation is as follows: Calgary Police Service (2,650 sf), Animal Bylaw Services (3,143 sf), Parks (2,230 sf), shared common (3,990 sf).

[6] Emergency Response specific area with their proportionate allocation of shared common.

[7] Total land purchase price for multi-use facility was 4.7 acres with lands allocated to Emergency Response and Corporate Properties. Price was $950,000 acre.

Infrastructure Costs

The following table outlines the cost of providing a new facility and how this was determined.

Table 45 - Police District Office Costs (Projected)

Component	2015 Costs		
	Component Cost	Size	Cost Per Unit
Building Construction[8]	$22,500,000	45,000 sf (4,180 s.m.)	$500 / sf
Consulting	$2,000,000	-	-
Site Development	$2,000,000	5 acres	$400,000 / acre
Contingency (10%)	$2,650,000		
Public Art (1%)	$291,500		
Land - Includes raw land purchase price and land servicing costs (i.e. building site, drainage, paving and landscaping)	$5,500,000	5 acres	$1.1 M / acre
Total Costs	**$34,941,500**[9]		

D.4 Recreation Centres (Recreation)

The projected infrastructure needs identified in this section are guided by the 2015 Facility Development and Enhancement Study (FDES), and facilitated by on-site delivery of programs and services during community build out.

Level of Service

The City's goal is to develop smaller regional facilities that can be built out as the community grows rather than building larger regional facilities which will take much longer to build. The provision of a recreation facility is population based. The City is using a catchment population of 40,000 to 80,000 people for a small regional recreation facility. The current average population catchment within approved/planned ASPs is 63,000 people/recreation centre. The charge will be based on average recreation centre coverage of 63,000 people.

[8] Building costs do not include furniture, fixture and equipment (FF&E). While FF&E is a capital cost associated with growth these expenses will be covered through operating.

[9] While capital costs related to Police patrol and investigative fleet have been excluded from this calculation, this capital investment required to service growth should be revisited.

Infrastructure Costs

The following table outlines the cost of providing a new facility and how this was determined.

Table 46 - Small Recreation Centre Costs

Component	2015 Costs, Facility Development & Enhancement Study Proposed Baseline		
	Component Cost	Size	Cost Per Unit
Building Construction - includes parking; on-site servicing; project administration; consultant fees.	$47,678,000[10]	125,000[11][12] sf	$380 / sf
Site Development - includes servicing, grading, parking etc.	3,165,000	-	-
Contingency (10%)	5,084,300		
Soft Costs - includes design, permits geotechnical testing / reports, land use etc.	6,537,653	-	-
Public Art (1%)	624,650		
Land (serviced)	$13,200,000	12 acres	$1.1 M / acre
Furniture & Equipment	$4,312,475		
Total Costs	**$80,602,078**		

* Facility costs represent baseline condition which includes aquatics, gymnasium, fitness, meeting spaces and support services (daycare and food services). Amenities beyond this level of service which provides a higher level of service include but are not limited to ice rinks, dry-land sport fieldhouses, art studios, performing art theatres, climbing walls, and youth centres.

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[10] Variance from June 16, 2015 figure are the result of: removal of Quarry Park methane mitigation, owner internal costs, and alignment with an "optimized facility" as per the Facility Development & Enhancement Study (2015).

[11] The proposed 125,000 sq. ft. facility is of a size that will effectively and efficiently meet regional recreation needs while not being of a size (e.g. Rocky Ridge Regional Recreation Facility: 284,000 sq. ft.) that will require significantly more funds and thus time to construct (i.e. a smaller facility can be built in a timely manner to meet the needs of developing communities). Note: the above calculation provides 1.98 sq. ft. of facility per person in the catchment area of 63,000 people. This aligns with the FDES recommendation of 2 sq. ft. per person

[12] Variance from June 16, 2015 is the result of a more detailed analysis by square foot and alignment with the "optimized facility" as per the Facility Development & Enhancement Study (2015).

D.5 Transit Buses (Transit)

Level of Service

The need for transit buses in greenfield communities is based on existing average transit bus route coverage. Current transit bus requirement in greenfield neighborhoods is six buses per 20,000 population.

Infrastructure Costs

The average cost of a new transit bus in 2015$ is $411,000.

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GLOSSARY

Area-Specific Off-Site Levies	Levies determined for different areas according to geographic zones or other distinctive areas based on technical reasons
Build Calgary	A collaborative cross-corporate team formed by the City of Calgary
Carry-Forward Levy Fund Balances	Current account balances for existing levy funds incorporated into updated levy calculations.
City-wide Off-Site Levies	The same levy cost is applied regardless of the location of the development
Commercial Development	A use identified on a development permit, and any uses that are ancillary to the principal use listed on a development permit, that are neither *residential development* nor *industrial development*.
Community Services Charges Resolution	Council resolution that establishes the growth driven costs and charges related to community infrastructure not included in the Bylaw. Types of infrastructure included in the Community Services Charges resolution are emergency response stations, recreations centres, public libraries, transit buses and police district stations.
Cost of Capacity Method	Determines the appropriate amount to charge new development for additional capacity.
Cottage Housing Cluster	A development form as defined in the City of Calgary Land Use Bylaw 1P2007
Developed Area	Developed Area is identified in the MDP and is considered to be all communities that were completely constructed prior to the approval of the MDP.
Developing Area	The Developing Area is identified in the MDP and is considered to be all communities that had no or only partial urban development prior to approval of the MDP.
Development Agreement	A legal contract between The City and the Developer that sets out the terms and conditions under which development of the lands are to take place within the city including the responsibility to construct public facilities and associated financial obligations.
Established Area	Area of the city as shown in Figure 2 of this report to be charged the Established Area levy.
Greenfield Area	Area of the city as shown collectively the areas identified as “Greenfield Area by Watershed” in Figure 2 of this report to be charged the Greenfield Area levy.
Gross Floor Area	Development building gross floor area as defined in the Land-Use Bylaw
Industrial Development	A use identified on a development permit, and any uses that are ancillary to the principal use listed on a development permit, listed in the following City of Calgary Land Use Bylaw 1P2007 Schedule A Group of Uses: a. Direct Control Uses, with the exception of the following specific uses: i. Adult Mini-theatre, ii. Emergency Shelter, iii. Gaming Establishment – Casino, iv. Jail; b. General Industrial Group;

	c. Industrial Support Group, with the exception of the following specific uses: i. Artist Studio, ii. Health Services Laboratory – Without Clients, d. Storage Group; or e. One of the following specific uses: i. Auction Market – Other Goods, ii. Auction Market – Vehicles and Equipment, iii. Restored Building Products Sales Yard , iv. Bulk Fuel Sales Depot, v. Fleet Service, vi. Large Vehicle Service, vii. Large Vehicle and Equipment Sales, viii. Large Vehicle Wash, ix. Recreational Vehicle Sales, or x. Recreational Vehicle Service.
Multi-Residential Grade-Oriented	Development with 3 or 4 units, regardless of form OR 5 or more units, where the units are provided in a Cottage Housing Cluster, Townhouse or Rowhouse building
Multi-Residential Non Grade-Oriented (1 Bedroom or Less)	Development with 5 or more units, where the units are provided in a Multi-Residential Development that are not provided in a Cottage Housing Cluster, Townhouse or Rowhouse building and has 1 bedroom or less.
Multi-Residential Non Grade-Oriented (2 Bedroom or More)	Development with 5 or more units, where the units are provided in a Multi-Residential Development that are not provided in a Cottage Housing Cluster, Townhouse or Rowhouse Building and has 2 bedrooms or more.
Non-Residential Growth	Development associated with industrial, commercial and institutional land uses.
Off-Site Levy Bylaw Project	The Off-Site Levy Bylaw project is a review and major update of The City of Calgary's transportation, water resources and community services charges for off-site infrastructure impacts related to growth.
Residential Development	A use identified on a development permit, and any uses that are ancillary to the principal use listed on a development permit, listed in the following City of Calgary Land Use Bylaw 1P2007 Schedule A Group of Uses: a. Residential Group (except Hotel)
Rowhouse	A development form as defined in the City of Calgary Land Use Bylaw 1P2007
Semi-Detached / Duplex	Development with only 2 units
Single Detached	Development with only 1 unit
Site Development Area	Area of land that is the subject of a development permit, and may be portions of, or all of one or more areas of land described in a certificate of title or described in a certificate of title by reference to a plan filed or registered in a land titles office
Townhouse	A development form as defined in the City of Calgary Land Use Bylaw 1P2007
Watershed Catchment Area	An area of land where surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another waterbody, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.

ACRONYMS

MGA	Municipal Government Act
GMSGC	The City of Calgary's General Managers Strategic Growth Committee
ALT	The City of Calgary's Administrative Leadership Team
MDP	Calgary Municipal Development Plan
CTP	Calgary Transportation Plan
LRT	Light Rail Transit
RTM	The City of Calgary's Regional Transportation Model
VKT	Vehicle Kilometres Travelled
CFA	Construction Financing Agreement
EP	Equivalent Population
ASP	Area Structure Plan
CPS	Calgary Police Services
CFD	Calgary Fire Department
CPL	Calgary Public Library
CULC	Canadian Urban Library Council
FDES	Facility Development and Enhancement Study

Charge Component	$/ha
Emergency Reponses Facilities	$19,615/ha
Calgary Public Library (Libraries)	$5,971/ha
Calgary Police Service (District Stations)	$7,650/ha
Recreation Facilities	$41,600/ha
Calgary Transit (Buses)	$4,007/ha
Community Services Total Charge	**$78,850**

All rates will be adjusted annually by using the average Statistics Canada non-residential construction price index for Calgary for the previous four published quarters.

2016 Work Plan

Purpose: To prepare a high level work plan and a set of key deliverables to resolve issues identified during the off-site levy process (that are not resolved through the calculations of off-site levies).

Commitment: Administration and industry would like to continue with the collaborative approach on important work that was started as part of the Off-site Levy Bylaw process. As a result this work plan for 2016 was created. City and Industry commitment to resources is needed to achieve the outcomes. Working groups with cross-corporate internal representatives and members of industry will be established to oversee and review the impacts of both the off-site levies and community service charges and other development related policies, processes and strategies.

Initiative 1 ***Establish Industry/City Collaboration Committee***				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
X				1. Create an ongoing and formalized steering committee with representatives from the Industry and City Administration: • Create sub-committees for Greenfield, Established, Industrial and Commercial/Retail/Office. • To provide insight and perspective on outcomes and deliverables ensuring connectivity and alignment with the MDP/CTP. • Develop a terms of reference.

Initiative 2 ***Phasing Growth/Land Supply Strategy***				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
X				1. Review and amend Growth Management Overlay process • Streamline governance model. • Complete the inventory of likely candidate areas, background information and issues. Work with landowners. Establish objectives/principles.
X	X			2. Finalize criteria for analysis and develop process steps • The City will establish a connection between growth management and infrastructure investment through Build Calgary. The intent is to prioritize infrastructure to open up lands matched to City investment capacity and potentially budget approval, and in combination with options for landowners to provide alternative funding mechanisms. Growth Management Overlays will be removed concurrently with outline plan process after servicing capacity has been confirmed.
X	X	X	X	3. Implement new approach.

Initiative 3 *Established Area Strategy*				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
X	X	X	X	1. Understand infrastructure capacity in Established Areas, prioritize areas for further analysis in coordination with Business units, such as corridors, main streets and activity centres, with industry input, and identify funding approaches. Areas of consideration include, but are not limited to, the following: • Water, storm & sanitary upgrades • Community amenities funding
X	X			2. Complete inventory of all costs imposed on development permits and review cumulative effect and relevancy, including reviewing Special Maintenance Agreements and the Centre City Levy program.
	X	X	X	3. Review engineering specification impacts. • Identify and prioritize specifications for review
	X	X	X	4. Develop a Public Realm/Community Benefits Strategy
X	X	X	X	5. Progress on Established Area permit approval processes and related issues (acknowledging that public processes will be required), such as: • Permitted Uses • Change of use applications • Land Use Bylaws • Community Engagement • Policy impacts (i.e.: Railway and Centre City design guidelines, Main Streets, Pedestrian strategy, Centre City CR20 C20/R20 Incentives Table) • Timelines
				6. Monitor the impacts of the levy rate on Established Areas Development and gather information to inform the next bylaw review.

Initiative 4 *Funding Growth Strategy*				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
X	X			1. Establish principles that align with Growth Management Overlay process.
X	X	X		2. Explore funding arrangements and options for alternate financing with the industry (i.e.: CFAs, Developer front ending and accompanying endeavours where appropriate and the potential for pay back from other developers) • Research best practices in other municipalities.
	X	X		3. Gather information and analyze annual operating costs to better understand impacts on budget resulting from advancement of additional growth areas.

	X	X		4. Provide more detailed and timely capital plan information to industry, with the intent to provide longer term certainty.
X	X	X	X	5. Continue to improve the annual levy tracking/reporting and governance procedures, e.g. collected, allocated and spent.

Initiative 5 ***Process Improvements Strategy***				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
X	X	X	X	1. Procedure improvements: • Work with industry to address issues previously identified to The City manager. • Areas for improvement: approval process, specifications, inconsistency between policy, regulations & conflict resolution.
X	X	X	X	2. Implement CPAG improvements including: • Governance • Applicant relations • Training o Continue to develop comprehensive program for training staff. o Improve application submission process
X	X			3. Final Acceptance Certificates Process Improvements o Identify issues o Develop solutions in collaboration with industry o Implement recommended changes
X	X	X		4. Address resourcing issues in business units.

Initiative 6 ***Industrial Strategy***				
Timelines				***2016 Actions***
2016 Q1	2016 Q2	2016 Q3	2016 Q4	
		X	X	1. Identify strategies for continued support of industrial development.
		X	X	2. Continued analysis of industrial land supply.
		X	X	3. Monitor the impacts of the levy rate on industrial development and gather information to inform the next bylaw review.
		X	X	4. Review potential policy impacts.

URBAN DEVELOPMENT INSTITUTE – CALGARY
www.udicalgary.com

Date: Monday, December-14-15

To: Brad Stevens
Deputy City Manager
The City of Calgary | Mail Code #8191

From: Guy Huntingford
CEO, UDI-Calgary

Re: 2016 Offsite Levy Bylaw

The Urban Development Institute – Calgary (UDI-C) offers this conditional letter in support of the Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11th, 2016. The Report and attachments support the new off-site levy bylaw that administration is proposing that Council approves.

UDI-C has been part of an industry group that has worked with the City's Build Calgary Team over the past year to produce a new set of offsite levies that will be enabled by the new bylaw. The process to complete this work was thorough and guided by a number of principles that were mutually agreed to. All calculations that informed the levies were made using technical sub-committees, for each infrastructure type, consisting of personnel from both Industry and the City.
UDI-C is confident that the resultant levies have been scrutinized and are accurate, based on the City's data sets provided that includes the projections for population growth. While developers have been paying proportional costs associated with growth infrastructure, except for water and sanitary levies, the new levies now have developers paying for 100% of all proportional costs associated with growth infrastructure.

For both Greenfield and Established area developers, these new levies represent a significant increase over current payments, and Council should be aware that these costs will add additional burden to development and subsequently to new businesses and homeowners.

UDI-C and other members of Industry requested that a comprehensive Work Plan for 2016 be created and added to the list of approvals going to Council as part of the bylaw documentation. Industry has worked with City Administration to craft the Work Plan which is attached to the Council Report. Our support of the Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11, 2016 regarding offsite levies is based on Council's support of the Work Plan, direction to Administration to undertake the Work Plan and any resources required to implement the Work Plan. Industry requests that Council support this Work Plan and direct Administration to enable the Plan and report back to Council semi-annually beginning at the end of June, 2016.

UDI-C would like to acknowledge and thank the Build Calgary team for their collaboration and dedication throughout this past year. We look forward to working closely with the team throughout 2016.

Yours Truly

Guy Huntingford
CEO, UDI-Calgary
On behalf of the UDI-C Board of Directors

Canadian Home Builders' Association – Calgary Region
#100 7326 10 Street NE
Calgary, Alberta
T2E 8W1

T 403.235.1911
F 403.248.1272
E info@chbacalgary.com
W www.chbacalgary.com

Calgary Region
Canadian Home Builders' Association

December 15, 2015

To: Brad Stevens, Deputy City Manager, City of Calgary

From: CHBA-Calgary Region

Re: 2016 Offsite Levy Bylaw

The Canadian Home Builders' Association- Calgary Region offers this letter in support of the Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11th, 2016. The Report and attachments detail the new off-site levy bylaw that administration is proposing Council approves.

CHBA-Calgary Region has been part of an industry group that has worked with the City's Build Calgary Team over the past year to produce a new set of offsite levies that will be enabled by the new bylaw. The process to complete this work was thorough and guided by a number of principles that were mutually agreed to.

All calculations that informed the levies were made using technical sub-committees, for each infrastructure type, consisting of personnel from both Industry and the City. CHBA-Calgary Region is confident that the resultant levies have been fully scrutinized and are accurate based on the City's data sets provided that includes the projections for population growth.

For Greenfield area developers, these new levies represent a significant increase over current payments. However, the new levies now reflect that developers are paying 100% of all proportional costs associated with growth infrastructure.

For those building in the Established area, this new levy adds considerable cost to redevelopment projects of all kinds. Every type of development from a new townhome to a 4 storey wood apartment to a concrete high rise building will be paying this new charge. While the industry is supportive of the need for The City to recoup its investment in growth related infrastructure regardless of where it occurs, we must also be cognizant of the impact this may have on overall affordability in our marketplace.

This is especially relevant in the Established area where projects already suffer from increased uncertainty when it comes to approvals, timing and on site infrastructure needs. In order to address these concerns, many suggestions were made to the Build Calgary team over the past 6-10 months of engagement.

Canadian Home
Builders' Association –
Calgary Region
#100 7326 10 Street NE
Calgary, Alberta
T2E 8W1

T 403.235.1911
F 403.248.1272
E info@chbacalgary.com
W www.chbacalgary.com

Calgary Region

Canadian Home Builders' Association

As a result of those discussions, CHBA-Calgary Region and other members of Industry requested that a comprehensive Work Plan for 2016 be created and added to the list of approvals going to Council. Industry has worked with City Administration to craft the Work Plan and requests that Council support this document, directing Administration to enable the Plan and report back to Council semi-annually beginning end Q2, 2016.

CHBA-Calgary Region would like to acknowledge and thank the Build Calgary team for reaching out to our organization to participate in this important work. Their ongoing collaboration and dedication has been appreciated throughout this past year.

We look forward to working closely with the team throughout 2016.

Sincerely,

Donna Moore

Donna Moore, CEO
CHBA-Calgary Region
donna@chbacalgary.com
(403) 730-4252

NAIOP
COMMERCIAL REAL ESTATE
DEVELOPMENT ASSOCIATION
CALGARY CHAPTER

December 15, 2015

Brad Stevens, Deputy City Manager
The City of Calgary
PO Box 2100, Station M #8032
Calgary, Alberta T2P 2M5

Re: 2016 Offsite Levy Bylaw

NAIOP Calgary is pleased to offer this letter of support of the Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11, 2016 regarding offsite levies. The Report and attachments support the new off-site levy bylaw that Administration is proposing that Council approves.

NAIOP Calgary has been part of an industry group that has worked with the City's Build Calgary Team over the past year to produce a new set of offsite levies that will be enabled by the new bylaw. The process to complete this work was thorough and guided by a number of principles that were mutually agreed to. All calculations that informed the levies were made using technical sub-committees, for each infrastructure type, consisting of personnel from both Industry and the City.

NAIOP Calgary was very appreciative of the Administration's willingness to defer presentation of their report to Council by a month so that the complicated and important work regarding the offsite levies in the Established Area could be further reviewed to ensure, among other considerations, alignment with the goals of the City's Municipal Development Plan (MDP). NAIOP Calgary is comfortable that the water and wastewater treatment levy on a per "Equivalent Person" calculation was fully scrutinized and reasonable, based on the assumptions provided by the City with respect to growth and future cost estimates, and based on the City's data sets provided that include the projection for population growth.

However, we were concerned that while the Greenfield Area is effectively capped at 60 Equivalent People per Hectare for the water and wastewater treatment levy, the Established Area also needed a representative ceiling that accords with the densities for the applicable typologies described. With careful analysis, we worked with City Administration to establish a similar ceiling for the Established Area. We believe the proposed ceiling of 285 Equivalent People per Hectare over the entire Established Area

Tel: (403) 451-6782 400, 1040 – 7th Avenue SW, Calgary, AB Canada T2P 3G9 **Fax:** (403) 244-2340

is reasonable, but needs to be further evaluated over time, and followed up on to ensure that it is equitable. It should be noted that the 285 EP/Ha ceiling is throughout the Established Area, and that this is a density equivalent to a Major Activity Centre in the MDP. Further, Industrial areas do not have a ceiling but are based on 30 EP/Ha which is aligned with industrial density described in the MDP.

Notably, for both Greenfield and Established area developers these new levies represent a significant increase over current payments, and Council should be aware that these costs are passed on to new businesses and homeowners.

NAIOP Calgary and other members of Industry requested that a comprehensive Work Plan for 2016 be created and added to the list of approvals going to Council as part of the bylaw documentation, as there are a number of initiatives and items that need continued discussion. Our support of the Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11, 2016 regarding offsite levies is based on Council's support of the Work Plan, and direction to Administration to undertake and dedicate the resources required to implement the Work Plan. Industry has worked with City Administration to craft the Work Plan which is attached to the Council Report. Industry requests that Council also require the Administration to report back to Council semi-annually beginning the end of June, 2016.

NAIOP Calgary would like to acknowledge and thank the Build Calgary team for their collaboration and dedication throughout this past year, along with UDI Calgary, CHBA Calgary Region and many, many others. We look forward to working closely with the team throughout 2016 and beyond.

Sincerely, on behalf of the NAIOP Calgary Board of Directors

Chris Ollenberger, 2016 Chapter President
NAIOP Calgary

cc: Kathy Dietrich, Jeff Fielding – City of Calgary
UDI Calgary
CHBA Calgary Region

400, 1040 – 7th Avenue SW, Calgary, AB Canada T2P 3G9 **Tel:** (403) 451-6782 **Fax:** (403) 244-2340

BATTISTELLA DEVELOPMENTS

To: Brad Stevens, Deputy City Manager, City of Calgary
Date: December 15, 2015
From: Paul Battistella
Re: Off-site Levy Bylaw

With regards to Deputy City Manager's Office Report to Council for the Combined Meeting of Council on January 11th, 2016

Please accept this letter of support for the above noted bylaw. My name is Paul Battistella. My family has been developing in Calgary's inner city for the past 35 years. I was a member of the external advisory committee. My comments will focus strictly on the Established Area levy.

First, I would like to commend the Build Calgary team for an open, transparent, collaborative process. The biggest success, I believe, was the building of trust between the development industry and the City as we worked together through the process.

The focus of the Established Area Levies on water and wastewater treatment alone is appropriate. I believe this is the only infrastructure component that should be paid by established area growth. The analysis that was done by the Build Calgary Team to arrive the equivalent person cost seems to be reasonable. A lot of time was spent between the City and the development industry to understand and support the calculations.

At the end of the day these additional costs will be passed on to the new homebuyers in established areas. There have been some critical promises made by the Build Calgary team that form a complete package that includes the levy. They are made up of the following:

1) A two-year implementation time frame. Any developer who has acquired land that has not developed did not include the levy cost in their proforma analysis when purchasing their sites. This transitional period helps address a completely new cost not anticipated before.
2) The cap at 285 EP/ha. After much work with Build Calgary this cap was seen as mutually beneficial to both the development industry and the City. The property tax revenues generated by very high-density residential and commercial buildings is a windfall to the City. The incremental operating costs associate with this revenue are marginal and this revenue becomes a very high value annuity to the City that is worth significantly more than the one time cost recovery for the treatment plants.
3) Payment at DCP. This time frame better matches when users actually start to use the treatment system and when funds are received from the end users.

1432 - 1st Street SW Calgary Alberta Canada T2R 0V8 Ph 1.403.264.2992 Fax 1.403.264.2253 www.battistella.ca

BATTISTELLA DEVELOPMENTS

4) The 2016 work plan and established area strategy. Notwithstanding the desires of the MDP, it is very challenging to develop in Calgary's established areas. The often-conflicting requirements and costs that arise from navigating through the City's regulatory process act as a drag on the timely redevelopment of the established area. The work plan is a promise to help explore and address these issues that are both financial and non-financial in nature. This is an extremely important piece of an entire package.

Overall it is always difficult to accept additional costs without some type of tangible marketable benefit. I am able to support this levy because of how we worked with the Build Calgary team and the trust that was established through the process. The result is a very delicate balance that strives to address the challenges of both the City and the re-development industry. Any material modifications made to this result that do not go through a similar process as we did to arrive at it, would erode that trust. I am hopeful that the hard work, thought and energy put into this result is carefully considered as we move forward.

Yours truly,

Paul Battistella

1432 - 1st Street SW Calgary Alberta Canada T2R 0V8 Ph 1.403.264.2992 Fax 1.403.264.2253 www.battistella.ca

The City of Calgary

Final Report

Omni ASP Appeal: Transportation Network Study

City of Calgary PO #: CTYPO0000696542

ORIGINAL

May 22, 2018

City of Calgary

FINAL REPORT

Omni ASP Appeal
TRANSPORTATION NETWORK STUDY

CTYPO0000696542

PERMIT TO PRACTICE
CIMA CANADA INC.
PERMIT NUMBER: P-8204
The Association of Professional Engineers and Geoscientists of Alberta

Prepared by:

May 22/18
Kari Fellows, P.Eng., PTOE
Senior Transportation Engineer

Daniel Krejcik-Rose, P.Eng.
Transportation Engineer

Verified by:

René Rosvold, P.Eng.
Transportation Project Manager

CIMA+
6815 8th Street NE
Suite 300
Calgary, AB T2E 7H7

May 22, 2018

CIMA+ Project Number: CA000431

May 18, 2018

I, Tom Hopkins, M.Eng., P.Eng. authenticate the submission of this document titled *The City of Calgary: Omni ASP Appeal: Transportation Network Study* completed by CIMA+, dated May 2018

TO BE USED

for the purposes of the Omni Area Structure Plan Intermunicipal Appeal. The City of Calgary agrees with the findings and analysis contained within this report. The specific contents of the document remain the responsibility of the engineer of record and their company.

PROFESSIONAL ENGINEER
TOM HOPKINS
ALBERTA

MAY 18, 2018

Professional Engineer Authentication
Tom Hopkins, M.Eng, P.Eng

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CITY OF CALGARY
Signature
Date 2018/05/18
PERMIT NUMBER: P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Corporate Permit to Practice
The City of Calgary

2018/05/18

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Executive Summary

Rocky View County Council approved the Omni Area Structure Plan (ASP) on September 26, 2017. The plan area is directly adjacent to the City of Calgary boundary, covers an area of 1,280 acres, and includes destination commercial, highway commercial, and industrial land uses. The City of Calgary (the City) initiated a Municipal Government Board appeal of the plan, with the primary grounds being impacts on the City's transportation network. This report describes and evaluates the detrimental impacts on City of Calgary infrastructure and transportation operations that would result from full development of the Omni ASP.

Comprehensive analysis was completed to determine a likely land use scenario for the plan area, analyze the impact of development on the City of Calgary's transportation network, and determine City funded upgrades to accommodate and mitigate the impacts of the Omni development. To determine the likely land use, the policy within the ASP, the Rocky View County Land Use Bylaw, and recently approved developments in Rocky View County with land uses and constraints similar to the Omni plan were reviewed and analyzed.

The selection of trip generation rates and equations and the application of site traffic forecasting methods were carefully considered to produce a likely traffic volume scenario, with the recognition that the area could produce even higher traffic volumes. City of Calgary transportation projects required to support Omni were summarized and cost estimates developed for the largest projects. It is expected that 15,339 additional vehicle trips will occur during each weekday afternoon peak hour due to build out of the Omni area.

The large capital infrastructure projects required to support Omni and their estimated costs are summarized in Table E-1.

Of the $240M known costs, $180M have been anticipated in the City's long term plans, but not the current 4-year budget and 10-year capital planning cycles. An additional $60M in known costs has not been planned for by Rocky View County or by the City. Since it is probable that the Omni area will develop in the next 10 years, the City would be forced to advance these projects and defer committed projects currently in the City's budget and plans. This would be detrimental to the City and its citizens.

In addition to projects for which costs have been estimated, there will be significant additional costs for upgrading City infrastructure for projects for which the scope and cost estimates have not yet been determined. These include upgrading interchanges on Stoney Trail at Country Hills Boulevard and McKnight Boulevard, and intersection improvements at existing and future intersections on 84 Street NE.

In addition to capital budget impacts for the City, additional operating expenses will be incurred to operate and maintain the new and expanded roads and respond to emergency calls due to increased motor vehicle collisions.

Table E-1 City of Calgary Infrastructure Costs to Support Omni ASP

Infrastructure Project	Cost Estimate	Funding Mechanism	How is this Accounted for in City Plans?
Stoney Trail & Country Hills interchange upgrade - widening/ twinning structure	$15M	None established	Beyond 4-year and 10-year capital plans
Stoney Trail & Airport Trail interchange - crossing & east ramps	$60M	City budget	Beyond 4-year and 10-year capital plans
Airport Trail west of 60 Street NE to Métis Trail - construct road connection	$20M	City budget	Beyond 4-year and 10-year capital plans
Stoney Trail & 64 Avenue NE - construct flyover	$30M	City budget	Beyond 4-year and 10-year capital plans
Stoney Trail & McKnight Boulevard interchange - upgrade to ultimate	$30M	None established	Beyond 4-year and 10-year capital plans
McKnight Boulevard & 68 Street NE - upgrade intersection to interchange	$70M	City Budget	Beyond 4-year and 10-year capital plans

Infrastructure Project	Cost Estimate	Funding Mechanism	How is this Accounted for in City Plans?
84 Street NE paving, widening, alignment changes to accommodate interchange upgrades and flyovers	$15M City $30M Total	Typically adjacent landowners fund; likely that City will cover half of cost ($15M)	Beyond 4-year and 10-year capital plans
McKnight Trail & 84 Street NE Intersection - partially grade separated intersection (configuration to be determined)	unknown	None established	Beyond 4-year and 10-year capital plans
Potential City Funded Capital Cost	$240M + unknown costs		

1. Introduction

Rocky View County Council approved the Omni Area Structure Plan (ASP) on September 26, 2017. The plan area is directly adjacent to the City of Calgary boundary and covers an area of 1,280 acres. Approximately 660 acres of the plan area is allocated for commercial development, including large destination commercial uses and highway commercial uses. The remaining 620 acres will accommodate industrial development, including office developments.

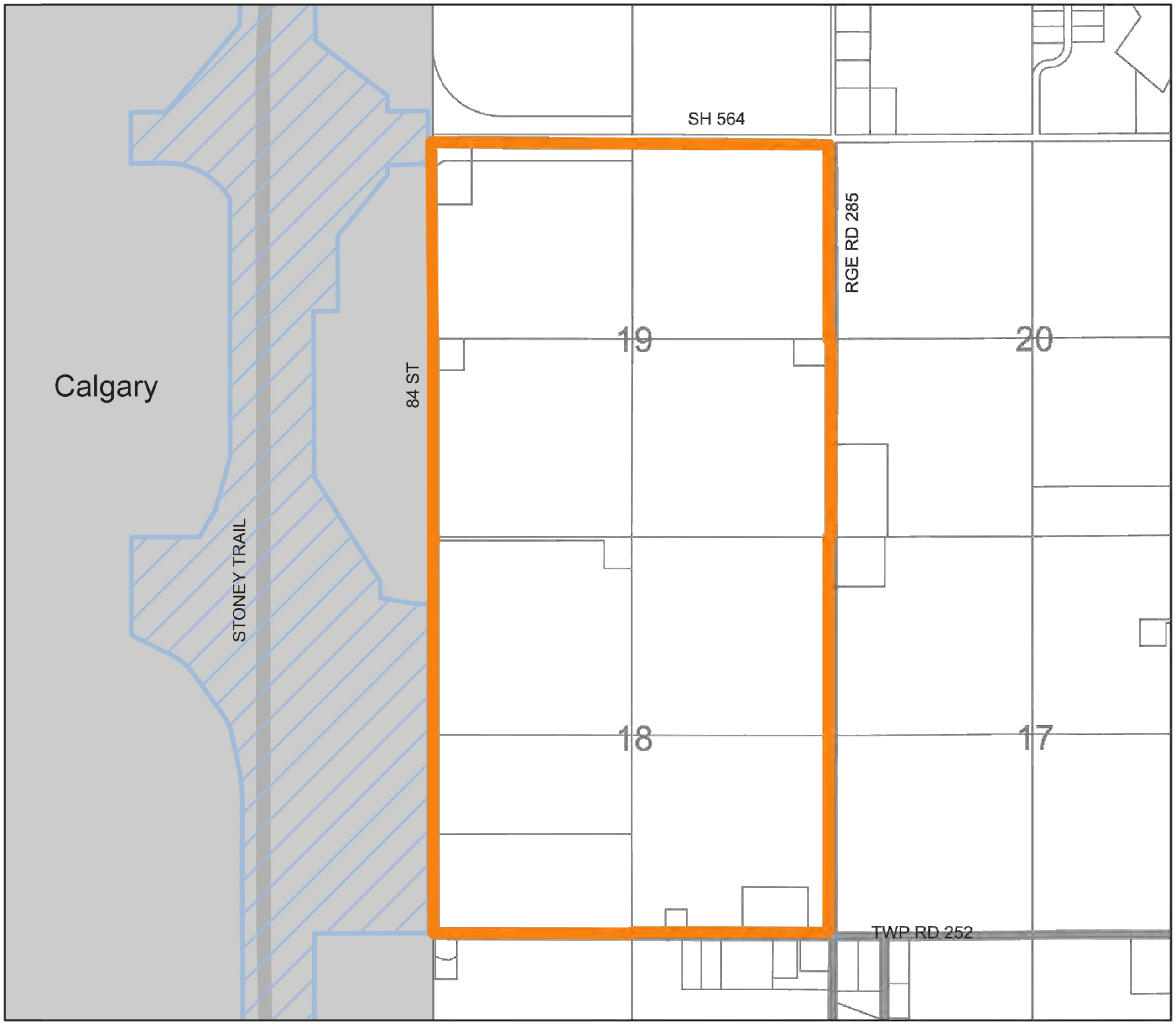
The City of Calgary initiated a Municipal Government Board appeal of the plan, with the primary grounds being impacts on the City's transportation network.

This report describes and evaluates the detrimental impacts on City of Calgary infrastructure and transportation operations that would result from full development of the Omni ASP. The following key questions are answered in the report:

+ What types and sizes of development are allowed under the Omni ASP?
+ How much traffic is development expected to generate?
+ What are the expected impacts on the users of the transportation network?
+ Is there a way to accommodate the plan area's future trips, and if so, what transportation network improvements are required?
+ If potential development to the plan area cannot be accommodated, how does the plan need to change to result in a workable transportation network?

The general location of the plan area, as indicated in the Omni ASP document, is illustrated in Figure 1-1.

References to the Omni Area Structure Plan in this report pertain to the "Omni Area Structure Plan Approved September 26, 2017 Bylaw C-770-2017".

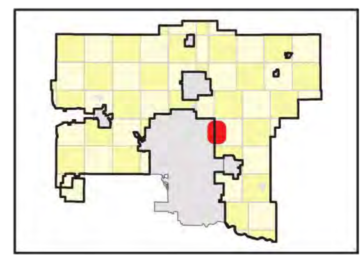


This map is conceptual in nature. No measurements or area calculations should be taken from this map.

Map 1: Plan Area Location

ASP Boundary

Transportation and Utility Corridor



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OMNI ASP APPEAL SUPPORT

FIGURE TITLE

Location of Omni Area Structure Plan

FILE No.	SCALE	FIGURE No.
Figure 1-1 Location of Omni Area Structure Plan.dwg	AS SHOWN	1.1

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2. Potential for Development in Omni Area

An Area Structure Plan (ASP) is a statutory document approved by Council and adopted by bylaw. In Rocky View County, the policies in an ASP form a bridge between the general planning policies contained in the County Plan and the more detailed planning and design direction contained in a conceptual scheme or master site development plan. The purpose of an ASP is to provide guidance for land use changes, subdivision, and development in the area. The Alberta Municipal Government Act states that an ASP must describe:

+ Proposed land uses;
+ Density of population and sequence of development;
+ General location of major transportation routes and public utilities;
+ Any other matters Council considers necessary.

The customary approach to reasonably plan for transportation and public utility needs for an area structure plan is to consider land use policy identified in the ASP itself, plus applicable municipal plans, bylaws, and policies, and develop land use scenarios to sufficient detail that traffic demand can be forecasted. It is prudent to determine the transportation system required to accommodate potential levels of development to verify that the servicing plan can adapt to and accommodate the development allowed for in the ASP.

2.1 Influencing Factors

Factors affecting the types and sizes of future development in Omni Area include:

+ Omni ASP Policy including specific examples of land uses identified in the ASP;
+ Rocky View County Land Use Bylaw;
    - Land use districts that match the land use objectives and policies in the ASP
+ Development Factors for Land Parcels;
    - Area required for roads, utilities, environmental reserve, other factors
    - Stormwater management
+ Development standards;
+ The market for specific forms and types of development and developers' willingness to invest in specific products.

2.1.1 Omni ASP and Rocky View Land Use Bylaw

The Omni ASP covers approximately 1,280 acres of land. Within the ASP, Map 5 indicates the land use scenario for the plan. The Strategy related to the land use plan identifies that approximately 660 acres of the area will be allocated for commercial development and 620 acres for industrial uses. Objectives and policy statements further describe two different focusses for the commercial development: a highway commercial area along the major transportation routes, and the development of destination commercial and associated retail, entertainment, services, and offices. The ASP Land Use Policies describe the areas where the highway commercial and destination commercial will be situated, and lists examples of the types of development for each use.

Prior to development, Rocky View Council must approve land use districts aligning with the ASP policies. Table 2-1 on the following page is a summary of the expected land uses guided by the ASP Strategy, Objectives and Policies, identifying land use districts from the Land Use Bylaw that align with the intent of the ASP.

In addition to land use districts currently in the Rocky View County Land Use Bylaw, a Direct Control (DC) District may be assigned to specific areas to develop unique requirements or address unusual site constraints for an area. DC Districts are not intended to be used in substitution of any other land use district in the Bylaw that could be used to achieve the same land uses.

Table 2-1 Omni Potential Land Use

Land Use (Source: ASP)	Location (Source: ASP)	Approximate Area (acres)	Examples of Development Types (Source: ASP)	Applicable Land Use Districts (Source: Land Use Bylaw)
Destination Commercial	Commercial Area on Map 5, adjacent to Airport Trail extension and along 84 St NE	540	Large-format retail centres	Commercial – Regional Commercial (C-RC)
			Shopping centres	Commercial – Regional Commercial (C-RC)
			Outlet malls	Discretionary use – Commercial – Regional Commercial (C-RC)
			Entertainment	Recreation Business District (B-4) Business – Recreation Destination (B-RD)
			Personal services	Commercial – Regional Commercial (C-RC)
			Office parks	Commercial – Regional Commercial (C-RC) Business – Business Campus
			Institutional uses	Public Services District (PS)
			Seniors housing	Various Residential Districts; Residential Care Facility is a Discretional Use in Commercial – Village Centre (C-VC) Special Care Facility is a Discretionary Use in various Residential Districts

Land Use (Source: ASP)	Location (Source: ASP)	Approximate Area (acres)	Examples of Development Types (Source: ASP)	Applicable Land Use Districts (Source: Land Use Bylaw)
Highway Business Commercial	Commercial Area on Map 5, adjacent to Highway 564 and Township Road 252	120	Banks	Discretionary use – Business – Highway Frontage (B-HF)
			Restaurants	Highway Business (B-1) Business – Highway Frontage (B-HF)
			Service stations	General Business (B-2) Business – Highway Frontage (B-HF)
			Truck stops	Discretionary use – Business – Highway Frontage (B-HF)
			Automotive / recreational vehicle sales	Discretionary use – Business – Highway Frontage (B-HF)
			Tourist accommodations	Highway Business (B-1)
Industrial	Industrial Area on Map 5	620	Office	Business – Business Campus Business – Industrial Campus (B-IC)
			Warehousing	Industrial – Industrial Activity (I-IA)
			Industrial services	Business – Industrial Campus (B-IC)
			Manufacturing	Industrial – Industrial Activity (I-IA)

2.1.2 Estimated Size of Developments

Trip generation for new development is generally a function of the specific land use and the size of buildings for office and commercial uses or the numbers of residential units for residential uses. Trip generation for industrial land uses can be estimated based upon acres of land. The proportion of developable land and size of new buildings depends upon factors such as the amount of land required for roads, utilities, storm ponds and municipal reserve, Land Use Bylaw rules, and restrictions and development type.

To predict expected developable land and building areas for land uses in this area of the Rocky View County, approved Master Site Development Plans and Conceptual Schemes for similar development types were reviewed. Table 2-2 summarizes features and raw land to building area proportions for approved Master Site Development Plans in Rocky View County with land uses like those proposed in the destination commercial area of the Omni ASP.

Table 2-2 Comparable Approved Destination Commercial Sites

Site Name	Approval Date	Site Size (acres)	Site Features, Constraints	Land Uses	Floor Area	Floor Area to Site Size Ratio
Bingham Crossing	Stage 1 November 1, 2012	79.44		• Retail • Office • Senior's Residence	• 270,000 ft^2 Commercial (Retail / Office) • 185,000 ft^2 Senior's Housing (90 units in care building, 53 independent living units, 8 semi-detached villas)	605,000 ft^2 / 3,460,406.4 ft^2 = 0.174
	Stage 2 November 1, 2012			• Senior's Housing	• Estimate 150,000 ft^2 Senior's Housing (53-90 unit independent living/care building, 30 semi-detached villas)	
CrossIron – Cell A-2 CrossIron Mills	April 25, 2006	120	Nose Creek Municipal reserve Historical resources CPR	• Retail commercial	1,100,000 ft^2 commercial	

Site Name	Approval Date	Site Size (acres)	Site Features, Constraints	Land Uses	Floor Area	Floor Area to Site Size Ratio
CrossIron – Cell A-3 CrossIron Common	March 26, 2012	30	Nose Creek Municipal reserve Historical resources CPR	• Retail commercial • Storage	(90,000 + 150,000 + 50,000) ft^2= 290,000 ft^2 commercial	
CrossIron – Cell C	February 5, 2008	70	Nose Creek Municipal reserve Historical resources CPR	• Open space • ER • PUL	0 ft^2	
CrossIron – Cell D CrossIron Common	March 3, 2009	110	Nose Creek Municipal reserve Historical resources CPR		1,015,500 ft^2 commercial	
Sum of Cells A-2, A-3, C, D		330			2,405,500 ft^2 commercial	2,405,500 ft^2 / 14,374,800ft^2= 0.167

Average Floor Area to Total Land Area Ratio = 0.171

These plan areas include similar constraints to the development as found in the Omni area, in particular the presence of wetlands and the incorporation of overland drainage in the site plans. The mix of uses for the sites is similar to what is envisioned for the Omni plan area, suggesting that the average floor area to total land area ratio for these sites is representative of what would be developed for Omni, based upon both market factors and development constraints.

It is notable that the developments used in these examples do not represent the maximum floor areas that could be achieved for development in the Omni area, since building height restrictions for these development types allow for additional floors. Therefore, based upon policy in the ASP and regulations in the land use Bylaw, development in Omni may have larger floor areas.

Table 2-3 below summarizes raw to building area ratios for approved conceptual schemes in Rocky View County with land uses similar to the industrial uses permitted under the Omni ASP.

Table 2-3 Comparable Approved Industrial Sites

Site Name	Approval Date	Site Size (acres)	Site Features, Constraints	Land Uses	Developable Area to Total Area Ratio
Conrich Station	September 29, 2015	728	• Within CSMI boundaries and Shepard Regional Drainage Plan Area • Existing wetlands • Existing gas pipelines	• General Industrial (486.39 ac) • Commercial / Office (39.49 ac)	525.88 ac / 727.43 ac = 0.723
Emcor Business Park	July 29, 2014	315	• Within CSMI area • wetlands		250.45 ac / 314.5 ac = 0.796
Transport Industrial Park	May 4, 2004	112.58	• significant wetland (preserved as storm pond)	• Industrial	105.85 ac / 112.58 ac = 0.938

Average Developable Area to Total Area Ratio = 0.819

These sites are similar in constraints to the Omni lands, being within the Cooperative Stormwater Management Initiative (CSMI) area and having significant wetland areas. The average developable to total area ratio for these is assumed to be representative of industrial sites in the Omni area.

2.1.3 Potential Mix of Land Use Districts

The Omni ASP provides policy and guidance for potential land uses for the three (3) general categories of land use, as summarized in Table 2-1. There is no specific policy limiting or guiding the mix of different land uses within the areas for Destination Commercial, Highway Commercial, and Industrial land uses.

As an example of a potential mix of destination commercial land uses, promotional materials by a developer managing a large portion of this site were consulted. The materials can be found at:

http://theomnicalgary.com/

The types and relative sizes of various uses referred to in this plan are summarized in Table 2-4.

Table 2-4 Envisioned Land Uses for Genesis Omni Project

Land Use Type	Development Size
Showcase Retail	600,000 ft^2
Outlet Centre	325,000 ft^2
Office Campus	500,000 ft^2
Restaurants & Cafes	60,000 ft^2
Senior Active Living	250 units
Business/Boutique Hotels	3 hotels
Children's Creativity Zone	27,000 ft^2

This example of land use mix is representative of market demand for this type of development in the Omni area.

3. Independent Network Analysis

3.1 Introduction

This section forecasts development potential and City of Calgary transportation system network impacts of the Omni Area Structure Plan.

The Plan area covers 1,280 acres in Rocky View County, immediately east of the City of Calgary. Plan area boundaries are Township Road 252 (80 Avenue NE) to the south, Highway 564 (Country Hills Boulevard) to the north, 84 Street NE to the west and 100 Street to the East. The east right-of-way limit of 84 Street NE is concurrent with the municipal boundary between the City of Calgary and Rocky View County.

Figure 3-1 illustrates the land uses for the plan area as indicated in the ASP policy. Highway commercial uses have been superimposed on Map 5 from the ASP to illustrate their locations as described in the ASP policies.

The west limit of the plan area is slightly over 600 metres east of the northeast portion of Stoney Trail, which provides key regional connections to the plan area. East-west connections between the plan area and northwest Calgary can be made via Highway 564 (Country Hills Boulevard) and Township Road 250 (McKnight Boulevard).

The City of Calgary Transportation Plan, which will be developed over the long term, allows for additional east-west connections to this area in the long term with the following projects:

+ Interchange expansion to extend Airport Trail east of Stoney Trail and accommodate all movements at the interchange;
+ A flyover of 64 Avenue NE (potentially transit and active modes only);
+ Interchange upgrades for increased capacity at Stoney Trail & McKnight Boulevard.

These projects will be constructed within the provincial government's Transportation Utility Corridor (the right-of-way for Stoney Trail); however, Alberta Policy TCE-TS-509 advises that the funding of these projects are municipal responsibility. The City of Calgary acknowledges this responsibility and is planning for their funding through the collection of Transportation Off-site Levies.

These projects are anticipated to become required within the 60-year period considered in the Transportation Off-site Levy, but are neither included nor anticipated to be needed to support City of Calgary growth within the 4-year budget cycle or the 10-year plan.

3.2 Approved Plans in the Area

The lands east of Stoney Trail and north of Township Road 250 are currently undeveloped and used for agricultural purposes, with the exception of a few small areas. In addition to the Omni ASP, Rocky View County and the City of Calgary have each approved one ASP in the area, described below. The balance of lands in the area are unplanned at the time of writing this report. Figure 3-2 illustrates the locations of the East Stoney and Conrich areas relative to the Omni area.

3.2.1 East Stoney Area Structure Plan, City of Calgary

The East Stoney ASP covers 235 acres between Stoney Trail to the west, 84 Street NE to the east, McKnight Boulevard to the south and Airport Trail to the north. Land use for the area will primarily be residential and will include a school and neighbourhood scale commercial services. Approximately 5,000 residents and 750 jobs are anticipated for the area once fully built out. Future local transit will service the ASP area linking the site to LRT stations in Northeast Calgary.

Development in the East Stoney Area is conditional on removal of the Growth Management Overlay to confirm City of Calgary servicing standards can be met.

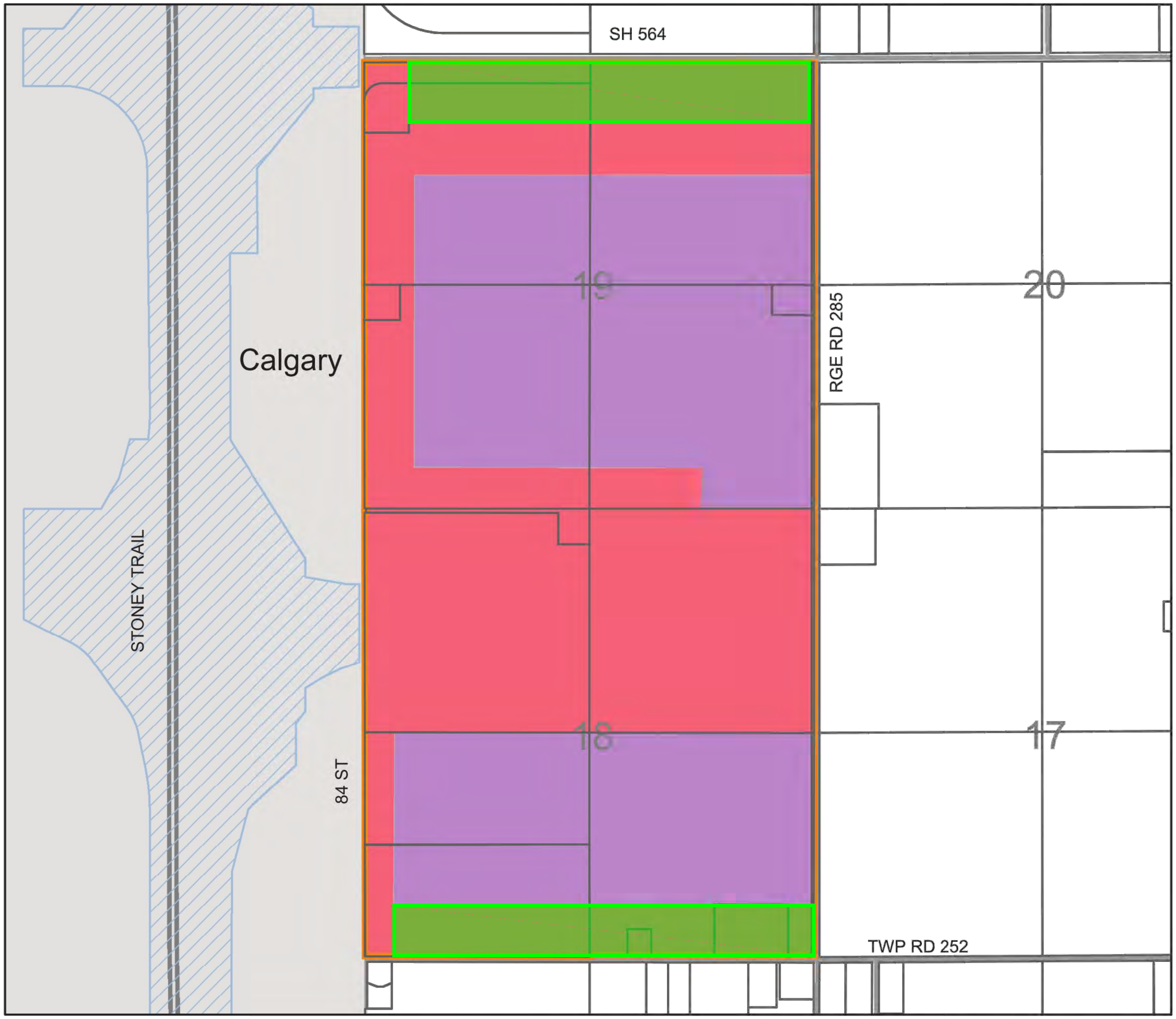
3.2.2 Conrich Area Structure Plan, Rocky View County

The Conrich ASP covers 10,876 acres of land, which includes the existing hamlet of Conrich and the CN Logistics Park. Rough boundaries for the plan area are Highway 1 to the south, Township Road 252 to the north, 84 Street NE to the west and Range Road 282 to the east (Figure 3-2 shows boundaries more precisely). Within the plan area, a number of land uses are identified, with some parcels identified as future policy areas to be determined at a later date.

Approved land uses include:

+ Residential;
+ Institutional;
+ Industrial;
+ Heavy industrial;
+ Highway business.

Map 5: Land Use Scenario



- ASP Boundary
- Commercial
- Light Industrial
- Transportation and Utility Corridor
- Highway Commercial

This map is conceptual in nature. No measurements or area calculations should be taken from this map.

Area Structure Plan
OMNI

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FIGURE TITLE
Land Uses in Omni Area

FILE No.	SCALE	FIGURE No.
Figure 3-1LandUse.dwg	AS SHOWN	3.1

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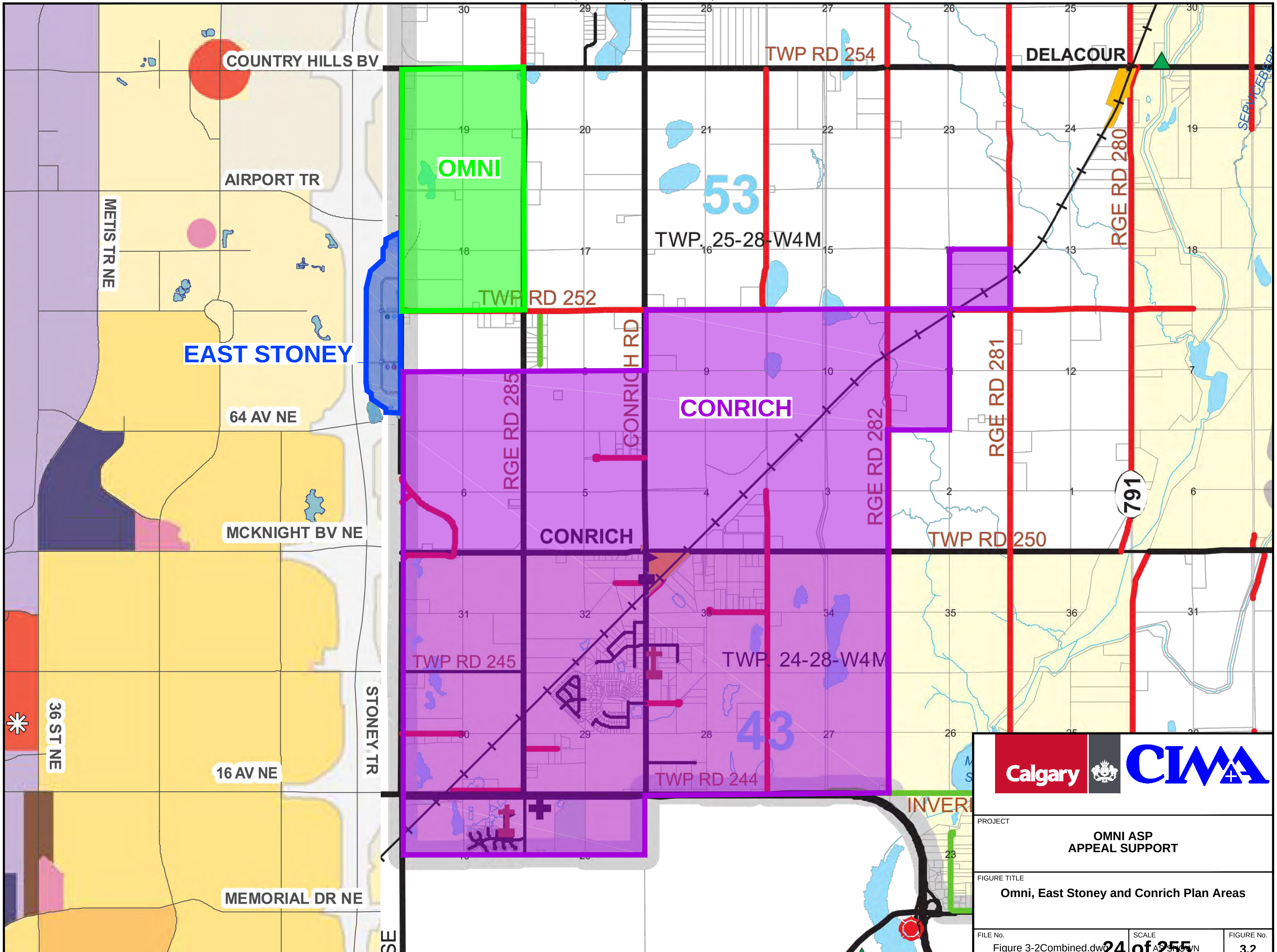

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FIGURE TITLE

Omni, East Stoney and Conrich Plan Areas

FILE No.	SCALE	FIGURE No.
Figure 3-2Combined.dwg	AS SHOWN	3.2

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3.3 Existing Transportation System

The road network providing transportation service to the Omni ASP area includes the following infrastructure under City of Calgary jurisdiction, or subject to funding of improvements by the City of Calgary:

+ 84 Street NE;
+ Stoney Trail & Country Hills Boulevard/Highway 564 interchange;
+ Stoney Trail & McKnight Boulevard Interchange.

There is currently only a partial interchange for Stoney Trail & Airport Trail, with ramps between the west and south. The area east of Stoney Trail cannot be accessed via Airport Trail at this time.

3.3.1 84 Street NE

This street currently has approximately 20.1 metres of right of way and a gravel surface with open ditches for drainage. Approaching the intersections of McKnight Boulevard and Country Hills Boulevard, the alignment shifts into Rocky View County. The reason for these alignment changes is to allow sufficient distance between the Stoney Trail interchanges and the intersections. Where the alignment shifts, the street changes jurisdiction from the City of Calgary to Rocky View County.

Both intersections are stop controlled for 84th Street NE. The speed limit in the study area is 50 kilometres per hour.

Mediation between the City of Calgary and Rocky View County over the Conrich ASP established a joint Calgary-Rocky View study to cooperatively determine the future cross section, alignment, classification, and access management for 84 Street NE. The 84 Street study has not been approved by the City of Calgary at the time of writing this report. It is expected that 84 Street NE will have two (2) lanes in each direction in its ultimate configuration.

3.3.2 Country Hills Boulevard / Highway 564

The jurisdictional change for Country Hills Boulevard and Highway 564 is the Calgary city limit. Alberta Transportation is responsible for the road east of Calgary. Highway 564 extends about 100 kilometers east on an east-west alignment before continuing on a north-south alignment. Country Hills Boulevard extends through the City following an east-west orientation to the City's west limit. West of Stoney Trail, Country Hills Boulevard is an arterial street.

Both east and west of the boundary, the road is paved with two (2) basic lanes. From 84 Street NE eastward, the speed limit on Country Hills Boulevard is 100 kilometres per hour. Across the Stoney Trail interchange, the speed limit is 80 kilometres per hour, and west of the interchange the speed limit is 50 kilometres per hour.

The intersection of Country Hills Boulevard with 84 Street NE is controlled by stop signs on 84 Street NE. The alignment of 84 Street shifts to the east, with small radius curves to achieve adequate distance from the ramp terminal at the Stoney Trail interchange. There are auxiliary right turn lanes for turning from Highway 564 onto 84 Street NE, and acceleration tapers are provided for vehicles turning right from both 84 Street approaches onto Highway 564.

Stoney Trail has a parclo A4 interchange with Country Hills Boulevard. Ramp terminals are stop controlled.

3.3.3 McKnight Boulevard / Township Road 250

Township Road 250 currently has a four (4) lane divided cross section between the Stoney Trail east ramp and 100 Street NE. The Township Road is in Rocky View County jurisdiction, and the speed limit is 80 kilometres per hour between 100 Street NE and 84 Street NE, and 70 kilometres per hour west of 84 Street NE. McKnight Boulevard currently has two (2) lanes in each direction west of the Stoney Trail eastbound to southbound ramp, and a single (1) eastbound and two (2) westbound lanes across Stoney Trail. Jurisdiction of the road changes at the municipal boundary.

The intersection of Township Road 250 & 84 Street NE is stop controlled for 84 Street NE. The alignment of the 84 Street NE approaches shifts to the east to allow adequate distance from the Stoney Trail ramp terminals. There are small radius curves on the south leg and large radius curves on the north leg.

3.4 Existing Traffic

Since existing land uses in the plan area and in all directions except to the west are primarily agricultural with a few residential properties, existing traffic volumes are relatively low.

There is currently no public transit service provided by Rocky View County, and the nearest transit stops are further than the 600-metre distance desirable to be considered a reasonable walking distance. Although Calgary Transit is evaluating the possibility of future regional transit service serving some areas in Rocky View County, this area is not currently under consideration for such service.

Existing traffic volumes are illustrated in Figures 3-3A to 3-3D.

3.5 Future City of Calgary Transportation Projects

The City’s long-term plans include a number of major transportation projects in this area in anticipation of future development in the East Stoney and Conrich areas.

Projects and their funding status are summarized in Table 3-1.

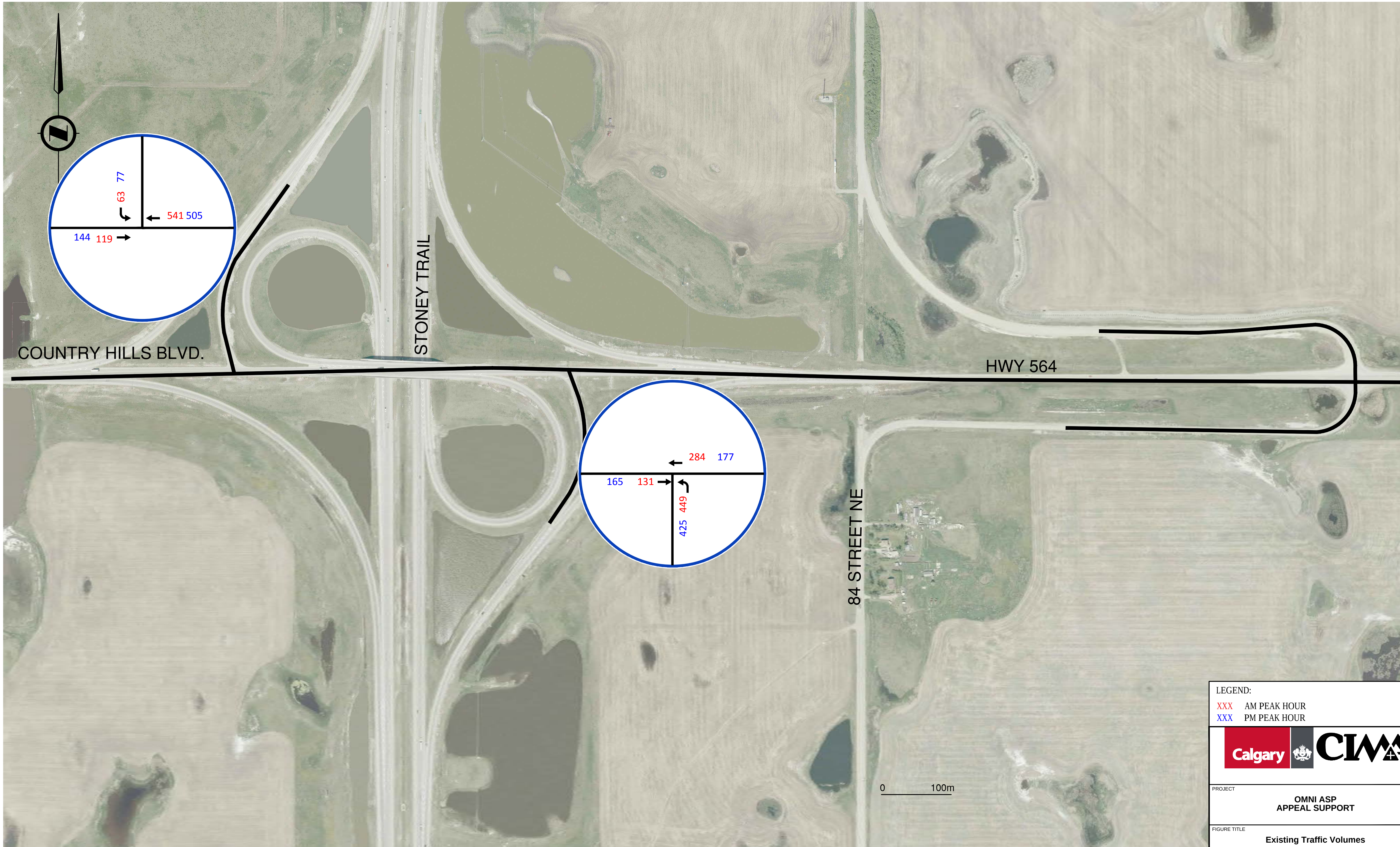

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FIGURE TITLE
Existing Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-3 Existing Traffic Volumes.dwg	AS SHOWN	3.3A

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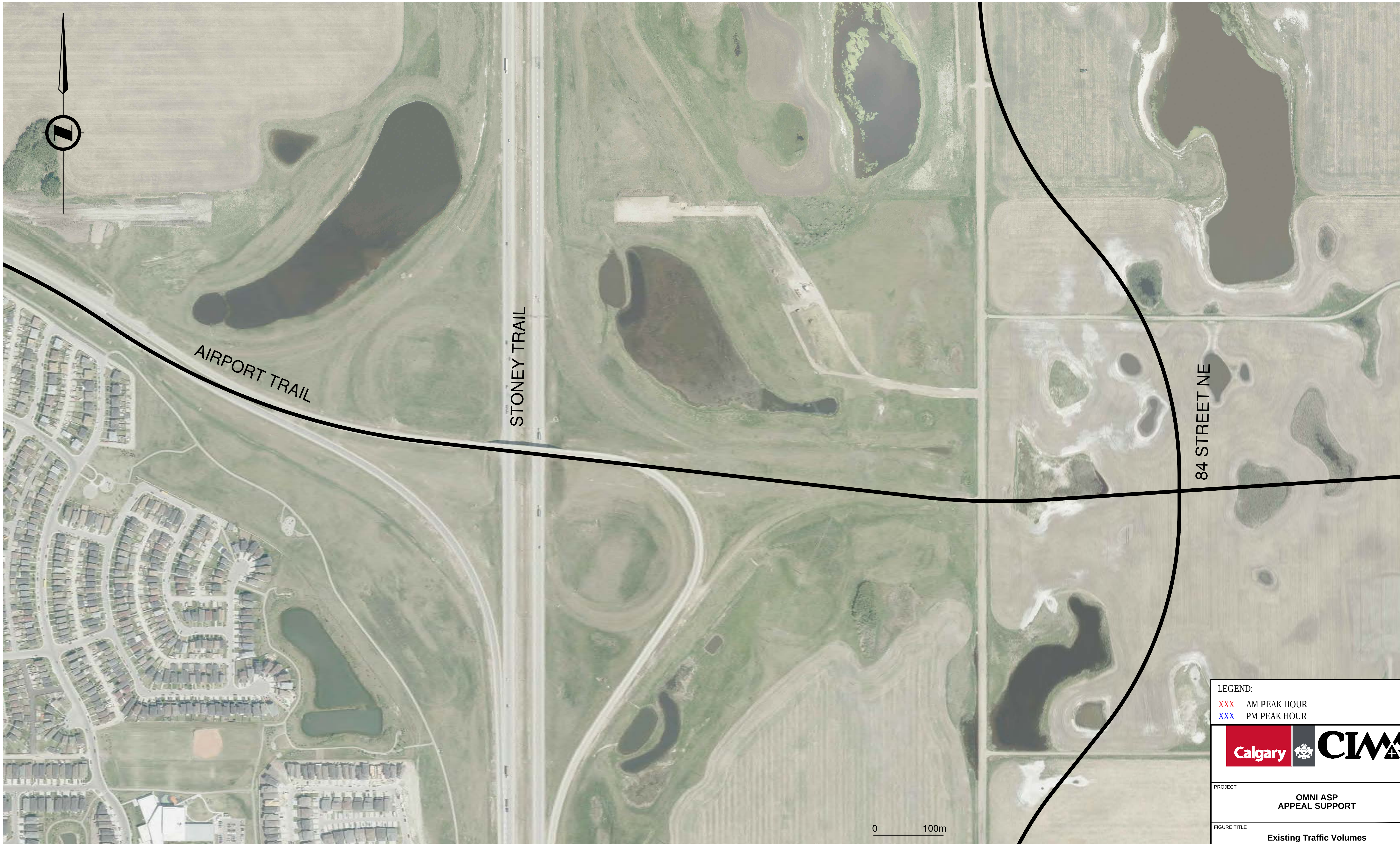

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FIGURE TITLE
Existing Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-3 Existing Traffic Volumes.dwg	AS SHOWN	3.3B

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FIGURE TITLE

Existing Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-3 Existing Traffic Volumes.dwg	AS SHOWN	3.3C

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FIGURE TITLE
Existing Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-3 Existing Traffic Volumes.dwg	AS SHOWN	3.3D

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Table 3-1 Future Projects

Infrastructure Project	Cost Estimate	Funding Mechanism	Funding Status		
			4-Year Budget	10-Year Capital Plan	Funds Collected in City's Levy Bylaw
Stoney Trail & Country Hills interchange upgrade - widening/ twinning structure	$15M	None established	No	No	No
Stoney Trail & Airport Trail interchange-crossing & east ramps	$60M	City budget	No	No	Yes
Airport Trail west of 60 Street NE to Métis Trail - construct road connection	$20M	City budget	No	No	Yes
Stoney Trail & 64 Avenue NE - construct flyover	$30M	City budget	No	No	Yes
Stoney Trail & McKnight Boulevard interchange - upgrade to ultimate	$30M	None established	No	No	No

Infrastructure Project	Cost Estimate	Funding Mechanism	Funding Status		
			4-Year Budget	10-Year Capital Plan	Funds Collected in City's Levy Bylaw
McKnight Boulevard & 68 Street NE - upgrade intersection to interchange	$70M	City Budget	No	No	Yes
84 Street NE - paving, widening, alignment changes to accommodate interchange upgrades and flyovers	$15M City $30M Total	Typically adjacent landowners fund; likely that City will cover half of cost ($15M)	No	No	No
McKnight Boulevard (Township Road 250) widening from City boundary to 84 Street NE intersection	$5.5M	Potential funding from Rocky View County Transportation Offsite Levy	No	No	No

Some design work has been undertaken for these projects. A design has been prepared for the construction of Airport Trail between 60 Street NE and Métis Trail. A functional plan for 84 Street NE between Country Hills Boulevard and its terminus just north of Highway 1 has been developed as a cooperative effort between the City of Calgary, Rocky View County and two other developers. Conceptual plans have been prepared by Alberta Transportation for the ultimate interchange configurations for Stoney Trail & Country Hills Boulevard, Stoney Trail & Airport Trail, Stoney Trail & McKnight Boulevard, and the 64 Avenue flyover. Further design work is required to develop detailed designs, tender packages and more refined cost estimates.

3.6 Future Rocky View Country Transportation Projects

The Rocky View County Transportation Offsite Levy Bylaw (Bylaw C7599-2016) includes a special project described as Township Road 250 (McKnight Boulevard) Expansion and refers to the East Freeway Functional Design Study completed by Earth Tech in 2006. The functional design report recommends that the interchange configuration be upgraded from its current diamond form to a Parclo A4, which will provide additional capacity. The County's bylaw indicates $5.5M allocated to the project, as referred to in Table 3-1.

In the bylaw document, Map "B" Special Area #2 highlights the interchange and the section of McKnight Boulevard between the municipal boundary and the intersection of Township Road 250 & 84 Street NE. It is not specified exactly what work is included in the $5.5M levy item. It is assumed that these funds would be applied to the widening of McKnight Boulevard and intersection improvements within the County, and are not intended to be applied to the upgrade of the Stoney Trail & McKnight Boulevard interchange to its ultimate configuration.

3.7 Future Background Traffic

A traffic forecast for future conditions was developed using the City of Calgary EMME forecast model. Assumptions were that the East Stoney and Conrich areas are fully built out, and City of Calgary infrastructure projects in the area are built and traffic for other areas matches land development expected in 2028. Although development of the Omni area may not be complete by 2028, the background forecast is considered to reasonably reflect the traffic growth for the area as it accounts for build out of the East Stoney and Conrich areas, which are the major developments approved in the area.

Since public transit service is not under consideration for this area, and there is already a backlog of areas where service has been identified as desirable but is unfunded, the background traffic forecast assumes no public transit service outside of the City's boundaries in this area. The typical weekday afternoon and weekday morning peak hours were considered for analysis. The land uses for the area – shopping, employment and residential – typically result in the worst conditions occurring during the weekday afternoon peak hour.

Traffic volumes on future City of Calgary roads in this area are illustrated in Figures 3-4A to 3-4D.

City of Calgary EMME forecast model reports are provided in Appendix A.

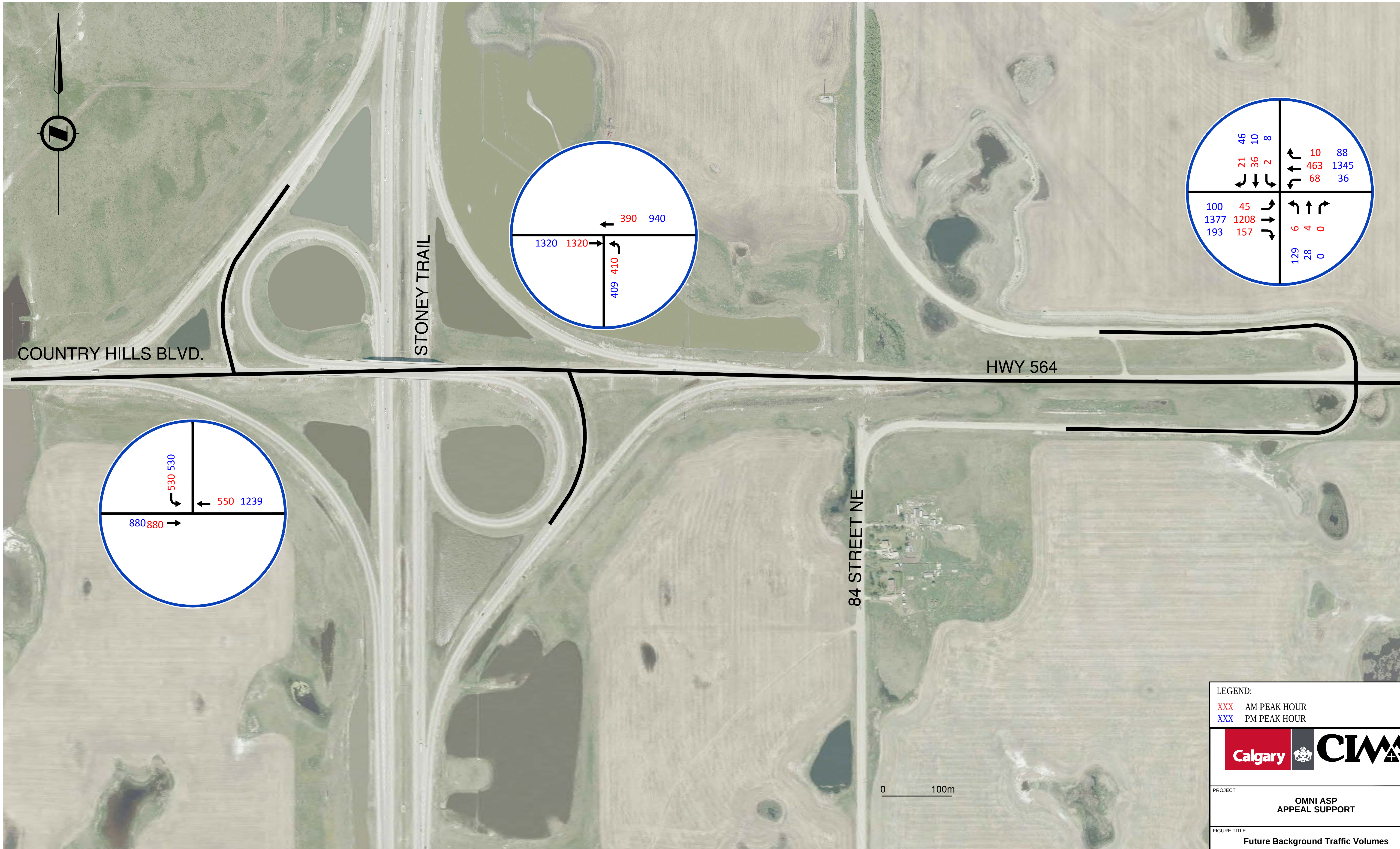

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FIGURE TITLE
Future Background Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-4 Future Traffic Volumes.dwg	AS SHOWN	3.4A

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FILE: S:\PROJECTS\CA00431 - CITY OF CALGARY OMNI ASP APPEAL SUPPORT\400 DRAWINGS\04 CADD\3 WORKING DWGS\2 PRELIM DESIGN\FIGURE 3-4 FUTURE TRAFFIC VOLUMES.DWG | DATE: Tuesday, May 22, 2018 8:38:40 AM | ISC: UNRESTRICTED

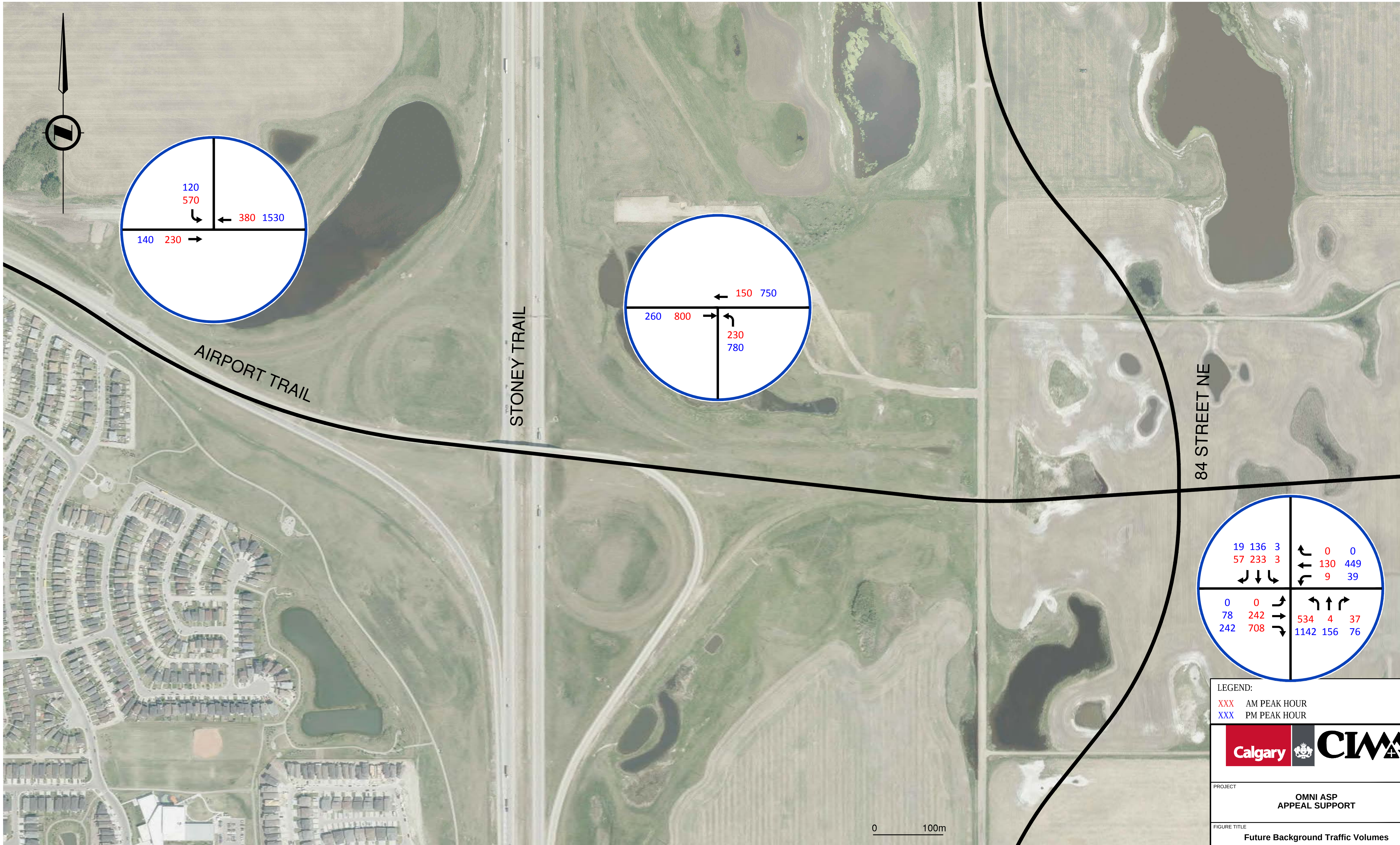

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FIGURE TITLE
Future Background Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-4 Future Traffic Volumes.dwg	AS SHOWN	3.4B

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FIGURE TITLE
Future Background Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-4 Future Traffic Volumes.dwg	AS SHOWN	3.4C

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FIGURE TITLE
Future Background Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-4 Future Traffic Volumes.dwg	AS SHOWN	3.4D

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3.7.1 Transportation Impacts for Future Background Traffic

Traffic operations for build out of the Conrich and East Stoney plan areas were evaluated.

In addition to the planned future background improvements summarized in Table 3-1, the following road network improvements were determined to be required for future background conditions:

+ Country Hills Boulevard
    - Two (2) through lanes in each direction from Stoney Trail west ramp through Omni ASP area
+ Country Hills Boulevard & Stoney Trail interchange
    - Northbound to westbound and southbound to eastbound off ramps have two (2) left turn lanes at ramp terminals
+ Country Hills Boulevard & 84 Street NE
    - Each approach has two (2) through lanes, one (1) left turn lane and one (1) right turn lane
+ Airport Trail
    - Two (2) through lanes in each direction from Stoney Trail west ramp through Omni ASP area
+ Stoney Trail & Airport Trail interchange
    - East ramps and bridge over Stoney Trail completed (Parclo A-4)
    - Northbound to westbound off ramp and southbound to eastbound off ramps have two (2) left turn lanes at ramp terminals
+ Airport Trail & 84 Street NE
    - Two (2) left turn lanes, two (2) through lanes and one (1) right turn lane northbound
    - One (1) left turn lane, two (2) through lanes and one (1) right turn lane all other approaches
+ 64 Avenue NE & 84 Street NE
    - Two (2) left turn lanes, one (1) through and one (1) shared through and right turn lane northbound
    - One (1) left turn lane, one (1) through lane and one (1) shared through and right turn lane all other approaches
+ McKnight Boulevard
    - Three (3) through lanes in each direction from Stoney Trail west ramp through Omni ASP area

- Stoney Trail & McKnight Boulevard interchange
    - East ramps and bridge over Stoney Trail completed (Parclo A-4)
    - Northbound to westbound off ramp and southbound to eastbound off ramps have two (2) left turn lanes at ramp terminals
- McKnight Boulevard & 84 Street NE
    - Two (2) left turn lanes, two (2) through lanes and one (1) right turn lane northbound and southbound
    - Two (2) left turn lanes, Three (3) through lanes and one (1) right turn lane eastbound and westbound
    - Extra storage lane length for exclusive lanes

For the purposes of this analysis, turn lane storage lengths were estimated to be the shorter of the length that can fit within the available link distance and the length required to accommodate the 95th percentile queue reach.

Results of the capacity analysis are summarized in Table 3-2.

Table 3-2 Future Background Intersection Analysis

Intersection		Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
A.M. peak hour																
1)	McKnight Boulevard / W Ramp Terminal	Signal	LOS		B			B					C			B
			Delay (s)		16.8			15.6					24.7			17.0
			v/c ratio		0.86			0.87					0.63			0.87
			95^{th}% Queue (m)		114.1 #			113.5 #					33.2			
			Queue > Storage		N			N					N			
2)	McKnight Boulevard / E Ramp Terminal	Signal	LOS		C			B		C						B
			Delay (s)		20.7			12.2		27.3						19.0
			v/c ratio		0.92			0.63		0.80						0.92
			95^{th}% Queue (m)		107.8 #			52.1		53.5						
			Queue > Storage		N			N		N						
3)	Airport Trail / W Ramp Terminal	Signal	LOS		A			B					B			B
			Delay (s)		8.7			19.3					18.7			16.9
			v/c ratio		0.16			0.26					0.65			0.65
			95^{th}% Queue (m)		12.9			30.7					33.6			
			Queue > Storage		N			N					N			
4)	Airport Trail / E Ramp Terminal	Signal	LOS		B			A		B						B
			Delay (s)		14.2			5.5		18.7						14.0
			v/c ratio		0.46			0.09		0.37						0.46
			95^{th}% Queue (m)		58.2			6.5		17.2						
			Queue > Storage		N			N		N						
5)	Country Hills Boulevard / W Ramp Terminal	Signal	LOS		B			A					B			B
			Delay (s)		12.4			9.9					18.8			13.4
			v/c ratio		0.61			0.38					0.63			0.63
			95^{th}% Queue (m)		54.5			30.5					30.9			
			Queue > Storage		N			N					N			

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

Intersection		Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
A.M. peak hour																
6)	Country Hills Boulevard / E Ramp Terminal	Signal	LOS		C			A		C						B
			Delay (s)		14.3			7.0		25.6						14.9
			v/c ratio		0.77			0.23		0.62						0.77
			95th% Queue (m)		99.7 #			19.3		32.40						
			Queue > Storage		N			N		N						
7)	Country Hills Boulevard / 84 Street	Signal	LOS	A	A	A	A	A	A	B	B	A	B	B	A	A
			Delay (s)	4.3	5.1	1.4	8.9	3.4	0.0	16.7	16.8	0.0	16.5	17.1	0.0	4.8
			v/c ratio	0.07	0.49	0.14	0.28	0.19	0.01	0.02	0.01	0.00	0.01	0.10	0.01	0.49
			95th% Queue (m)	5.30	58.3	5.4	12.9	16.7	0.0	3.0	2.2	0.0	1.5	9.1	0.0	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
8)	Airport Trail / 84 Street	Signal	LOS	B	B	B	B	B	A	C	B	A	D	C	A	C
			Delay (s)	15.0	19.8	19.5	15.2	18.9	0.0	31.3	15.8	0.1	35.3	30.5	0.6	23.1
			v/c ratio	0.00	0.27	0.89	0.03	0.15	0.00	0.71	0.00	0.05	0.02	0.47	0.14	0.89
			95th% Queue (m)	1.0	26.9	101.8 #	3.8	15.7	0.0	76.0 #	1.3	0.0	3.0	31.0	0.0	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
9)	64 Avenue / 84 Street	Signal	LOS	C	B		B	B		D	A		E	C		C
			Delay (s)	23.8	14.2		14.6	15.8		44.2	9.9		65.6	19.5		24.3
			v/c ratio	0.56	0.71		0.12	0.12		0.69	0.32		0.76	0.82		0.82
			95th% Queue (m)	27.0	34.4		6.5	6.6		29.8 #	19.3		42.3 #	95.8 #		
			Queue > Storage	N	N		N	N		N	N		N	N		
10)	McKnight Boulevard / 84 Street	Signal	LOS	F	D	E	F	F	C	F	D	C	F	D	F	F
			Delay (s)	184.4	49.0	63.0	146.8	158.2	25.7	221.6	53.5	26.1	86.9	48.0	135.1	102.5
			v/c ratio	1.26	0.95	1.04	1.06	1.25	0.67	1.30	0.28	0.65	0.84	0.30	1.19	1.30
			95th% Queue (m)	148.5 #	237.3 #	291.5 #	60.4 #	307.6 #	98.3	71.6 #	35.6	59.5	64.7 #	44.6	251.1 #	
			Queue > Storage		N	Y		N			N			N	Y	

Notes:
[#] Queue expected to be longer than estimate due to multiple cycle delays
[m] Queue reach metered by upstream signal
Traffic Operation is failing

Intersection		Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour																
1)	McKnight Boulevard / W Ramp Terminal	Signal	LOS		A			D					F			D
			Delay (s)		9.7			38.3					85.1			38.0
			v/c ratio		0.49			1.01					1.05			1.05
			95th% Queue (m)		54.7			238.2 $^{\#}$					122.5 $^{\#}$			
			Queue > Storage		N			N					N			
2)	McKnight Boulevard / E Ramp Terminal	Signal	LOS		C			C		D						C
			Delay (s)		29.7			20.9		46.1						30.3
			v/c ratio		0.93			0.78		0.95						0.95
			95th% Queue (m)		154.9 $^{\#}$			102.4		133.9 $^{\#}$						
			Queue > Storage		N			N		N						
3)	Airport Trail / W Ramp Terminal	Signal	LOS		A			A					C			A
			Delay (s)		4.2			9.1					23.0			9.6
			v/c ratio		0.06			0.70					0.24			0.70
			95th% Queue (m)		5.3			83.3					12.8			
			Queue > Storage		N			N					N			
4)	Airport Trail / E Ramp Terminal	Signal	LOS		A			B		C						B
			Delay (s)		9.9			13.1		20.6						15.9
			v/c ratio		0.2			0.56		0.78						0.78
			95th% Queue (m)		14.4			43.0		48.7						
			Queue > Storage		N			N		N						
5)	Country Hills Boulevard / W Ramp Terminal	Signal	LOS		B			B					C			B
			Delay (s)		10.7			13.3					25.0			14.8
			v/c ratio		0.54			0.76					0.70			0.76
			95th% Queue (m)		52.1			85.5 $^{\#}$					40.9			
			Queue > Storage		N			N					N			

Notes: $^{\#}$ Queue expected to be longer than estimate due to multiple cycle delays

^{m} Queue reach metered by upstream signal

Traffic Operation is failing

	Intersection	Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour																
6)	Country Hills Boulevard / E Ramp Terminal	Signal	LOS		B			A		C						B
			Delay (s)		12.5			9.6		24.7						13.4
			v/c ratio		0.77			0.55		0.62						0.77
			95th% Queue (m)		96.9 #			53.9		32.5						
			Queue > Storage		N			N		N						
7)	Country Hills Boulevard / 84 Street	Signal	LOS	C	A	A	B	A	A	D	C	A	C	C	B	B
			Delay (s)	32.7	9.5	1.4	11.0	9.3	1.6	36.0	25.1	0.0	25.2	24.8	10.2	10.7
			v/c ratio	0.64	0.64	0.19	0.24	0.63	0.09	0.54	0.05	0.00	0.04	0.02	0.15	0.64
			95th% Queue (m)	41.0 #	99.5	6.8	8.7	95.2	4.8	35.3	5.1	0.0	4.6	2.6	8.4	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
8)	Airport Trail / 84 Street	Signal	LOS	C	C	B	C	D	A	C	A	A	D	D	A	C
			Delay (s)	23.0	32.8	10.3	25.5	36.8	0.0	30.1	9.1	0.2	40.3	38.0	0.3	27.2
			v/c ratio	0.01	0.17	0.58	0.15	0.71	0.00	0.86	0.08	0.09	0.03	0.40	0.06	0.86
			95th% Queue (m)	1.30	13.1	19.8	12.8	61.5	0.0	162.1 #	15.1	0.0	3.4	22.2	0.0	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
9)	64 Avenue / 84 Street	Signal	LOS	F	A		C	D		E	C		E	C		D
			Delay (s)	113.4	9.9		24.6	44.4		66.5	32.3		59.9	20.2		45.1
			v/c ratio	1.12	0.43		0.29	0.83		0.99	0.84		0.40	0.49		1.12
			95th% Queue (m)	115.9 #	22.8		18.0	61.1 #		126.9 #	165.3 #		16.4	28.7		
			Queue > Storage	N	N		N	N		N	N		N	N		
10)	McKnight Boulevard / 84 Street	Signal	LOS	F	E	B	F	F	E	F	E	B	F	E	E	F
			Delay (s)	227.0	71.9	18.7	132.5	186.2	74.2	205.1	75.5	12.0	96.8	57.2	79.4	122.6
			v/c ratio	1.39	1.04	0.57	1.05	1.31	1.03	1.31	0.81	0.44	0.95	0.29	1.06	1.39
			95th% Queue (m)	224.5 #	272.1 #	81.5	76.5 #	289.2 #	221.2 #	136.7 #	84.3 #	20.5	97.0 #	33.20	161.7 #	
			Queue > Storage	Y	N	N	N	N	Y	N	N	N	N	N	N	

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

As indicated in Table 3-2, the intersections on Country Hills Boulevard and Airport Trail will be able to accommodate future background traffic demand with some reserve capacity. McKnight Boulevard will not have reserve capacity given the improvements contemplated.

As the table indicates, the west ramp terminal for Stoney Trail & McKnight Boulevard will be at capacity, with the southbound left turn having a volume to capacity ratio of 1.05 and level of service F, and the westbound through movement having a volume to capacity ratio of 1.01. Overall intersection level of service is D.

Also in the afternoon peak hour, demand is expected to exceed capacity for the eastbound left turn movement and to be at capacity for the northbound left turn movement at the intersection of 64 Avenue NE and 84 Street NE. Other movements experience acceptable volume to capacity ratios and the intersection has an overall level of service D. This intersection can be considered to be operating at capacity under these conditions.

The intersection of McKnight Boulevard & 84 Street NE is expected to have failing conditions for both the weekday morning and weekday afternoon peak hours. During both time periods, the overall intersection level of service is F and at least half of all movements have volume to capacity ratios exceeding 1.00. The development area contributing to future traffic demand at this intersection is the Conrich area, which is expected to generate significant commuter and heavy truck trips to and from Calgary during peak periods.

A potential mitigating measure to accommodate future traffic volumes for this intersection include a partial grade separation for the intersections itself, identified in the joint Rocky View County – City of Calgary 84 Street study, which is in progress. The improvement design is not finalized and a funding source for the improvement has not been identified at the time of writing.

Another future transportation infrastructure project, which is included in the East Stoney Infrastructure Analysis project, is upgrading McKnight Boulevard & 68 Street NE, which is the next major intersection west of Stoney Trail, to an interchange. This project is currently included in the City of Calgary's Transportation Off-site Levy, but is not included in plans and budgets for the 10- to 20-year future. This project may also be necessitated by build out of the Conrich area.

3.8 Omni Area Structure Plan Trip Generation

Traffic volumes forecast for the Omni Plan area are illustrated in Figures 3-5A to Figure 3.5D. Details of the estimation of trip generation are summarized in the following sections.

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FIGURE TITLE
Total Trip Assignment

FILE No.	SCALE	FIGURE No.
Figure 3-5 Total Trip Assignment.dwg	AS SHOWN	3.5A

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FILE: S:\PROJECTS\CA00431 - CITY OF CALGARY OMNI ASP APPEAL SUPPORT\400 DRAWINGS\04 CADD\03 WORKING DWGS\02 PRELIM DESIGN\FIGURE 3-5 TOTAL TRIP ASSIGNMENT.DWG | DATE: Tuesday, May 22, 2018 8:39:18 AM | ISC: UNRESTRICTED

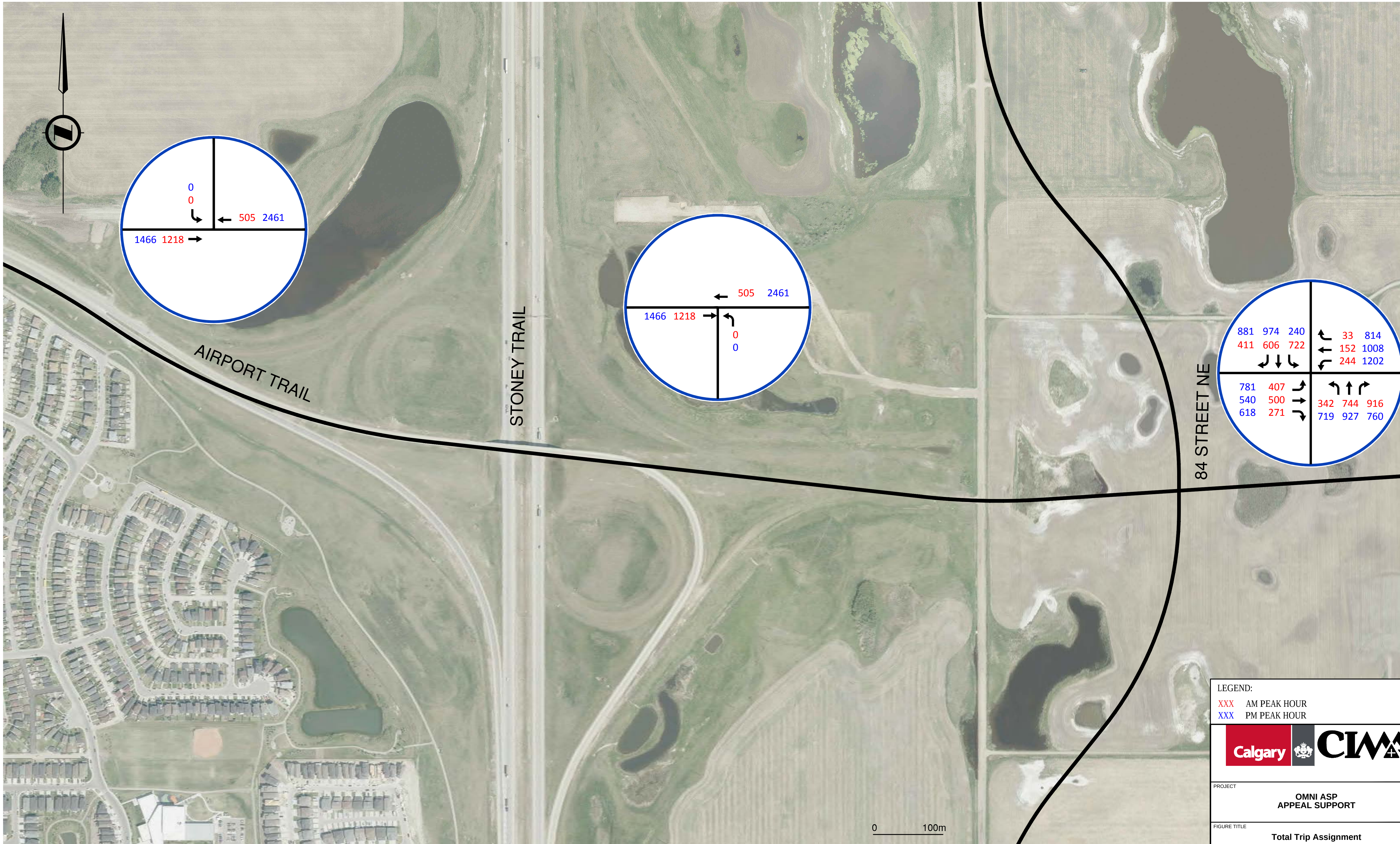

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FIGURE TITLE
Total Trip Assignment

FILE No.	SCALE	FIGURE No.
Figure 3-5 Total Trip Assignment.dwg	AS SHOWN	3.5B

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FIGURE TITLE
Total Trip Assignment

FILE No.	SCALE	FIGURE No.
Figure 3-5 Total Trip Assignment.dwg	AS SHOWN	3.5C

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PROJECT
OMNI ASP

FIGURE TITLE
Total Trip Assignment

FILE No.	SCALE	FIGURE No.
Figure 3-5 Total Trip Assignment.dwg	AS SHOWN	3.5D

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FILE: S:\PROJECTS\CA000431 - CITY OF CALGARY OMNI ASP APPEAL SUPPORT\400 DRAWINGS\04 CADD\3 WORKING DWGS\2 PRELIM DESIGN\FIGURE 3-5 TOTAL TRIP ASSIGNMENT.DWG | DATE: Tuesday, May 22, 2018 8:39:43 AM | ISC: UNRESTRICTED

3.8.1 Land Use Scenario

The analysis in Section 2 Potential Development in Omni Area was considered to estimate a mix and sizes of land uses. This land use scenario reflects current and anticipated market demand, but not the highest potential development for the area. Actual development could generate more traffic.

The scenario includes a mix of uses for the destination commercial development envisioned by a developer for the area. Total leasable area for the destination commercial area reflects the building coverage ratios found in the approved Rocky View County developments summarized in Table 2-2.

The mix and sizes of Highway Commercial properties were developed based upon the list of potential uses in the ASP and a review of comparable sites in Southern Alberta. For the land allocated for industrial development, the total land to developable land ratio for approved Rocky View County development summarized in Table 2-3 was applied.

Resulting development sizes assumed for the plan area are summarized in Table 3-3.

Table 3-3 Development Assumed for Omni Plan Area

Development Type	Development Size
Highway Commercial	231,000 ft^2
Destination Commercial	3,575,405 ft^2
Industrial	508 developable acres
Seniors Housing	250 units
Hotel & Motel	900 rooms
Service Stations	3 sites - 8 pumps each site

3.8.2 Expected Timeframe for Development

The Omni ASP indicates that development is anticipated over 20+ years. Since a major landowner in the area (620 acres) is currently marketing the developed site (see http://theomnicalgary.com/), indicating their interest in developing beginning in Summer 2018, it is probable that site development will occur within 10 years.

3.8.3 Selection of Trip Generation Rates

The Trip Generation Manual (9th Edition) published by the Institute of Transportation Engineers (ITE) provides a large set of observed trip generation rates collected in North American cities, and instructions for estimating trip generation for development sites. For the anticipated land uses, the available ITE data sets were reviewed for fit with the plan area conditions.

Since the potential uses for the industrial lands are broad and general in nature, and include office uses, the rate selected for this use was Industrial Park (ITE Code 750). Trip generation was completed using total land area in acres as an independent variable.

For the retail land uses, it is notable that the City generally applies a rate of 6.0 trips per 1,000 square feet of floor area for the afternoon peak hour. The average rate from ITE Trip Generation is lower, at 3.71 trips per 1,000 square feet of floor area. The lower rate from ITE was used for traffic forecasting in both the high and moderate trip generation scenarios, recognizing that higher trip generation is possible.

Trip generation for the plan area is summarized in Appendix B.

3.8.4 Accounting for Trips Internal to the Plan Area

Since the plan covers a large area and incorporates a variety of land use types, some trips will remain within the plan area and will not impact the adjacent streets. Trips within the plan area have been estimated based upon the ITE Trip Generation Handbook method in combination with the method developed by the Transportation Research Board's National Cooperative Highway Research Program (NCHRP) described in NCRP Report 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments. Trips external to the plan area have been reduced by the estimated numbers of internal trips. The affect of the reductions can be seen in the trip generation table in Appendix B, and the worksheets for calculating internal trips are included in Appendix C.

3.8.5 Accounting for Pass-by Trips

The Highway Commercial parts of the plan area will have land uses that often attract customers from the drivers who pass by the site in their travels. Examples of such uses include restaurants, gas stations and banks. Average pass by rates summarized in the ITE Trip Generation Manual were applied to the Highway Commercial Areas. The amounts of the reductions for each area are shown in the trip generation table in Appendix B.

3.8.6 Net Vehicle Trips External to Plan Area

The volume of external peak hour vehicle trips after accounting for internal and pass-by trip patterns, is summarized in Table 3-4.

Table 3-4 Trips External to the Omni Plan Area

Development Type	Vehicles per Hour	
	AM Peak Hour (vehicles/hour)	PM Peak Hour (vehicles/hour)
Highway Commercial	1451	1438
Destination Commercial	3704	9668
Industrial	3758	4233
Totals	8913	15339

3.8.7 Omni Area Structure Plan Trip Distribution, Network Assignment and Mode Split

Travel patterns to and from the Omni area will be influenced by the types of uses, which are primarily shopping and employment, and the locations of customers and employees. Existing, approved, and anticipated residential development is very heavily skewed toward the residential areas in northeast Calgary, which are within a few kilometres of the plan area. A high percent of trips is therefore expected to travel east-west via Airport Trail, McKnight Boulevard, County Hills Boulevard, and 64 Avenue NE. There are also smaller existing and planned concentrations of residential development east of Stoney Trail in Chestermere, the Belvedere area of Calgary.

Travel patterns forecast by the City's EMME model for the Conrich area were reviewed as an example of employment distribution patterns in this area. Distribution patterns forecast for Conrich are summarized in Table 3-5. The distribution pattern by route is summarized in Table 3-6.

Table 3-5 Forecast Distribution Pattern for Conrich by Direction

To / From	A.M.		P.M.	
	In	Out	In	Out
North	13%	4%	4%	10%
South	18%	11%	11%	14%
East	5%	2%	2%	5%
West	37%	49%	42%	39%
Total (External)	**73%**	**66%**	**59%**	**68%**
Internal	**27%**	**34%**	**41%**	**32%**

Table 3-6 – Forecast Distribution Pattern for Conrich by Route

Roadway	To / From	A.M.		P.M.	
		In	Out	In	Out
Stoney Trail (North)	North	13%	4%	4%	10%
Country Hills Boulevard	West	6%	0%	3%	4%
Airport Trail	West	0%	0%	0%	4%
64 Avenue	West	5%	3%	4%	5%
McKnight Boulevard	West	9%	10%	10%	8%
32 Avenue	West	7%	11%	8%	8%
16 Avenue (West)	West	5%	7%	7%	6%
16 Avenue (East)	East	5%	2%	2%	5%
Memorial Drive	West	2%	8%	5%	2%
17 Avenue	West	0%	3%	0%	0%
Peigan Trail	West	0%	4%	3%	0%
Glenmore Trail	West	3%	3%	2%	2%
Stoney Trail (South)	South	11%	4%	3%	8%
Chestermere	South	4%	2%	3%	3%
Belvedere	South	3%	5%	5%	3%
Total (External)		**73%**	**66%**	**59%**	**68%**
Internal		**27%**	**34%**	**41%**	**32%**

For the Omni Plan Area, the distribution patterns are assumed to be slightly different. Internal trip making has been estimated by the NCHRP method, therefore the external distribution patters will amount to 100% of the external trips. Since the Omni area is further north, east-west oriented trips will be more concentrated around Airport Trail, McKnight

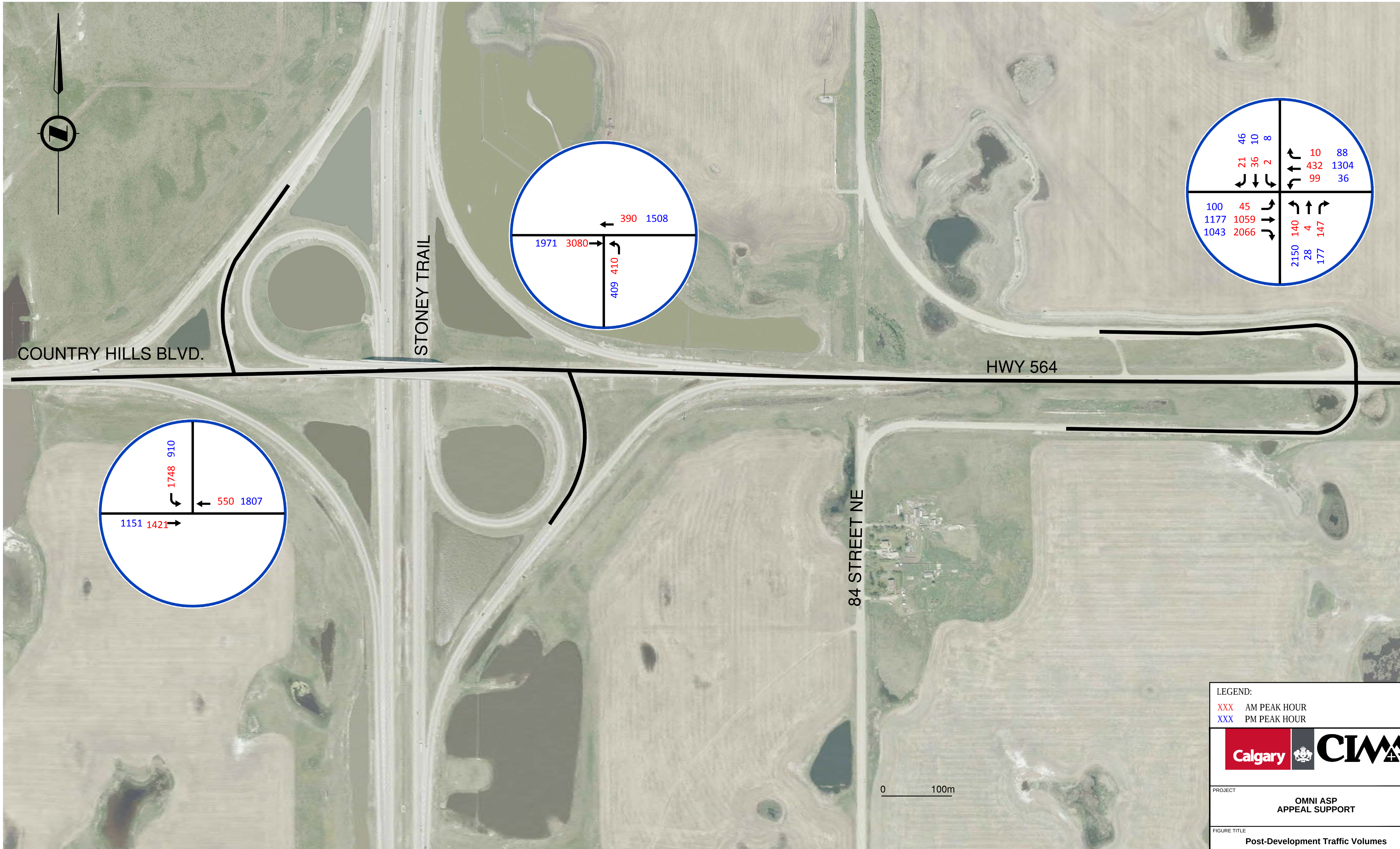
Boulevard, 64 Avenue NE, and Country Hills Boulevard. Trips will also travel between the Omni area and the future Conrich and East Stoney areas.

The expected distribution for trips to and from the Omni Area are summarized in Table 3-7.

Table 3-7 – Distribution and Network Assignment for Omni Area

Direction and Route	Estimated Distribution for Omni			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64 Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16 Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
Totals	100%	100%	100%	100%

Regarding travel mode split, it is assumed that the process of estimating trip generation and internal trip making within the plan area account for travel by modes other than auto. The trip generation for the area has been developed based upon ITE Trip Generation rates, which are observed rates for auto trips and therefore implicitly account for some trips made by transit, cycling, and walking modes. For the Omni area, where no plans or budget for transit service or active modes connections are in place, actual vehicle trips could be higher than indicated in this report if no transit service is provided. Details of assignment of site trips and reductions for pass-by trips are summarized in Appendix D. Total future traffic volumes are illustrated in Figures 3-6A to 3-6D.



LEGEND:
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Calgary CIMA+

PROJECT
OMNI ASP
APPEAL SUPPORT

FIGURE TITLE
Post-Development Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-6 Post-Development Traffic Volumes.dwg	AS SHOWN	3.6A

SHEET SIZE

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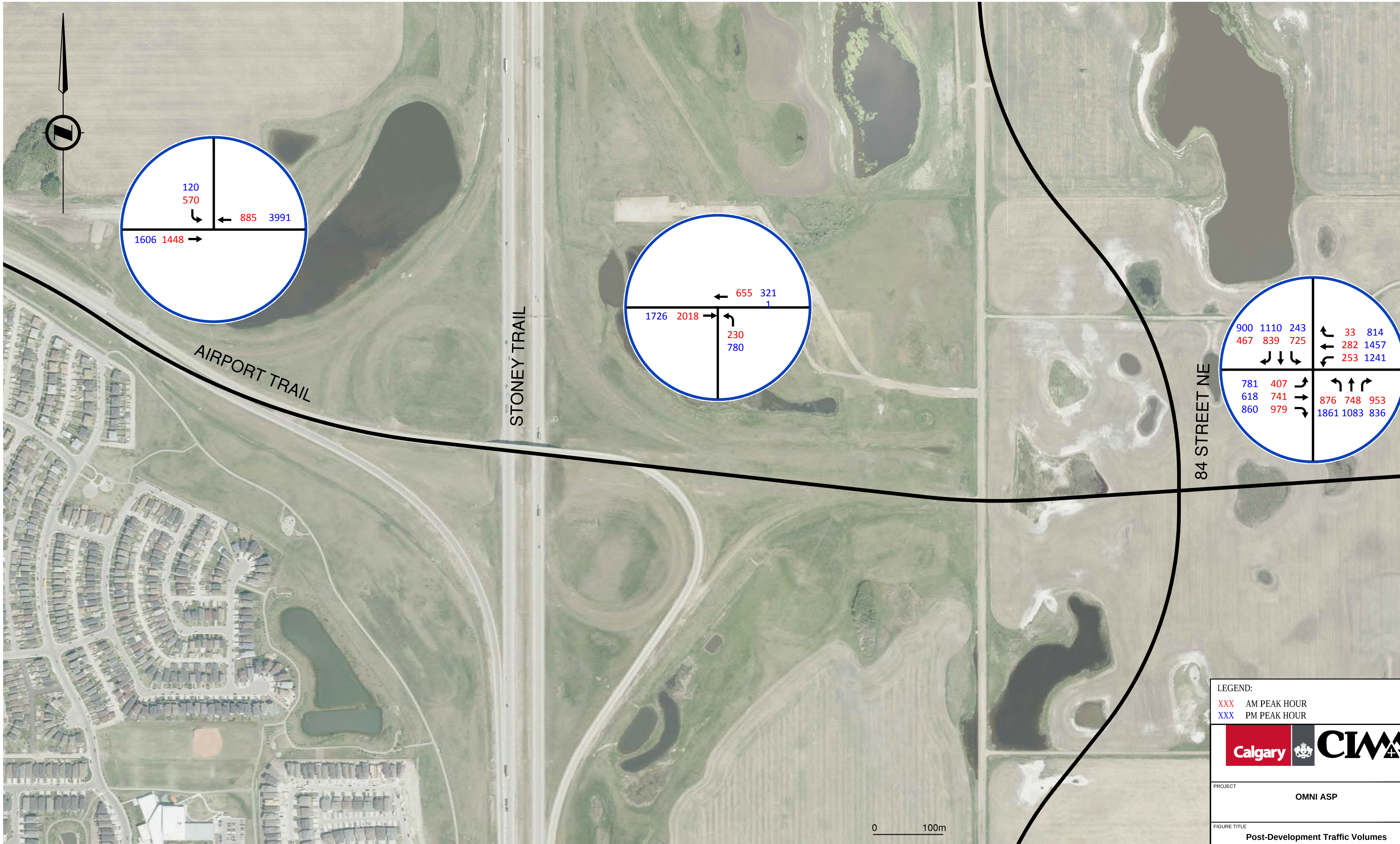

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Calgary CIMA+

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OMNI ASP

FIGURE TITLE
Post-Development Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-6 Post-Development Traffic Volumes.dwg	AS SHOWN	3.6B

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Calgary CIMA+

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FIGURE TITLE
Post-Development Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-6 Post-Development Traffic Volumes.dwg	AS SHOWN	3.6C

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Calgary CIMA+

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OMNI ASP

FIGURE TITLE
Post-Development Traffic Volumes

FILE No.	SCALE	FIGURE No.
Figure 3-6 Post-Development Traffic Volumes.dwg	AS SHOWN	3.6D

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FILE: S:\PROJECTS\CA00431 - CITY OF CALGARY OMNI ASP APPEAL SUPPORT\400 DRAWINGS\04 CADD\03 WORKING DWGS\02 PRELIM DESIGN\FIGURE 3-6 POST-DEVELOPMENT TRAFFIC VOLUMES.DWG | DATE: Tuesday, May 22, 2018 8:40:29 AM | ISC: UNRESTRICTED

3.9 Traffic Impacts

3.9.1 Intersection Capacity Analysis

To evaluate the traffic impacts of the Omni development, the following additional road network improvements were applied.

+ Country Hills Boulevard
    - Widened to three (3) through lanes in each direction
+ Country Hills Boulevard & 84 Street NE
    - Add two (2) northbound left turns lane for three (3) total
    - Add eastbound right turn lane for two (2) total
+ Airport Trail
    - Widened to three (3) through lanes in each direction
+ Airport Trail & 84 Street NE
    - Add eastbound left turn lane for two (2) total
    - Add westbound left turn lane for two (2) total
    - Add northbound left turn lane for three (3) total
    - Add southbound left turn lane for two (2) total
    - Add right turn on all approaches for two (2) total
+ 64 Avenue NE & 84 Street NE
    - Add exclusive right turn lane on each approach for one (1) total
    - Add eastbound left turn lane for two (2) total

For the purposes of this analysis, turn lane storage lengths were estimated to be the shorter of the length that can fit within the available link distance and the length required to accommodate the 95th percentile queue reach.

Intersection performance was analyzed and is summarized in Table 3-8.

Detailed Synchro reports are included in Appendix E.

Table 3-8 – Post Development Intersection Analysis

	Intersection	Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
A.M. peak hour																
1)	McKnight Boulevard / W Ramp Terminal	Signal (90 s)	LOS		C			B					D			C
			Delay (s)		31.6			15.9					44.2			25.5
			v/c ratio		1.00			0.96					0.77			1.00
			95th% Queue (m)		225.8 $^{\#}$			202.6 $^{m\#}$					54.50			
			Queue > Storage		N			N					N			
2)	McKnight Boulevard / E Ramp Terminal	Signal (90 s)	LOS		D			B		E						C
			Delay (s)		35.9			13.3		69.5						32.0
			v/c ratio		1.04			0.75		1.00						1.04
			95th% Queue (m)		198.6 $^{m\#}$			99.4		101.7 $^{\#}$						
			Queue > Storage		N			N		N						
3)	Airport Trail / W Ramp Terminal	Signal (50 s)	LOS		B			B					B			B
			Delay (s)		13.3			10.1					18.7			13.4
			v/c ratio		0.69			0.42					0.65			0.69
			95th% Queue (m)		58.5			31.5					33.6			
			Queue > Storage		N			N					N			
4)	Airport Trail / E Ramp Terminal	Signal (60 s)	LOS		A			A		C						A
			Delay (s)		9.8			5.4		24.3						9.9
			v/c ratio		0.72			0.24		0.43						0.72
			95th% Queue (m)		74.4			16.8		20.9						
			Queue > Storage		N			N		N						
5)	Country Hills Boulevard / W Ramp Terminal	Signal (120 s)	LOS		E			C					D			D
			Delay (s)		62.7			31.5					52.9			53.5
			v/c ratio		1.00			0.39					1.02			1.02
			95th% Queue (m)		167.8 $^{\#}$			50					286.3 $^{\#}$			
			Queue > Storage		N			N					Y			

Notes: $^{\#}$ Queue expected to be longer than estimate due to multiple cycle delays

^{m} Queue reach metered by upstream signal

Traffic Operation is failing

Intersection		Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
A.M. peak hour																
6)	Country Hills Boulevard / E Ramp Terminal	Signal (100 s)	LOS		D			A		D						C
			Delay (s)		35.1			4.8		52.0						33.8
			v/c ratio		1.01			0.13		0.81						1.01
			95th% Queue (m)		282.6 #			11.9		59.3						
			Queue > Storage		N			N		N						
7)	Country Hills Boulevard / 84 Street	Signal (140 s)	LOS	A	A	C	B	A	A	E	D	B	E	E	A	B
			Delay (s)	5.1	5.6	22.5	10.5	4.6	0.0	78.2	51.5	13.0	63.5	57.8	1.3	17.5
			v/c ratio	0.08	0.33	0.99	0.38	0.13	0.01	0.68	0.01	0.47	0.03	0.14	0.12	0.99
			95th% Queue (m)	7.10	42.1	335.0 #	21.2	15.8	0.0	28.1 #	2.4	20.9	3.5	10.9	0.0	
			Queue > Storage	N	N	Y	N	N	N	N	N	N	N	N	N	
8)	Airport Trail / 84 Street	Signal (110 s)	LOS	F	D	D	F	D	A	E	D	E	F	D	B	E
			Delay (s)	106.7	50.9	35.6	85.7	42.7	0.2	72.7	54.7	65.8	89.9	53.9	10.3	59.2
			v/c ratio	1.06	0.83	0.97	0.92	0.39	0.06	1.00	0.91	1.04	1.05	0.93	0.49	1.06
			95th% Queue (m)	84.7 #	76.3	99.6 #	55.1 #	30.9	0.00	101.7 #	124.1 #	143.0 #	132.4 #	137.5 #	28.2	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
9)	64 Avenue / 84 Street	Signal (150 s)	LOS	F	D	E	F	E	A	F	F	A	F	D	A	F
			Delay (s)	121.2	43.8	69.8	98.9	60.8	0.6	100.9	133.4	5.4	206.4	41.8	7.1	90.1
			v/c ratio	1.11	0.22	0.97	0.50	0.15	0.08	0.87	1.21	0.22	1.20	0.90	0.25	1.21
			95th% Queue (m)	171.8 #	35.8	183.3 #	22.7 #	12.7	0.00	53.6 #	445.6 #	17.7	88.3 #	259.1 #	23.7	
			Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
10)	McKnight Boulevard / 84 Street	Signal (150 s)	LOS	F	D	E	F	F	D	F	D	C	F	D	F	F
			Delay (s)	820.2	49.0	70.4	121.9	491.2	54.7	398.2	54.5	27.0	86.9	47.1	400.5	373.9
			v/c ratio	2.77	0.95	1.05	0.97	2.02	0.91	1.73	0.29	0.67	0.84	0.29	1.83	2.77
			95th% Queue (m)	685.2 #	237.3 #	301.4 #	57.5 #	378.2 #	138.1 #	78.6 #	36	60.1	64.7 #	44.2	600.2 #	
			Queue > Storage	Y	N	Y	N	N	N	N	N	N	N	N	Y	

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

Intersection		Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour																
1)	McKnight Boulevard / W Ramp Terminal	Signal (150 s)	LOS		C			F					F			F
			Delay (s)		24.9			157.0					173.8			109.2
			v/c ratio		0.94			1.30					1.25			1.30
			95th% Queue (m)		273.4			477.3 $^{m\#}$					190.9 $^{\#}$			
			Queue > Storage		N			N					Y			
2)	McKnight Boulevard / E Ramp Terminal	Signal (150 s)	LOS		F			E		F						F
			Delay (s)		150.9			60.2		168.7						118.5
			v/c ratio		1.28			1.06		1.25						1.28
			95th% Queue (m)		472.0 $^{m\#}$			371.2 $^{\#}$		251.4 $^{\#}$						
			Queue > Storage		Y			N		Y						
3)	Airport Trail / W Ramp Terminal	Signal (150 s)	LOS		A			D					E			C
			Delay (s)		3.3			46.3					73.7			34.8
			v/c ratio		0.43			1.06					0.52			1.06
			95th% Queue (m)		48.0			536.8 $^{\#}$					30.0			
			Queue > Storage		N			Y					N			
4)	Airport Trail / E Ramp Terminal	Signal (140 s)	LOS		B			E		F						D
			Delay (s)		12.6			56.9		111.2						51.0
			v/c ratio		0.57			1.06		1.10						1.10
			95th% Queue (m)		103.5			407.1 $^{\#}$		176.1 $^{\#}$						
			Queue > Storage		N			N		N						
5)	Country Hills Boulevard / W Ramp Terminal	Signal (60 s)	LOS		B			C					C			C
			Delay (s)		12.8			22.0					34.7			22.3
			v/c ratio		0.57			0.90					0.92			0.92
			95th% Queue (m)		46.0			103.4 $^{\#}$					85.8 $^{\#}$			
			Queue > Storage		N			N					N			

Notes: $^{\#}$ Queue expected to be longer than estimate due to multiple cycle delays

^{m} Queue reach metered by upstream signal

Traffic Operation is failing

	Intersection	Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour																
6)	Country Hills Boulevard / E Ramp Terminal	Signal (90 s)	LOS		B			A		D						B
			Delay (s)		10.1			8.0		42.4						12.7
			v/c ratio		0.68			0.68		0.18						0.74
			95th% Queue (m)		92.3			59.1		51.9						
			Queue > Storage		N			N		N						
7)	Country Hills Boulevard / 84 Street	Signal (150 s)	LOS	F	C	B	E	C	A	F	C	B	E	E	A	F
			Delay (s)	201.2	27.6	10.4	69.4	29.0	3.1	232.8	24.7	17.6	71.4	61.6	2.6	98.7
			v/c ratio	1.22	0.57	0.70	0.74	0.64	0.13	1.43	0.02	0.28	0.15	0.04	0.24	1.43
			95th% Queue (m)	76.5 #	108.9	69.1	51.1 #	125.0	7.6	342.5 #	6.4	42.2	8.7	4.8	0.0	
			Queue > Storage	N	N	N	N	N	N	Y	N	N	N	N	N	
8)	Airport Trail / 84 Street	Signal (150 s)	LOS	F	F	E	F	F	F	F	D	C	F	F	E	F
			Delay (s)	388.0	85.2	66.6	427.8	261.6	88.6	427.2	53.6	22.3	105.2	247.8	74.8	223.4
			v/c ratio	1.77	0.94	1.05	1.87	1.48	1.07	1.87	0.90	0.70	0.93	1.45	1.04	1.87
			95th% Queue (m)	233.7 #	98.5 #	127.5 #	355.9 #	266.5 #	168.6 #	351.2 #	203.8	96.3	67.9 #	298.7 #	173.9 #	
			Queue > Storage	N	N	N	Y	N	N	Y	N	N	N	N	N	
9)	64 Avenue / 84 Street	Signal (150 s)	LOS	F	D	C	F	F	B	F	F	A	F	F	F	F
			Delay (s)	412.3	52.5	35.0	106.1	82.7	13.3	431.1	262.2	0.8	111.0	352.1	96.6	272.3
			v/c ratio	1.82	0.20	0.76	0.72	0.83	0.55	1.87	1.52	0.12	0.61	1.71	1.11	1.87
			95th% Queue (m)	214.2 #	26.5	77.7	45.8 #	72.3 #	21.6	240.3 #	686.1 #	2.6	27.6 #	642.8 #	347.6 #	
			Queue > Storage	N	N	N	N	N	N	N	Y	N	N	Y	Y	
10)	McKnight Boulevard / 84 Street	Signal (150 s)	LOS	F	F	C	F	F	F	F	D	A	E	C	F	F
			Delay (s)	Error	161.4	28.7	552.5	635.5	272.5	769.1	50.8	3.6	73.9	34.0	Error	741.4
			v/c ratio	3.86	1.26	0.67	2.10	2.35	1.52	2.62	0.48	0.30	0.81	0.13	3.54	3.86
			95th% Queue (m)	790.1 #	310.6 #	103.0	97.8 #	359.7 #	283.1 #	167.9 #	73.0	8.1	79.3	25.4	1568.8 #	
			Queue > Storage	Y	N	N	N	N	Y	N	N	N	N	N	Y	

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

Error — Indicates failure so significant the software cannot analyze the movement

As the table indicates for the Omni fully built conditions, each of the four (4) intersections on 84 Street NE would have a level of service F during the afternoon peak hour, each with several volume to capacity ratios greater than 1.0. The ramp terminals on McKnight Boulevard would also have an overall level of service F during the afternoon peak, and the Airport Trail ramp terminals would have individual movements exceeding a volume to capacity ratio of 1.0. There would be fewer failing intersections during the morning peak hour, but conditions would still be worse than future background conditions, with additional operational failures.

3.9.2 Sensitivity Analysis of Reserve Capacity for Trips between Omni and Calgary

A sensitivity analysis was done to test the ability for an improved transportation network to accommodate trips between Omni and Calgary.

The approach to this analysis was to consider the road network improvement package determined for the full build out scenario, and test how different levels of development would impact the network and determine a level of development that could be developed and operate acceptably along with the associated infrastructure improvement required. Since the afternoon peak hour was found to be the worst case for the future background and post development analysis, the sensitivity analysis focussed on this time period.

This analysis indicates that with the intersection, interchange or road network improvements applied to the full build out scenario, there is reserve capacity equal to approximately 30% of the traffic demand forecast for the Omni development, if one or more grade separated movements are introduced at the intersection of McKnight Boulevard & 84 Street NE.

The 30% scenario included the development summarized in Table 3-9.

Table 3-9 30% Development Scenario

Development Type	Size of Development for 30% Scenario
Highway Commercial	69300 ft^2
Destination Commercial	1072622 ft^2
Industrial	152 acres
Seniors Housing	75 units
Hotel & Motel	270 rooms
Service Stations	1 sites - 8 pumps

The infrastructure improvements within the study area that would be required to support this level of development are summarized in Tables 3-10 and 3-11.

Table 3-10 Major Infrastructure Projects Required to Support 30% Development Scenario

Infrastructure Project	Cost Estimate	Funding Mechanism	Funding Status		
			4-Year Budget	10-Year Capital Plan	Funds Collected in City's Levy Bylaw
Stoney Trail & Country Hills interchange upgrade-widening/ twinning structure	$15M	None established	No	No	No
Stoney Trail & Airport Trail interchange-crossing & east ramps	$60M	City budget	No	No	Yes
Airport Trail west of 60 Street NE to Métis Trail-construct road connection	$20M	City budget	No	No	Yes
Stoney Trail & 64 Avenue NE-construct flyover	$30M	City budget	No	No	Yes
Stoney Trail & McKnight Boulevard interchange-upgrade to ultimate	$30M	None established	No	No	No
McKnight Boulevard & 68 Street NE-upgrade intersection to interchange	$70M	City Budget	No	No	Yes
84 Street NE-paving, widening, alignment changes to accommodate interchange upgrades and flyovers	$15M City $30M Total	Typically adjacent landowners fund; likely that City will cover half of cost ($15M)	No	No	No
McKnight Trail & 84 Street NE-partially grade separated intersection (configuration to be determined)	Unknown	None established	No	No	No

Table 3-11 Intersection Configurations Required to Support 30% Development Scenario

Intersection	Eastbound			Westbound			Northbound			Southbound		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Country Hills Boulevard & 84 Street NE	1 lane	3 lanes	2 lanes	1 lane	3 lanes	1 lane	3 lanes	2 lanes	1 lane	1 lane	2 lanes	1 lane
Airport Trail & 84 Street NE	2 lanes	3 lanes	2 lanes	2 lanes	3 lanes	2 lanes	3 lanes	2 lanes	2 lanes	2 lanes	2 lanes	2 lanes
64 Avenue NE & 84 Street NE	2 lanes	2 lanes	1 lane	1 lane	2 lanes	1 lane	2 lanes	2 lanes	1 lane	1 lane	2 lanes	1 lane
McKnight Boulevard & 84 Street NE	Grade separate of some movements required; design to be determined and costs unknown											

The intersection lane configurations in Table 3-11 are large relative to other suburban municipal intersections. It would not be practical to construct additional lanes to accommodate additional development.

Intersection performance for this 30% development scenario is summarized in Table 3-12.

Note that the package of capital projects indicated in Table 3-10 for the 30% development scenario are the same as for the 100% development scenario. The benefit of the 30% scenario is that there are fewer problems with severe congestion on the network.

Table 3-12 30% Development Scenario Intersection Analysis

	Intersection	Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour																
1)	McKnight Boulevard / W Ramp Terminal	Signal (150 s)	LOS		B			E					F			D
			Delay (s)		12.5			60.8					105.3			51.7
			v/c ratio		0.62			1.09					1.08			1.09
			95th% Queue (m)		99.1			341.2 m#					155.5 #			
			Queue > Storage		N			N					N			
2)	McKnight Boulevard / E Ramp Terminal	Signal (150 s)	LOS		D			C		F						D
			Delay (s)		37.3			25.7		80.3						41.4
			v/c ratio		1.00			0.83		1.04						1.04
			95th% Queue (m)		253.6 m#			172.1		196.5 #						
			Queue > Storage		N			N								
3)	Airport Trail / W Ramp Terminal	Signal (150 s)	LOS		A			A					C			A
			Delay (s)		3.9			8.0					25.8			7.9
			v/c ratio		0.18			0.70					0.26			0.70
			95th% Queue (m)		12.6			79.4					13.9			
			Queue > Storage		N			N					N			
4)	Airport Trail / E Ramp Terminal	Signal (140 s)	LOS		B			B		C						B
			Delay (s)		10.4			14.7		23.8						16.1
			v/c ratio		0.34			0.72		0.81						0.81
			95th% Queue (m)		24.7			62.3		55.0						
			Queue > Storage		N			N		N						
5)	Country Hills Boulevard / W Ramp Terminal	Signal (60 s)	LOS		B			B					B			B
			Delay (s)		11.2			18.6					19.1			16.3
			v/c ratio		0.50			0.73					0.70			0.73
			95th% Queue (m)		35.2			72.8 #					38.5			
			Queue > Storage		N			N					N			

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

Intersection	Traffic Control	Measure of Effectiveness	Eastbound			Westbound			Northbound			Southbound			Overall Intersection
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
P.M. peak hour															
6) Country Hills Boulevard / E Ramp Terminal	Signal (90 s)	LOS		B			A		B						B
		Delay (s)		14.3			9.2		19.2						13.1
		v/c ratio		0.68			0.50		0.56						0.68
		95th% Queue (m)		69.3			37.0		26.2						
		Queue > Storage		N			N		N						
7) Country Hills Boulevard / 84 Street	Signal (150 s)	LOS	E	B	A	C	B	A	E	C	A	D	D	A	C
		Delay (s)	79.7	14.9	1.8	25.6	15.0	0.7	56.7	26.7	3.4	49.2	41.9	1.3	22.1
		v/c ratio	0.88	0.54	0.30	0.40	0.55	0.11	0.92	0.03	0.12	0.11	0.03	0.17	0.92
		95th% Queue (m)	53.8 #	77.2	8.4	18.1	78.5	2.1	80.2 #	6.3	4.7	6.7	3.7	0.0	
		Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
8) Airport Trail / 84 Street	Signal (150 s)	LOS	E	D	A	F	D	A	F	C	A	D	D	A	D
		Delay (s)	60.0	36.5	6.2	111.1	48.1	5.8	84.3	20.8	2.7	51.8	50.7	6.3	50.0
		v/c ratio	0.77	0.31	0.55	1.08	0.85	0.36	0.08	0.33	0.25	0.41	0.80	0.43	1.08
		95th% Queue (m)	43.0 #	24.1	13.9	79.4 #	72.4 #	10.9	144.0 #	45.2	8.6	15.4	62.9 #	11.9	
		Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
9) 64 Avenue / 84 Street	Signal (150 s)	LOS	F	D	A	E	E	B	F	D	A	E	E	C	D
		Delay (s)	105.9	40.0	8.5	69.4	58.5	11.8	82.4	41.3	1.8	77.7	70.9	21.5	54.5
		v/c ratio	1.05	0.17	0.57	0.55	0.72	0.52	1.03	0.95	0.13	0.48	0.99	0.67	1.05
		95th% Queue (m)	95.5 #	21.6	25.5	31.4	54.0	20.2	151.9 #	269.2 #	5.7	21.0 #	158.2 #	68.4	
		Queue > Storage	N	N	N	N	N	N	N	N	N	N	N	N	
10) McKnight Boulevard / 84 Street	Signal (150 s)	LOS	F	F	C	F	F	F	F	E	A	E	D	F	F
		Delay (s)	586.5	118.6	24.0	439.4	385.7	167.2	479.3	57.0	4.2	75.0	40.6	380.6	295.8
		v/c ratio	2.23	1.16	0.63	1.84	1.78	1.27	1.96	0.56	0.33	0.82	0.16	1.78	2.23
		95th% Queue (m)	400.3 #	294.6 #	93.8	94.8 #	330.9 #	257.6 #	157.5 #	76.4	8.5	80.1	27.9	564.5 #	
		Queue > Storage	Y	N	N	N	N	Y	N	N	N	N	N	Y	

Notes: # Queue expected to be longer than estimate due to multiple cycle delays

m Queue reach metered by upstream signal

Traffic Operation is failing

As indicated in Table 3-12, the 30% development scenario indicates several failing movements for McKnight Boulevard & 84 Street NE. Note that the analysis was based upon a fully at-grade intersection for McKnight Boulevard & 84 Street NE. A partially grade separated intersection has the potential to alleviate these problems.

The details for the site traffic estimation and the Synchro reports for the 30% development scenario are included in Appendix F.

3.9.3 Summary of Network Improvement Requirements

Major transportation projects required to support future background traffic growth (Conrich and East Stoney Area Structure Plans), full development of the Omni area and 30% development of the Omni area are summarized in Table 3-11. Intersections configurations for intersections along 84 Street required to support each scenario are summarized in Table 3-12.

4. Conclusion: Transportation Detriment

4.1 Detriment

Development of the Omni ASP has been identified to cause significant detriment to the City of Calgary from a transportation perspective including significant increased and accelerated capital costs of infrastructure and increased safety and delay issues for City road users.

4.1.1 City of Calgary Capital Budget Impacts

There has been no commitment by Rocky View County to fund significant transportation capital costs required to support the Omni ASP. The City of Calgary cannot collect property taxes or offsite levy funds from County residents and landowners; therefore significant infrastructure capital costs that are both unexpected and unbudgeted for will be imposed on the City. Expected capital projects required to be in place to support the Omni development and future background growth from the County's Conrich ASP and the City's East Stoney ASP, and the costs of those projects, are summarized in Table 4-1.

Table 4-1 City of Calgary Infrastructure Costs to Support Omni ASP

Infrastructure Project	Cost Estimate	Funding Mechanism	How is this Accounted for in City Plans?
Stoney Trail & Country Hills interchange upgrade-widening/ twinning structure	$15M	None established	Beyond 4-year and 10-year capital plans
Stoney Trail & Airport Trail interchange-crossing & east ramps	$60M	City budget	Beyond 4-year and 10-year capital plans
Airport Trail west of 60 Street NE to Métis Trail construct road connection	$20M	City budget	Beyond 4-year and 10-year capital plans
Stoney Trail & 64 Avenue NE construct flyover	$30M	City budget	Beyond 4-year and 10-year capital plans

Infrastructure Project	Cost Estimate	Funding Mechanism	How is this Accounted for in City Plans?
Stoney Trail & McKnight Boulevard interchange upgrade to ultimate	$30M Total	None established	Beyond 4-year and 10-year capital plans
McKnight Boulevard & 68th Street NE upgrade intersection to interchange	$70M	City Budget	Beyond 4-year and 10-year capital plans
84 Street NE paving, widening, alignment changes to accommodate interchange upgrades and flyovers	$15M City $20M Total	Typically adjacent landowners fund; likely that City will cover half of cost ($15M)	Beyond 4-year and 10-year capital plans
McKnight Trail & 84 Street NE Intersection partially grade separated intersection (configuration to be determined)	unknown	None established	Beyond 4-year and 10-year capital plans
Potential City Funded Capital Cost	$240M + unknown costs		

Additional intersection improvement required to support the Omni development are summarized in Table 4.2.

Table 4-2 Intersection Improvements to Support Omni

Scenario	Intersection	Number of Lanes Required											
		Eastbound			Westbound			Northbound			Southbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Future Background	Country Hills Boulevard & 84 Street NE	1	2	1	1	2	1	1	2	1	1	2	1
	Airport Trail & 84 Street NE	1	2	1	1	2	1	2	2	1	1	2	1
	McKnight Boulevard & 84 Street NE	1	2	0	1	2	0	2	2	0	1	2	0
Post Development	Country Hills Boulevard & 84 Street NE	1	3	2	1	3	1	3	2	1	1	2	1
	Airport Trail & 84 Street NE	2	3	2	2	3	2	3	2	2	2	2	2
	McKnight Boulevard & 84 Street NE	2	2	1	1	2	1	2	2	1	1	2	1
Additional lanes to accommodate Omni	Country Hills Boulevard & 84 Street NE	0	1	1	0	1	0	2	0	0	0	0	0
	Airport Trail & 84 Street NE	1	1	1	1	1	1	1	0	1	1	0	1
	McKnight Boulevard & 84 Street NE	1	0	1	0	0	1	0	0	1	0	0	1

.

As table 4.1 indicates, the total potential city funded capital costs resulting from the Omni ASP are approximately $240M plus as yet undetermined additional costs for the following:

+ Improvements to McKnight Boulevard & 84 Street NE;
+ The intersection widenings summarized in Table 4-2.

Four of the projects required to support Omni, estimated to cost a total of $180M, are included in the City's transportation offsite levy bylaw:

+ Stoney Trail & Airport Trail Interchange – crossing and east ramps;
+ Airport Trail west of 60 Street NE to Métis Trail – construct road connection;
+ Stoney Trail & 64 Avenue NE – construct flyover;
+ McKnight Boulevard & 68 Street NE – upgrade intersection to interchange.

There are over 150 large capital projects included in the City's transportation levy calculation, which have a total value of approximately $8.5B. The proportion of the total fund allocated for these City levy projects is relatively small, and the projects are not currently considered a priority for the City and the developers contributing to the levy, whereas other projects in the levy charges have already been established as priorities to support development in the City.

Only one of the projects required to support Omni is identified in Rocky View County's Transportation Offsite Levy: Township Road 250 (McKnight Boulevard) Expansion. The total amount being collected in the levy is insufficient to fund the interchange upgrade and McKnight Boulevard widening east of the municipal boundary, so once the levy funds are completed collected, supplementary funds must also be applied. Further, it is unclear whether the County is prepared to fully fund the $5.5M portion for this project if it is required to support the Omni development before the $5.5M is collected from development levies.

In Table 4-1, the total of capital project with known costs and unestablished funding sources is $60M. These projects have not been anticipated in the City's long-range plans. Advancing funding for these projects into current planning cycles would displace other projects already committed and planned for by the City.

As it is probable that Omni lands will develop within 10 years, it would cause the City to greatly accelerate anticipated capital budget spending within current 4- and 10-year capital budgeting cycles. It is therefore likely the City would be forced to advance capital costs in the range of $60M to $240M plus unknown additional costs into the 10-year planning cycle. Reallocating any available City capital funds to any of these projects will have a detrimental affect on the City's ability to deliver projects that have already been committed in its 4- and 10-year capital budget plans.

As Table 4-2 indicates, each of the intersections in the plan area would require widening on multiple approaches. The costs of these intersection improvements are in addition to the estimated costs for interchange and lane widening projects. The City of Calgary does not have a funding source for provision of additional lanes at the intersections impacted by the Omni plan.

Even with the intersection improvements indicated in Table 4-2, significant traffic congestion will occur. If Omni development proceeds without the intersection improvements, City of Calgary road users will experience severe traffic congestion and therefore traffic safety detriment.

4.1.2 Safety and Delay Impacts to City of Calgary Users

Analysis indicates that the routes between Northeast Calgary and the Omni area would have reserve capacity without development of Omni, but would experience significant congestion during peak periods due to build out of the Omni area. Traffic demand would exceed road network capacity to the extent that left and right turn storage lanes would not provide sufficient space for vehicles to queue safely out of through lanes and collisions would likely increase.

In addition to significant traffic congestion and operational issues, the City of Calgary has recently conducted spatial analysis to analyze the frequency of motor vehicle collisions (MVC) in proximity to shopping Centres. This work is summarized in the memo “Analysis of MVC’s in Proximity to Shopping Centres”, included in Appendix G.

This work showed a clear correlation between shopping centre boundaries and high density locations for MVC’s. The analysis found that there is an increase in motor vehicle collisions in areas of the City following build out of a shopping area similar in size to the Omni commercial lands.

Currently, the area of the City near the Omni area accounts for approximate 100 motor vehicle incidents per year. Translating findings from the spatial analysis work, it may be expected with build out of Omni commercial lands that motor vehicle incidents within a one kilometre radius of shopping centres in the Omni area could increase by as much as 146%. This is a very large increase in the potential incidents involving City drivers and reduction in overall traffic safety for all drivers.

There has been no commitment by Rocky View County to mitigate the potential large increase in incidents and reduction of safety for Calgary drivers that could be correlated to the build out of the Omni commercial lands. Any mitigation measures or traffic safety related infrastructure improvements or emergency response to motor vehicle incidents would likely fall to the City in addition to capital costs identified in Section 4.1.1.

The traffic safety related detriments of the Omni ASP to the City of Calgary include potential large increases in motor vehicle incidents in proximity to the Omni area, and additional costs for City emergency services to respond to these increased number of incidents.

Appendix A

Future Background Forecast

Transportation Forecasting
Regional Transportation Model Version 2 Outputs

Conrich/Rocky View County Omni Asp
R2204

Client: Tom Hopkins
TDS

Prepared by: Erin Puente, P.Eng
11-May-18

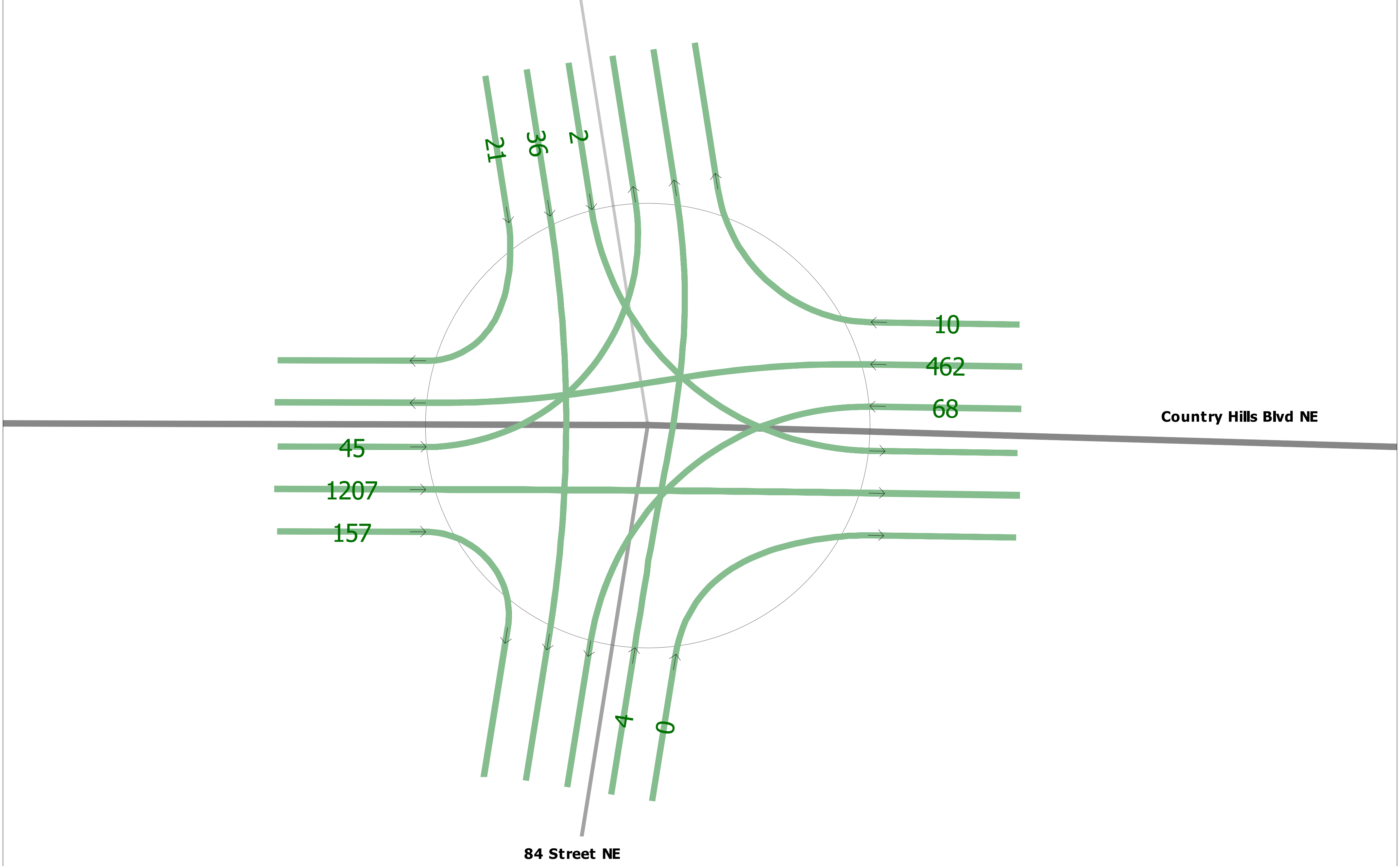
The following plots are raw model outputs which have not been adjusted to account for limitations of the model. Additionally, the custom Conrich & East Stoney Scenario was created in 2016 and may not reflect current network and land use assumptions.

Notes:
Please contact TranPlanForecast@calgary.ca for a copy of the scenario assumptions used to

ISC: Protected

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: AM Crown
Intersection: 84 Street NE & Country Hills Blvd NE

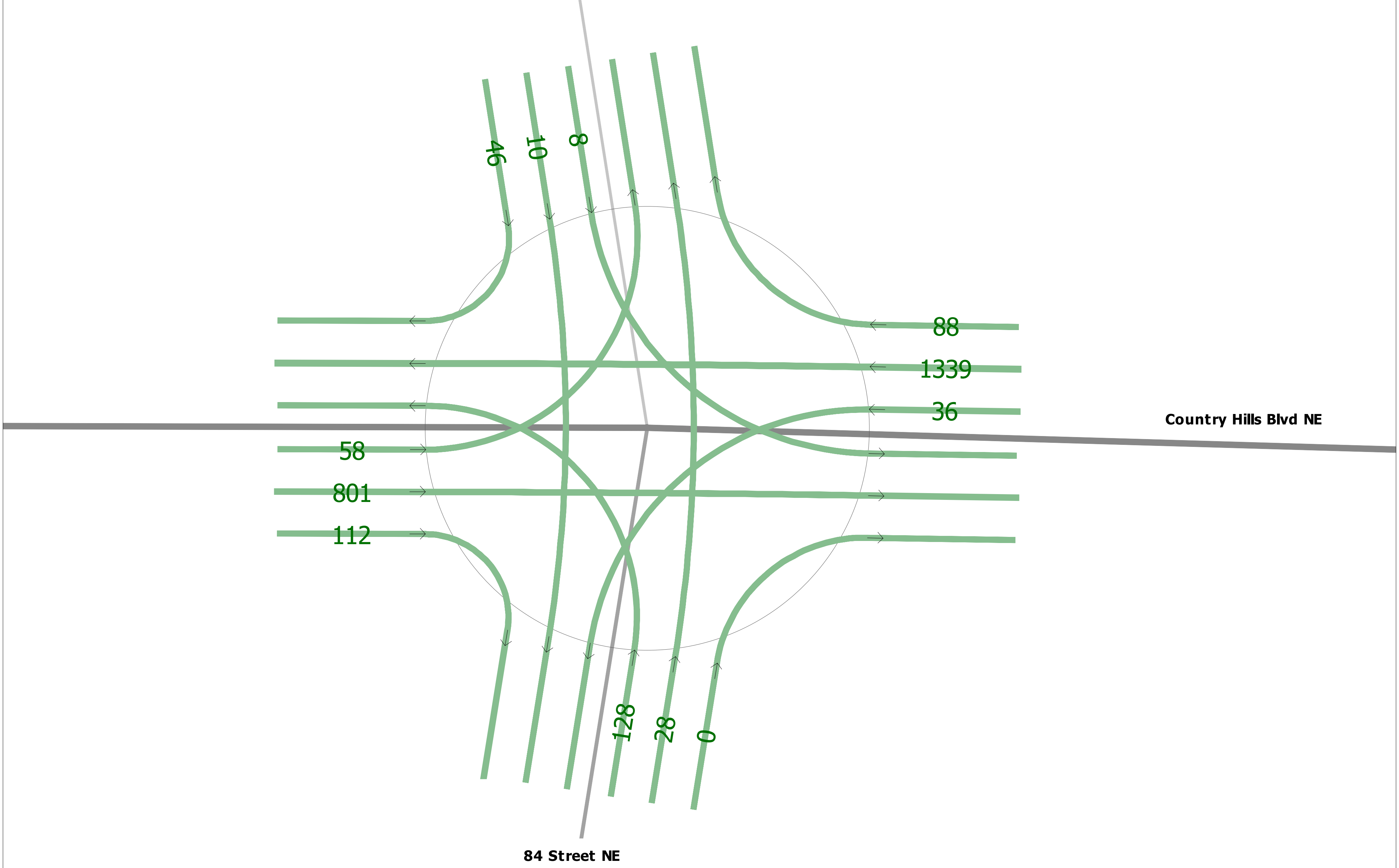


THE CITY OF CALGARY

Date: 2018-05-11 Databank: 2028 TI M 032916-2028 Horizon Conrich & East Stoney Scen. 1: AM Crown (AMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

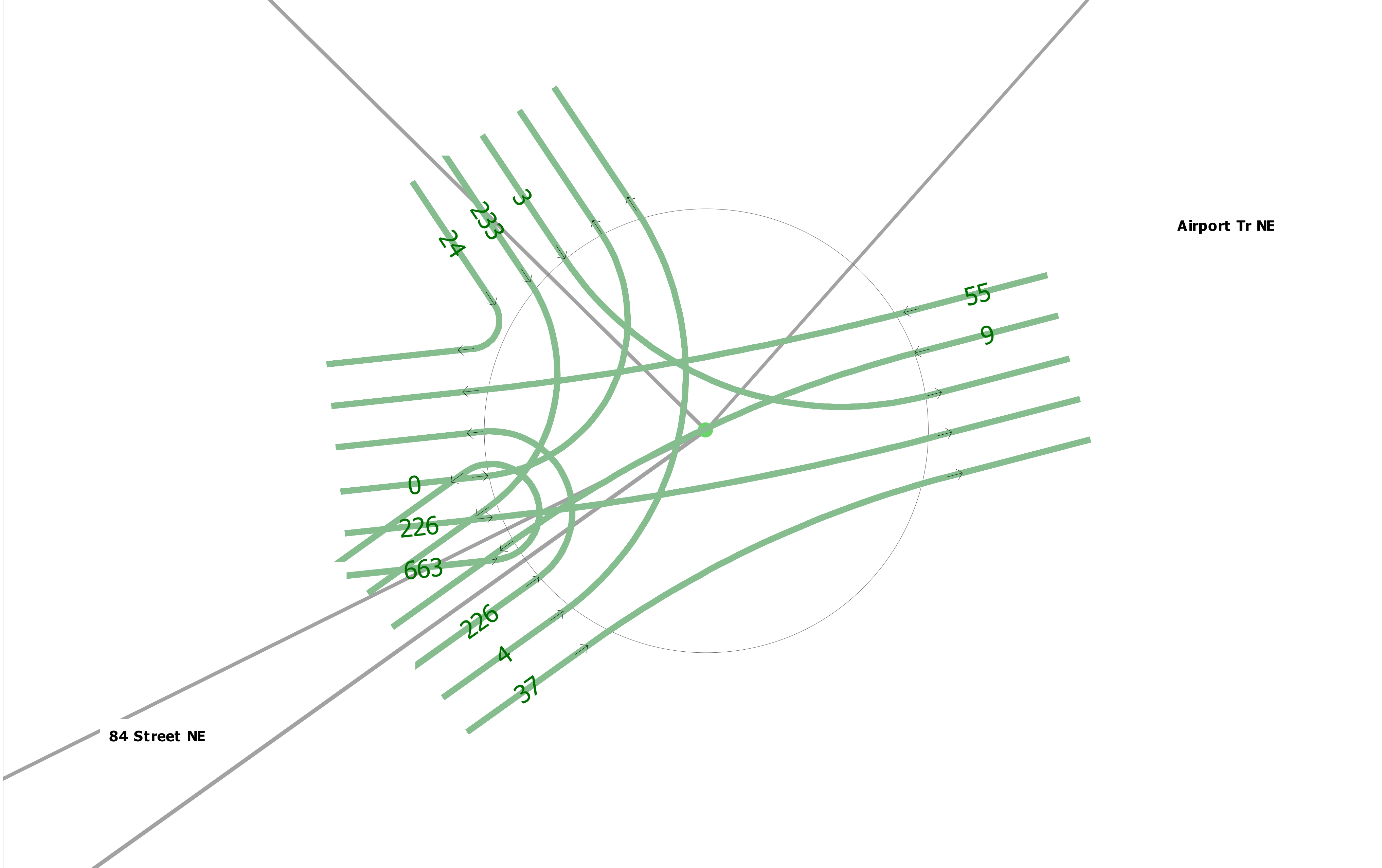
Time Period: PM Crown
Intersection: 84 Street NE & Country Hills Blvd NE



Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 3: PM Crown (PMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: AM Crown
Intersection: 84 Street NE & Airport Tr NE



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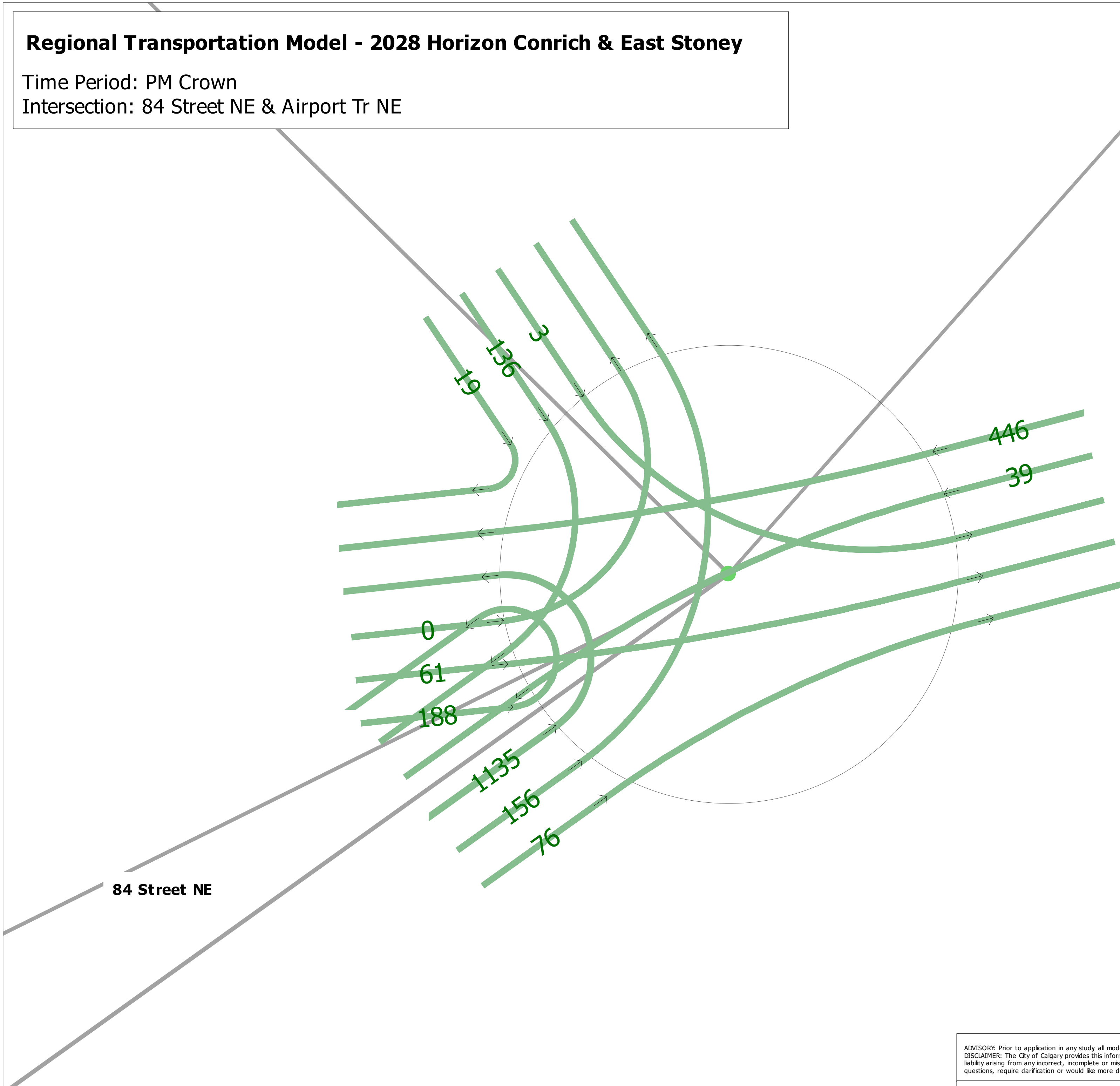
Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 1: AM Crown (AMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: PM Crown
Intersection: 84 Street NE & Airport Tr NE



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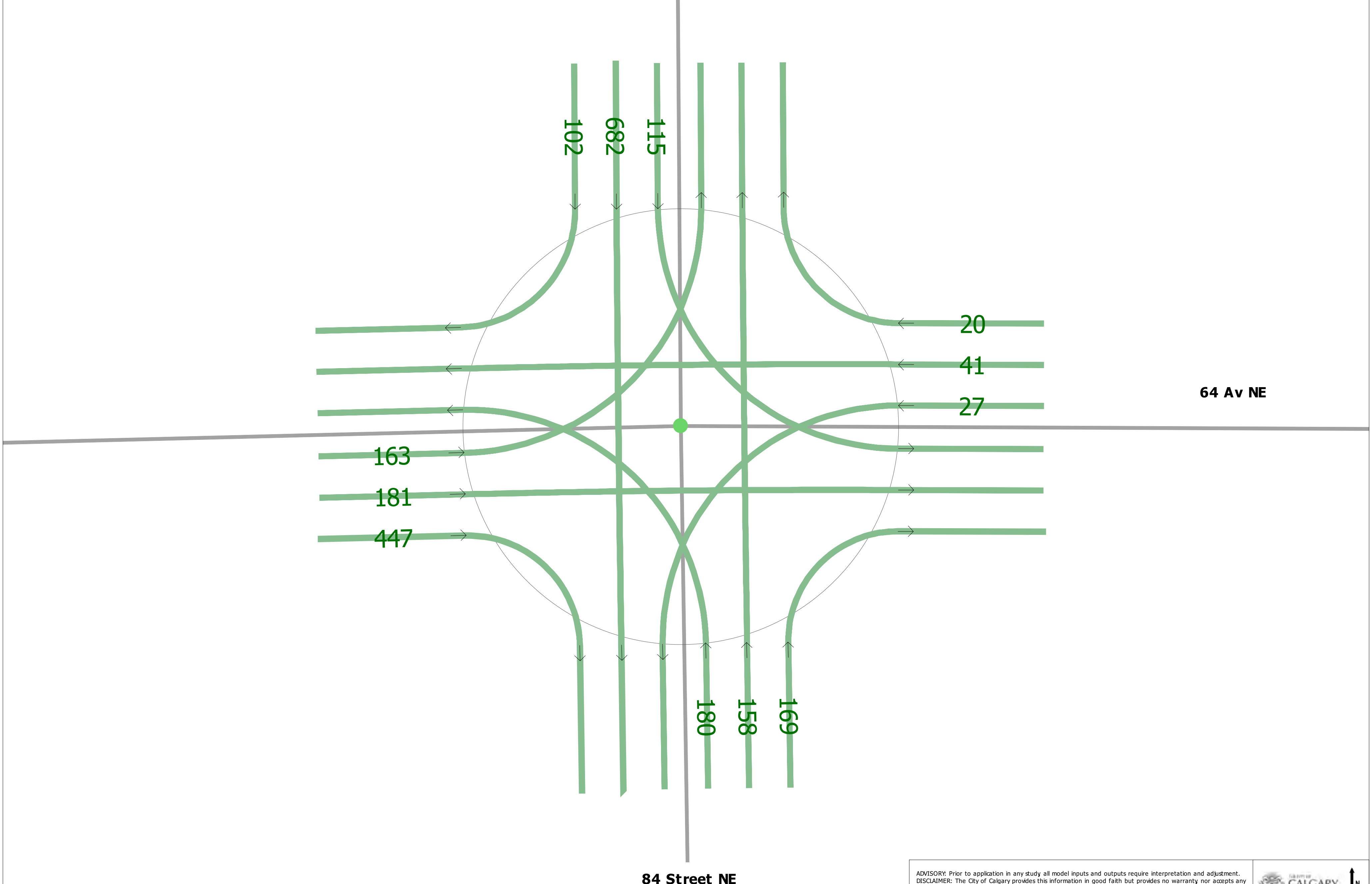
Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 3: PM Crown (PMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

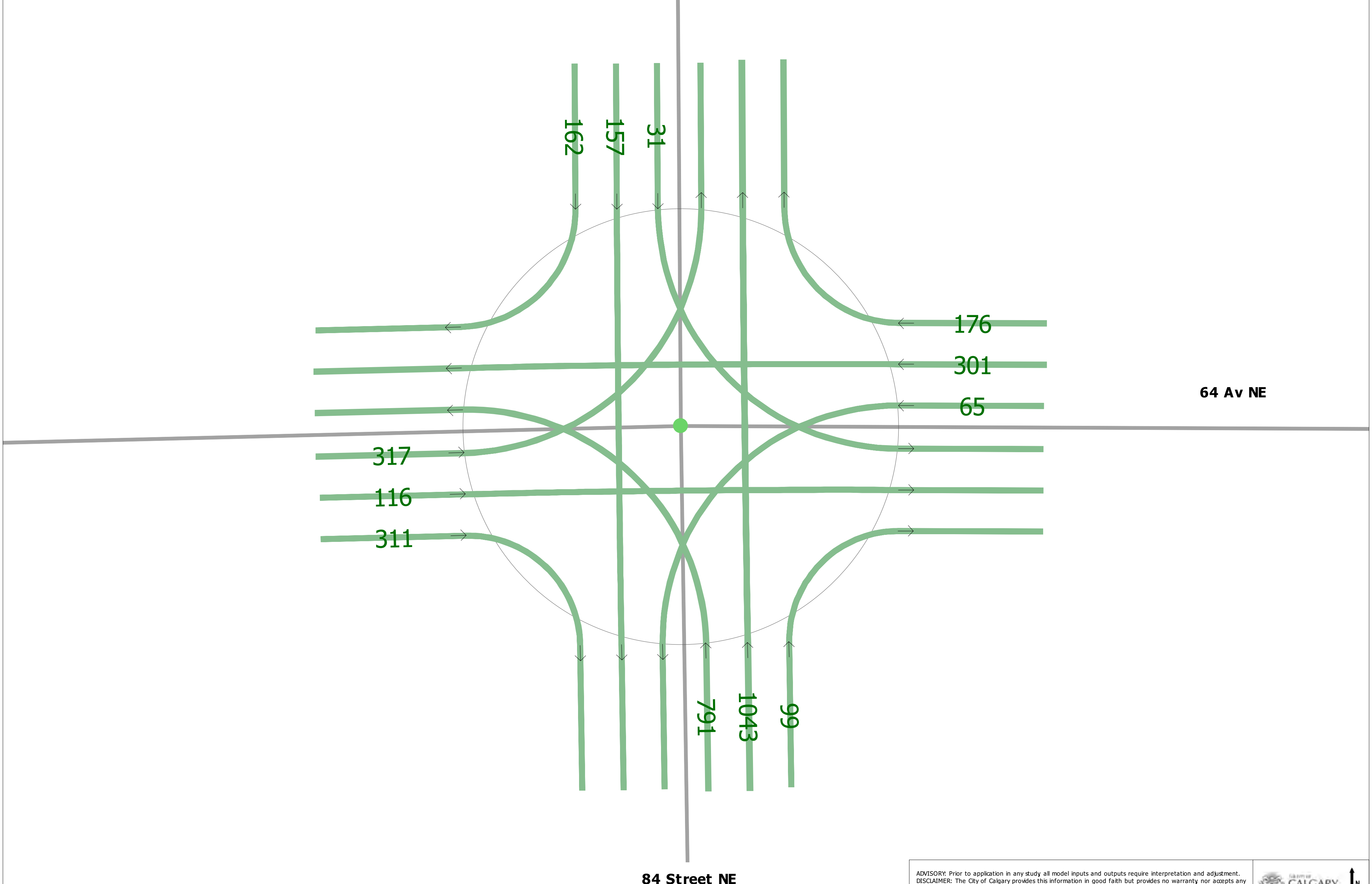
Time Period: AM Crown
Intersection: 84 Street NE & 64 Avenue NE



Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 1: AM Crown (AMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: PM Crown
Intersection: 84 Street NE & 64 Avenue NE



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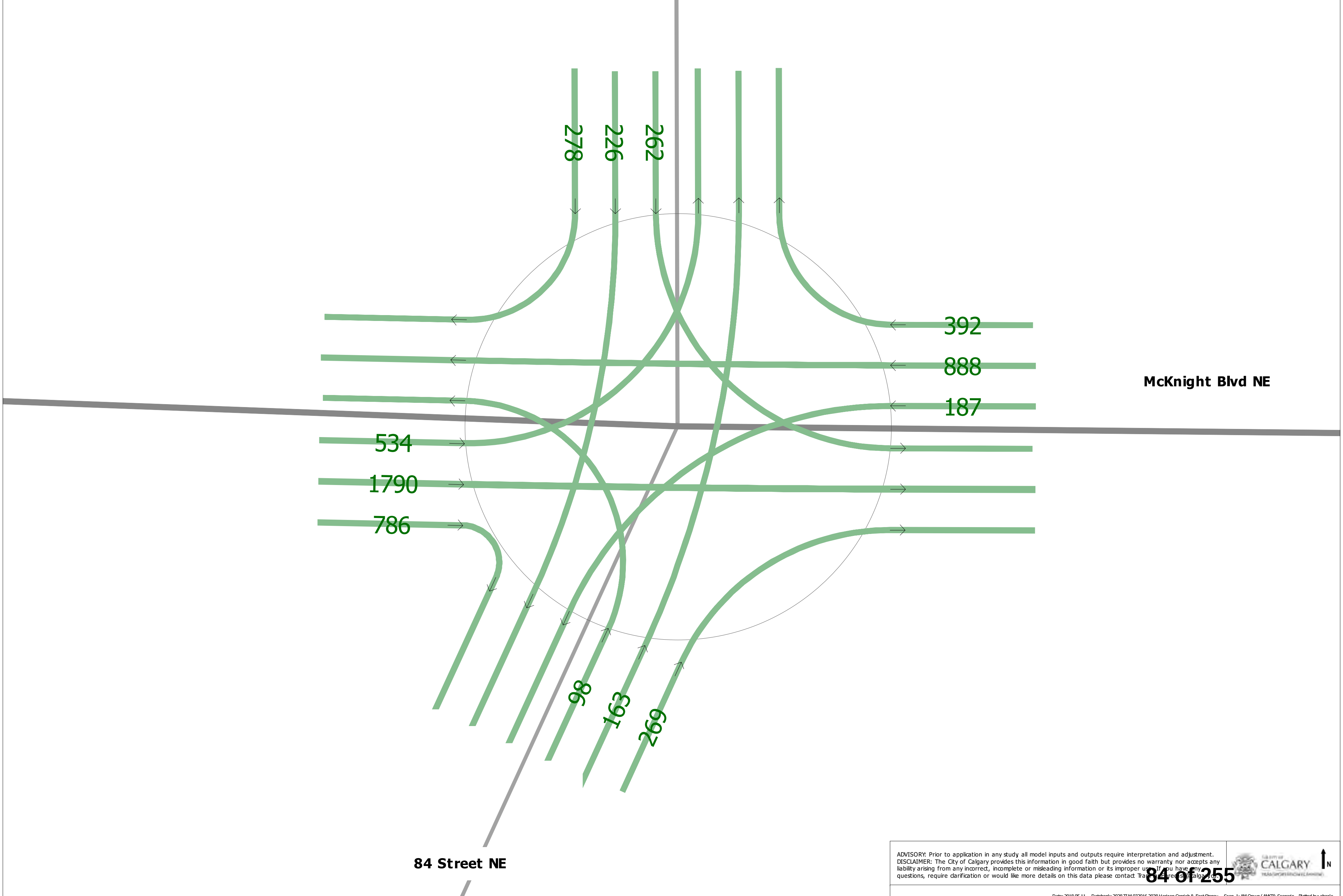
Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 3: PM Crown (PMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: AM Crown
Intersection: 84 Street NE & McKnight Blvd NE



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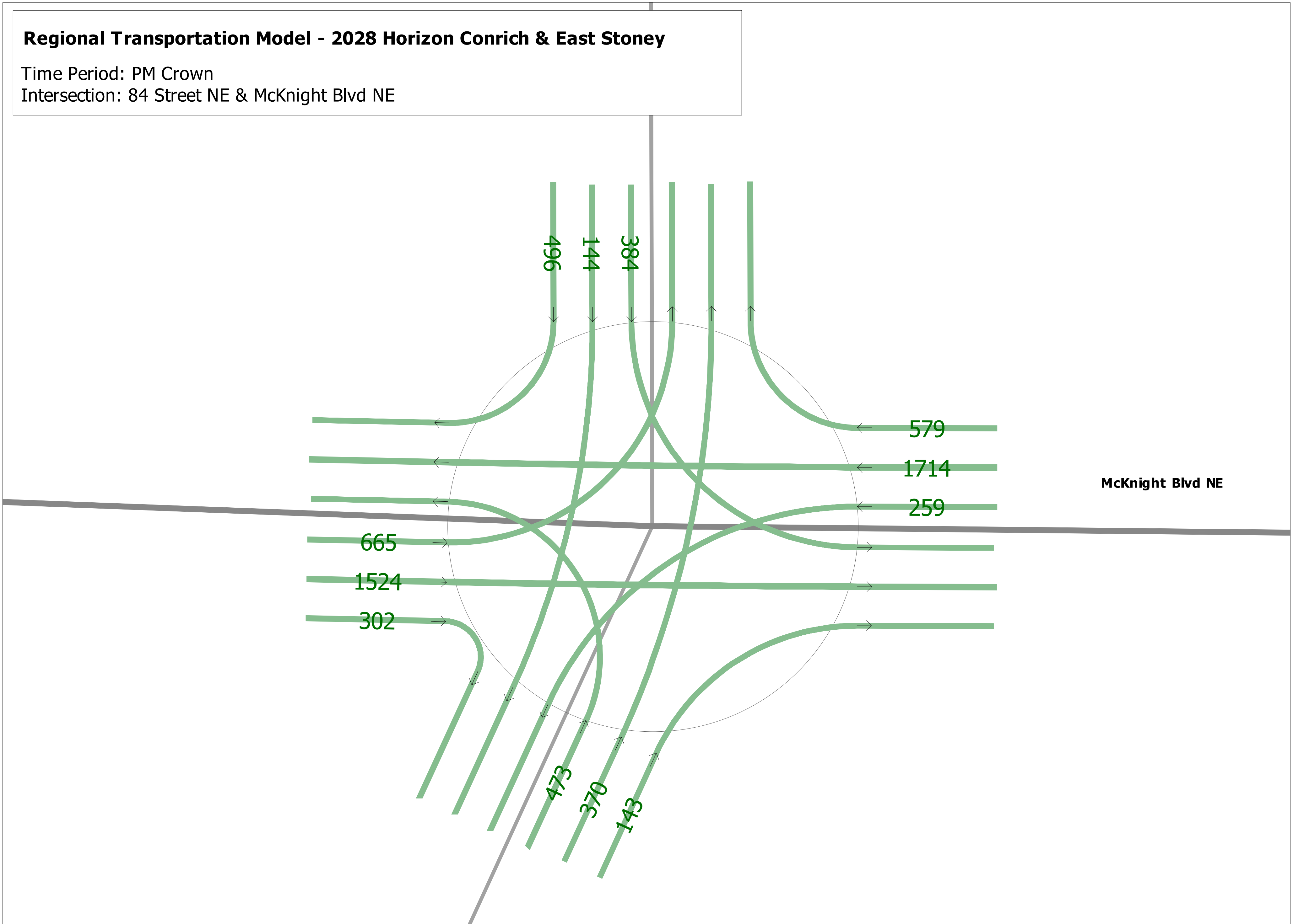
Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 1: AM Crown (AMCR) Scenario Plotted by: ehazle

Regional Transportation Model - 2028 Horizon Conrich & East Stoney

Time Period: PM Crown
Intersection: 84 Street NE & McKnight Blvd NE



Date: 2018-05-11 Databank: 2028 TIM 032916-2028 Horizon Conrich & East Stoney Scen. 3: PM Crown (PMCR) Scenario Plotted by: ehazle

Conrich Transportation Study ASP

Volume Plots

Request Number:	R1918
Location:	Conrich
Forecast Requested by:	Kari Fellows
Company:	The City of Calgary
Date Requested:	Feb 10, 2016
Forecast Prepared by:	Erin Puente
Date Completed:	April 12, 2016
Cost:	
Notes:	
Databases:	2028 RTM 2.0

If you have any questions regarding this forecast, please e-mail: TranPlanForecast@calgary.ca

THE CITY OF CALGARY TRANSPORTATION

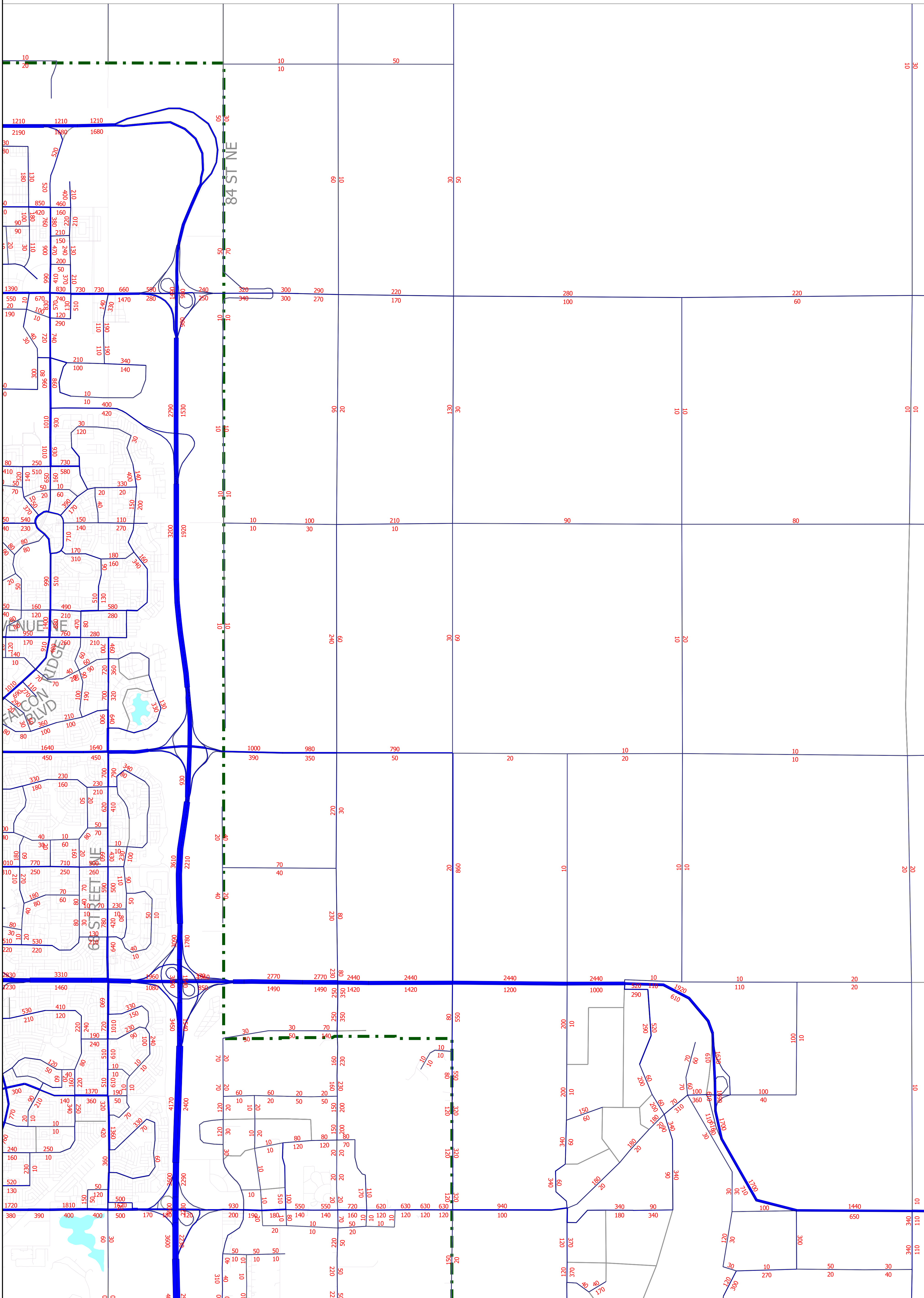
ISC: *Protected*

Calgary

One Hour Volume (veh/hr)
2028 LUN - AM Crown
Project: R1918 Conrich ASP

Scenario: 2028 Horizon Base

N



LEGEND

Hourly Volume (veh/hr)

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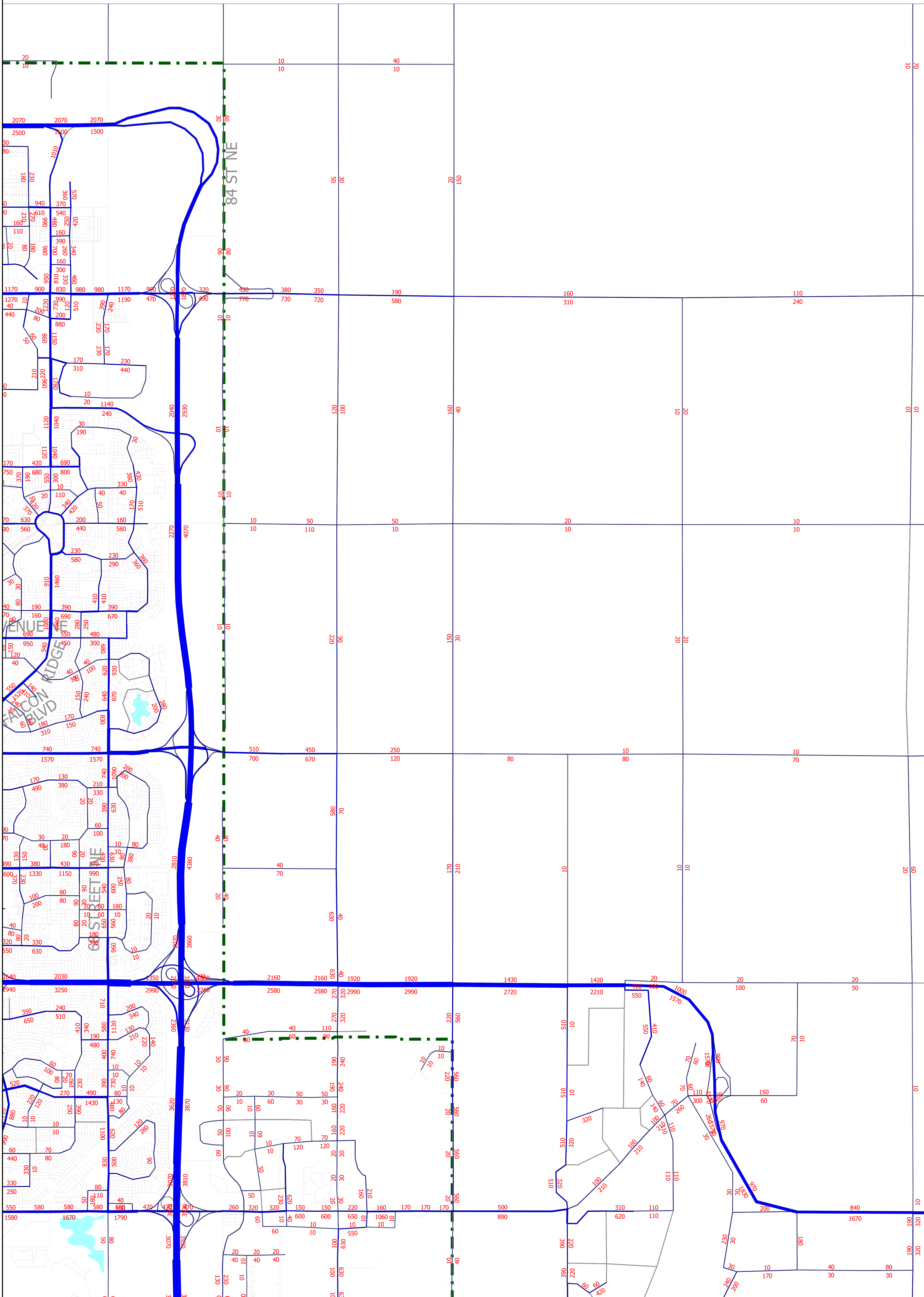
Date: 2016-04-12 Databank: 2028 TIM 021016-2028 Horizon Base Sc: 101: AM Crown (AMCR) Base Scenario Plotted by: ehazle

Calgary

One Hour Volume (veh/hr)
2028 LUN - PM Crown
Project: R1918 Conrich ASP

Scenario: 2028 Horizon Base



LEGEND

Hourly Volume (veh/hr)

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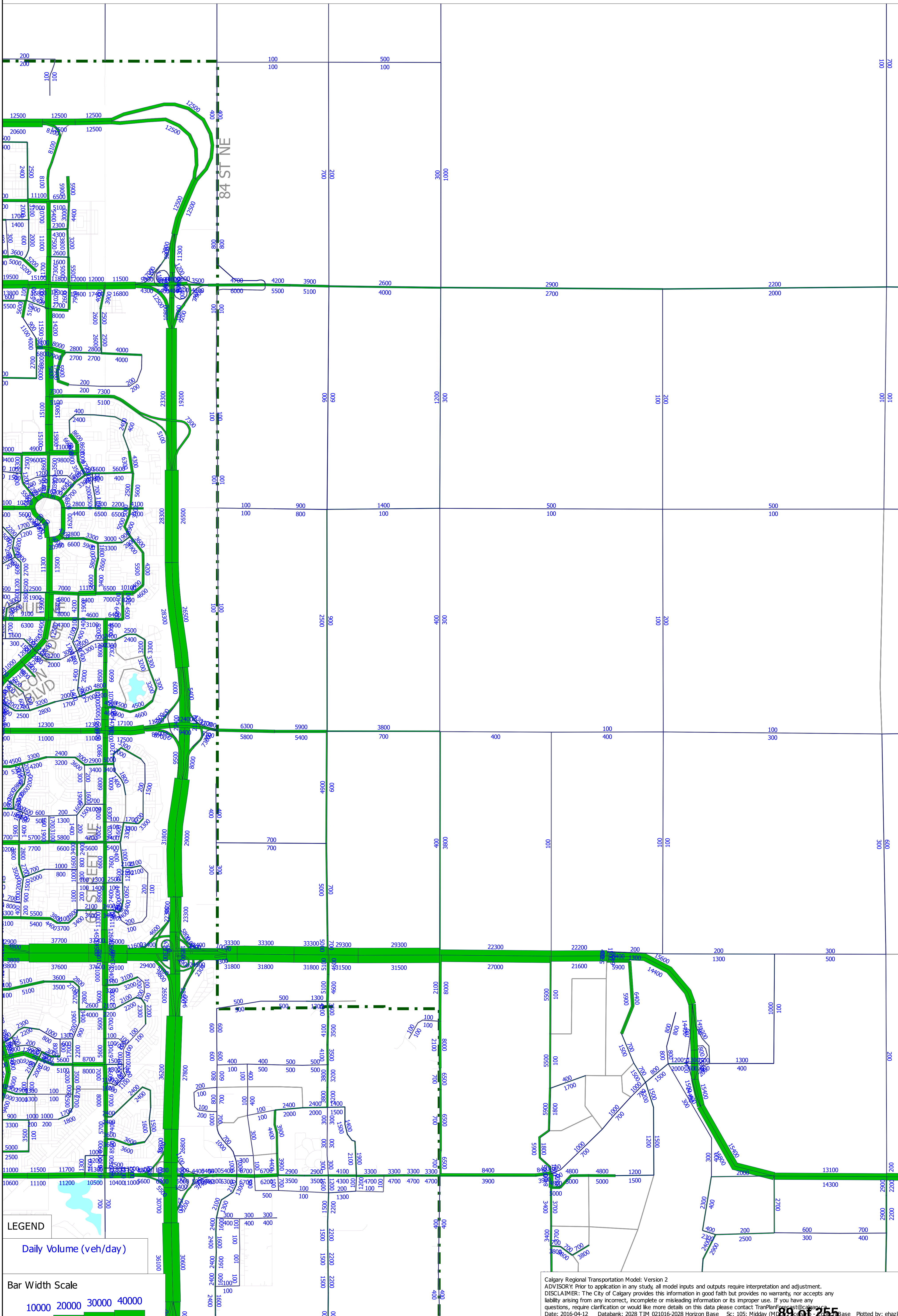
Date: 2016-04-12 Databank: 2028 TIM 021016-2028 Horizon Base Sc: 103: PM Crown (PMCR) Base Scenario Plotted by: ehazle

24 Hour Volume (Veh/Day)
2028 LUN
Project: R1918 Conrich ASP

Scenario: 2028 Horizon Base



LEGEND

Daily Volume (veh/day)

Bar Width Scale

10000 20000 30000 40000

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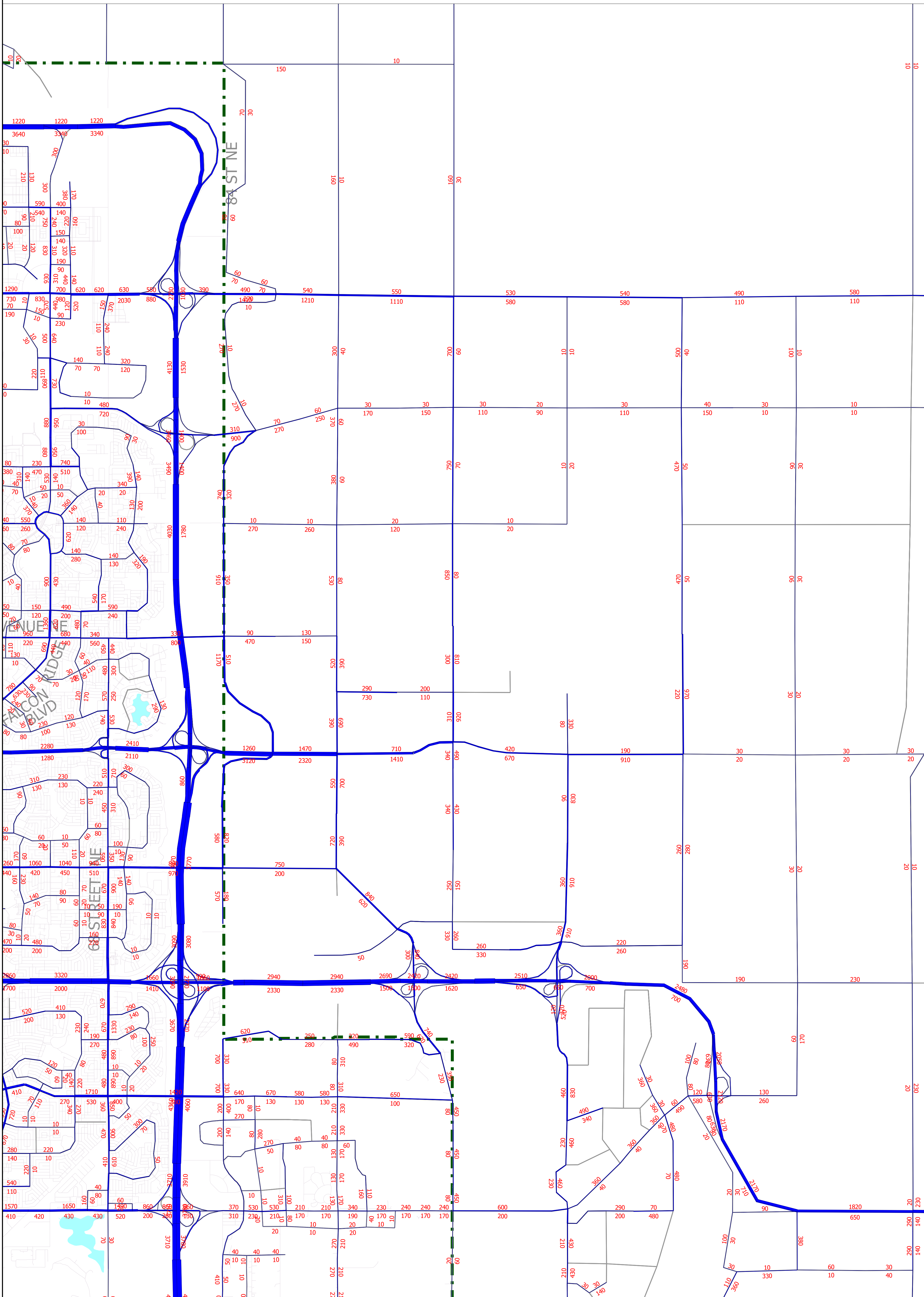
Date: 2016-04-12 Databank: 2028 TIM 021016-2028 Horizon Base Sc: 105: Midday (MD): Scenario - Conrich Base Plotted by: ehazle

Calgary

One Hour Volume (veh/hr)
2028 LUN - AM Crown
Project: R1918 Conrich ASP

Scenario: 2028 Conrich Additional SZ



LEGEND

Hourly Volume (veh/hr)

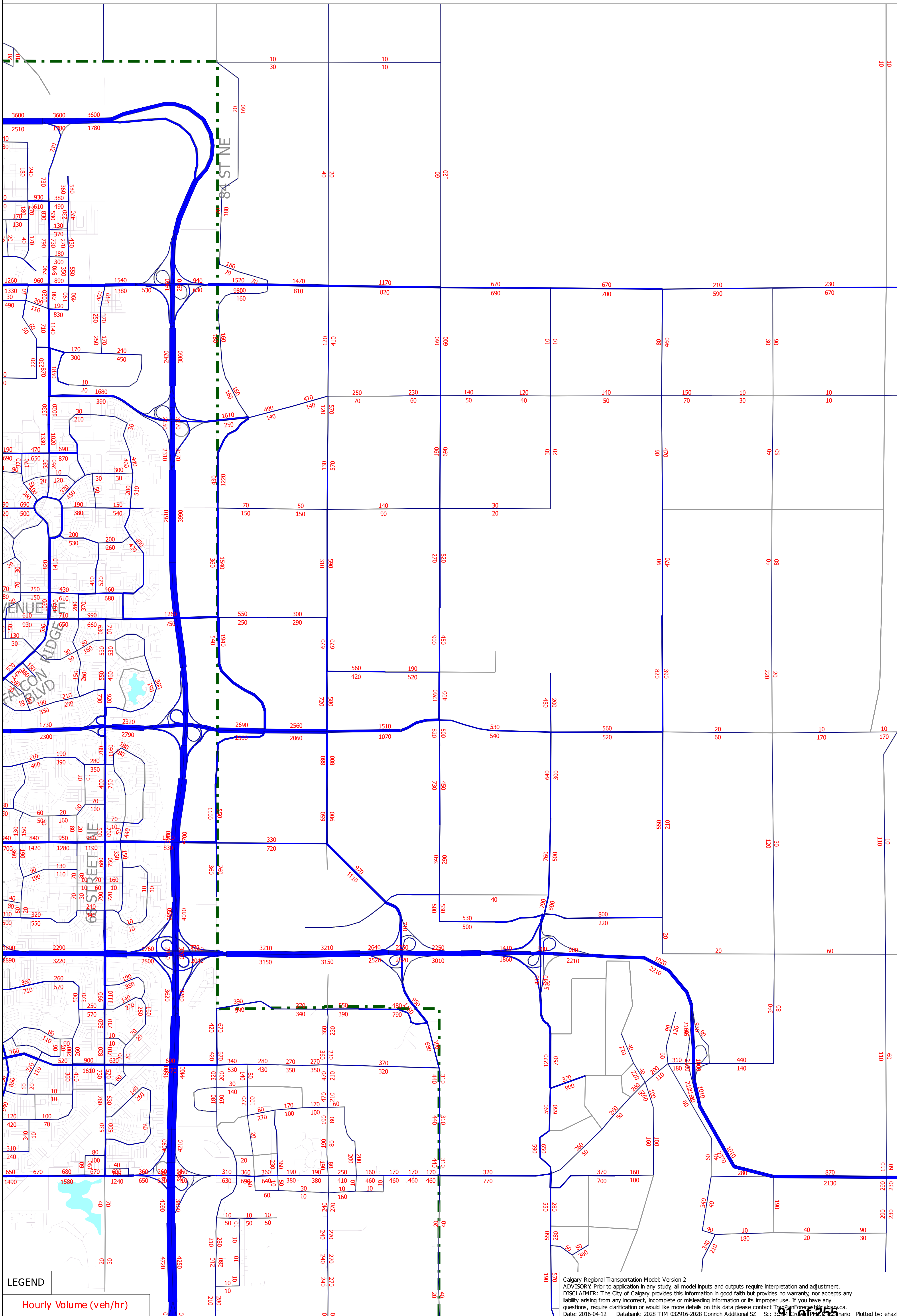
Calgary Regional Transportation Model: Version 2
ADVISORY: Prior to application in any study, all model inputs and outputs require interpretation and adjustment.
DISCLAIMER: The City of Calgary provides this information in good faith but provides no warranty, nor accepts any liability arising from any incorrect, incomplete or misleading information or its improper use. If you have any questions, require clarification or would like more details on this data please contact TranPlanForecast@calgary.ca.
Date: 2016-04-12 Databank: 2028 TIM 032916-2028 Conrich Additional SZ Plotted by: ehazle

Calgary

One Hour Volume (veh/hr)
2028 LUN - PM Crown
Project: R1918 Conrich ASP

Scenario: 2028 Conrich Additional SZ

N



LEGEND

Hourly Volume (veh/hr)

Calgary Regional Transportation Model: Version 2
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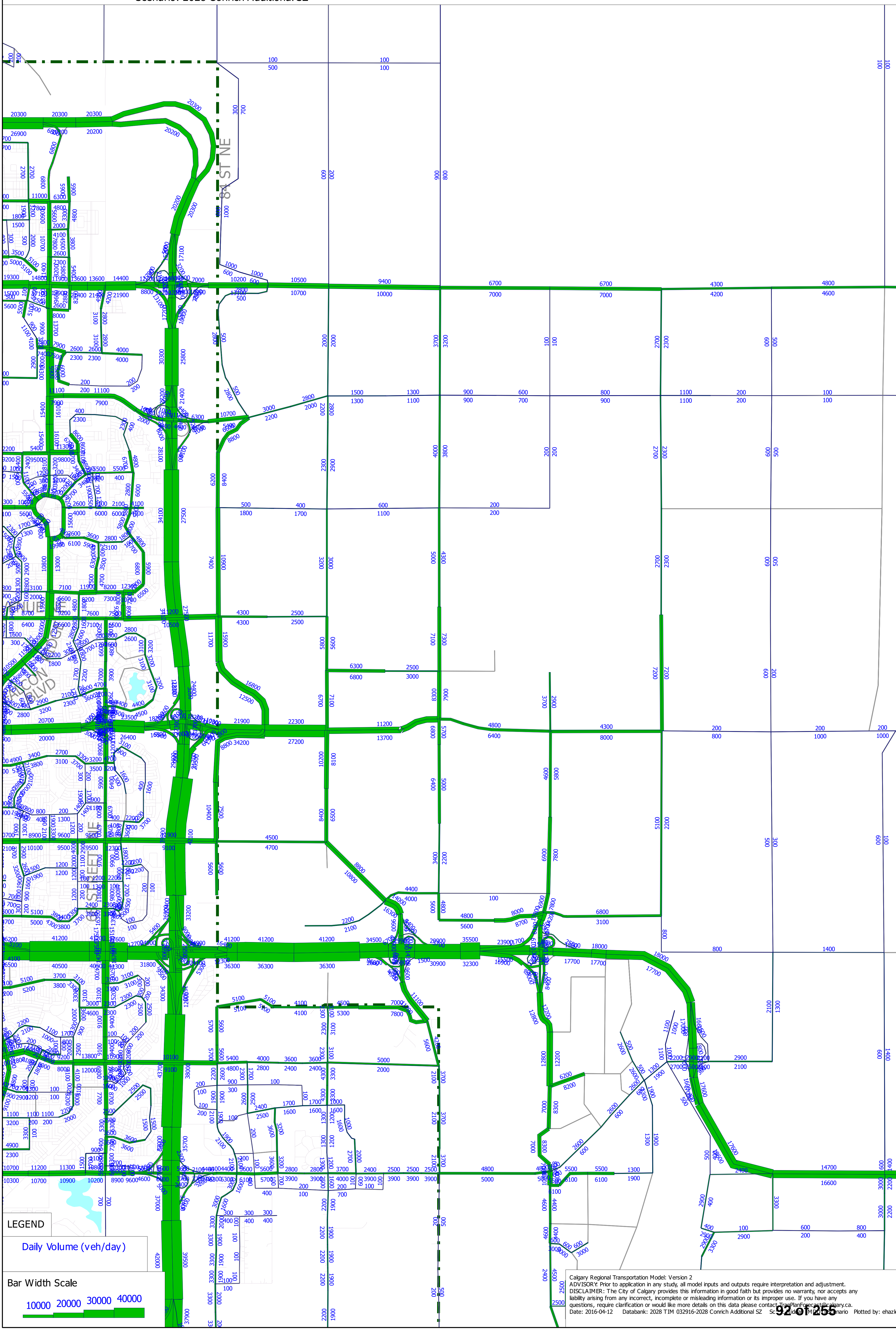
Date: 2016-04-12 Databank: 2028 TIM 032916-2028 Conrich Additional SZ Sc: 3: PM Crown PM CR Scenario Plotted by: ehazle

24 Hour Volume (Veh/Day)
2028 LUN
Project: R1918 Conrich ASP

Scenario: 2028 Conrich Additional SZ



Calgary Regional Transportation Model: Version 2
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Date: 2016-04-12 Databank: 2028 TIM 032916-2028 Conrich Additional SZ Sc[illegible] Midday [illegible] Scenario Plotted by: ehazle

THE CITY OF CALGARY
TRANSPORTATION PLANNING

Forecasting Request Documentation Summary Form

Request Number:	**R1918**	ISC: Protected
Project:	**Conrich Transportation Study ASP**	
Forecast requested by:	Kari Fellows	
Company:	The City of Calgary	
Date requested:	Wednesday, February 10, 2016	
Forecast prepared by:	Erin Puente	
Date completed:	Tuesday, April 5, 2016	
Cost of forecast:		
Other Files Sent:		
Other Information:	NOT ALL VOLUMES WERE BALANCED, SINCE THERE ARE STREETS BETWEEN THE MAJOR INTERSECTIONS. THERE ARE MANY CHANGES THAT ARE IMPLEMENTED TO THE FUTURE NETWORK FOR MUCH OF THE STUDY AREA THUS, THE FORECAST VOLUMES ARE SUBJECT TO MORE VARIATION SHOULD LAND USE IN THE AREA CHANGE **For the new development, traffic needs to be redistributed on local roads.**	

If you have any questions on this forecast, please e-mail: TranPlanForecast@calgary.ca

Advisory:
PRIOR TO APPLICATION IN ANY STUDY, ALL MODEL INPUTS AND OUTPUTS REQUIRE INTERPRETATION AND ADJUSTMENT.
SEE THE FORECASTING WEBSITE FOR APPROPRIATE CONTACT INFORMATION.

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R1918: Conrich Transportation Study ASP
Traffic Forecast
5-Apr-16
F:\Model Application\Requests\2016\R1918-TDS-Conrich Transportation Study-ASP\For Review\[R1918 Forecast including Turning Movements.xlsx]R1918

AM, PM, and ADT
2028 Base Scenario

Road Segment Description		2028 Horizon								
		AM			PM			ADT		
		Volume	Truck%	M:H Ratio	Volume	Truck%	M:H Ratio	Volume	Truck%	M:H Ratio
Country Hills west of Stoney Trail	WB	660	8%	1.9:1	1,170	3%	1.7:1	11,420	5%	1.6:1
	EB	1,470	4%	1.6:1	1,190	4%	1.1:1	16,720	5%	1.6:1
	Total	2,130	5%	1.7:1	2,350	3%	1.3:1	28,140	5%	1.6:1
Country Hills east of Stoney Trail	WB	320	16%	1:1.4	430	8%	1:1.6	4,660	14%	1:1.1
	EB	340	11%	1.1:1	770	7%	1:1.4	5,920	12%	1:1.1
	Total	650	13%	1:1.2	1,200	7%	1:1.5	10,580	13%	1:1.1
Airport Trail west of Stoney Trail	WB	400	8%	1.3:1	1,140	2%	1.2:1	7,250	5%	2:1
	EB	420	4%	2:1	240	6%	2:1	5,070	6%	2.5:1
	Total	810	6%	1.5:1	1,380	3%	1.4:1	12,310	5%	2.2:1
McKnight west of Stoney Trail	WB	1,850	3%	1:1	1,690	2%	2:1	17,080	4%	1.4:1
	EB	1,360	4%	1:1	2,100	3%	1.3:1	17,480	6%	1.6:1
	Total	3,200	3%	1:1	3,790	3%	1.4:1	34,550	5%	1.5:1
McKnight east of Stoney Trail	WB	1,000	5%	1:1.7	510	3%	1:1	6,210	6%	1:1.5
	EB	390	4%	1:1	690	4%	1:1.5	5,710	7%	1.2:1
	Total	1,390	4%	1:1.4	1,200	4%	1:1.4	11,920	6%	1:1.1
Highway 1 west of Stoney Trail	WB	2,700	6%	1:2.4	2,510	6%	1:1.8	34,950	8%	1:1.6
	EB	1,800	11%	1:5	4,250	4%	1:1.5	39,050	9%	1:1.7
	Total	4,490	8%	1:3.5	6,760	4%	1:1.6	74,000	8%	1:1.6
Highway 1 east of Stoney Trail	WB	2,770	5%	1:1.7	2,160	6%	1:2.7	33,270	8%	1:1.7
	EB	1,490	12%	1:3.8	2,580	4%	1:2.7	31,750	8%	1:1.9
	Total	4,250	8%	1:2.5	4,730	5%	1:2.7	65,010	8%	1:1.8

AM, PM, and ADT
2028 Conrich & East Stoney Scenario

Road Segment Description		2028 Horizon								
		AM			PM			ADT		
		Volume	Truck%	M:H Ratio	Volume	Truck%	M:H Ratio	Volume	Truck%	M:H Ratio
Country Hills west of Stoney Trail	WB	630	7%	1.8:1	1,540	3%	1.5:1	14,310	5%	2.2:1
	EB	2,030	5%	2.5:1	1,380	5%	1.9:1	21,810	6%	2:1
	Total	2,650	5%	2.2:1	2,910	4%	1.8:1	36,120	6%	2.1:1
Country Hills east of Stoney Trail	WB	490	13%	1:1.3	1,520	4%	1:1.1	10,180	10%	1.2:1
	EB	1,410	6%	1.6:1	980	8%	1.3:1	13,070	10%	1.5:1
	Total	1,900	8%	1.2:1	2,490	6%	1.2:1	23,240	10%	1.3:1
Airport Trail west of Stoney Trail	WB	480	8%	1.7:1	1,680	2%	2.4:1	11,090	5%	3.2:1
	EB	720	3%	1:1	390	4%	7:1	7,890	5%	3.1:1
	Total	1,200	5%	1.4:1	2,060	3%	3.2:1	18,970	5%	3.1:1
Airport Trail east of Stoney Trail	WB	310	15%	1.8:1	1,600	3%	2.9:1	10,620	8%	2.9:1
	EB	900	4%	1.3:1	250	12%	2:1	5,330	11%	2.1:1
	Total	1,200	7%	1.6:1	1,850	4%	2.5:1	15,950	9%	2.5:1
McKnight west of Stoney Trail	WB	2,410	4%	1.1:1	2,320	3%	2.3:1	23,470	7%	1.9:1
	EB	2,110	4%	1:1	2,790	5%	1.2:1	26,340	7%	1.6:1
	Total	4,520	4%	1.1:1	5,100	4%	1.4:1	49,810	7%	1.7:1
McKnight east of Stoney Trail	WB	1,260	10%	2.5:1	2,690	5%	5.6:1	21,880	12%	4.2:1
	EB	3,120	5%	4.3:1	2,500	8%	4.3:1	34,190	11%	4.4:1
	Total	4,370	6%	3.3:1	5,180	7%	4.8:1	56,070	11%	4.3:1
Highway 1 west of Stoney Trail	WB	2,510	8%	1:1.9	2,930	7%	1.4:1	37,520	11%	1.1:1
	EB	2,100	12%	1:2.7	3,870	5%	1.2:1	41,260	11%	1.1:1
	Total	4,600	10%	1:2.3	6,790	6%	1.3:1	78,780	11%	1.1:1
Highway 1 east of Stoney Trail	WB	2,940	7%	1:1.4	3,210	6%	1:1.1	41,160	10%	1.1:1
	EB	2,330	9%	1:2.1	3,150	5%	1:1.6	36,280	9%	1:1.2
	Total	5,260	8%	1:1.7	6,350	6%	1:1.3	77,430	10%	1:1.1
64^{th} Ave NE over Stoney Trail	WB	330	5%	H=0	1,260	1%	H=0	11,150	3%	H=0
	EB	800	2%	H=0	750	2%	H=0	10,500	3%	5:1
	Total	1,120	3%	H=0	2,000	2%	H=0	21,640	3%	10:1
32^{nd} Ave NE over Stoney Trail	WB	890	5%	H=0	1,390	3%	H=0	11,830	6%	H=0
	EB	970	4%	H=0	830	4%	H=0	9,060	5%	H=0
	Total	1,850	4%	H=0	2,210	3%	H=0	20,890	6%	H=0
Memorial Drive over Stoney Trail	WB	1,420	1%	H=0	600	3%	H=0	10,100	3%	H=0
	EB	380	3%	H=0	1,170	2%	H=0	9,030	3%	H=0
	Total	1,790	2%	H=0	1,760	2%	H=0	19,120	3%	H=0

R1918: Conrich Transportation ASP
Turning Movements
ISC: Protected
F:\Model Application\Requests\2016\R1918-TDS-Conrich Transportation Study-ASP\For Review\[R1918 Forecast including Turning Movements.xlsx]R1918 Forecast - Turn Movements

AM - Base

Stoney Tr NE / Country Hills Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
5%	1,690	80	1,490	120	1,210

WBO	EBL	EBT	EBR	EBI	EBtr
670	150	130	1,190	1,470	1%

WBtr	WBI	WBR	WBT	WBL	EBO
9%	330	80	140	110	350

SBO	NBL	NBT	NBR	NBI	NBtr
2,790	450	980	100	1,530	6%

Stoney Tr NE / Airport Tr NE

SBtr	SBI	SBT	NBO
4%	2,790	2,790	1,530

WBO	EBR	EBI	EBtr
400	420	420	2%

SBO	NBL	NBT	NBI	NBtr
3,210	400	1,530	1,930	6%

Stoney Tr NE / McKnight Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
3%	3,210	440	2,680	90	1,930

WBO	EBL	EBT	EBR	EBI	EBtr
1,850	250	250	870	1,370	2%

WBtr	WBI	WBR	WBT	WBL	EBO
1%	1,010	140	800	70	410

SBO	NBL	NBT	NBR	NBI	NBtr
3,620	610	1,540	70	2,220	5%

PM - Base

Stoney Tr NE / Country Hills Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
7%	1,500	180	1,220	100	2,080

WBO	EBL	EBT	EBR	EBI	EBtr
1,170	90	390	720	1,200	1%

WBtr	WBI	WBR	WBT	WBL	EBO
6%	440	120	220	100	780

SBO	NBL	NBT	NBR	NBI	NBtr
2,040	770	1,870	290	2,930	4%

Stoney Tr NE / Airport Tr NE

SBtr	SBI	SBT	NBO
6%	2,040	2,040	2,930

WBO	EBR	EBI	EBtr
1,140	240	240	2%

SBO	NBL	NBT	NBI	NBtr
2,280	1,140	2,930	4,070	3%

Stoney Tr NE / McKnight Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
6%	2,280	480	1,780	20	4,080

WBO	EBL	EBT	EBR	EBI	EBtr
1,700	610	570	930	2,110	1%

WBtr	WBI	WBR	WBT	WBL	EBO
0%	530	80	340	110	710

SBO	NBL	NBT	NBR	NBI	NBtr
2,820	880	3,390	120	4,390	3%

AM - Conrich

Stoney Tr NE / Country Hills Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
3%	3,350	90	2,730	530	1,220

WBO	EBL	EBT	EBR	EBI	EBtr
640	90	790	1,150	2,030	1%

WBtr	WBI	WBR	WBT	WBL	EBO
6%	490	100	140	250	1,410

SBO	NBL	NBT	NBR	NBI	NBtr
4,130	410	1,030	90	1,530	6%

Stoney Tr NE / Airport Tr NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
3%	4,130	100	3,460	570	1,940

WBO	EBL	EBT	EBR	EBI	EBtr
480	0	180	140	320	2%

WBtr	WBI	WBR	WBT	WBL	EBO
3%	720	540	150	30	900

SBO	NBL	NBT	NBR	NBI	NBtr
3,630	230	1,400	150	1,780	7%

Stoney Tr NE / McKnight Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
5%	2,620	370	1,890	360	4,000

WBO	EBL	EBT	EBR	EBI	EBtr
2,330	480	1,150	1,170	2,800	1%

WBtr	WBI	WBR	WBT	WBL	EBO
1%	2,700	480	1,290	930	2,510

SBO	NBL	NBT	NBR	NBI	NBtr
3,990	670	3,040	1,000	4,710	4%

PM - Conrich

Stoney Tr NE / Country Hills Blvd NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
6%	3,350	90	2,730	530	3,610

WBO	EBL	EBT	EBR	EBI	EBtr
1,329	90	790	1,150	2,030	1%

WBtr	WBI	WBR	WBT	WBL	EBO
1%	1,520	580	830	110	1,669

SBO	NBL	NBT	NBR	NBI	NBtr
3,990	409	2,940	349	3,698	3%

Stoney Tr NE / Airport Tr NE — Interchange

SBtr	SBI	SBR	SBT	SBL	NBO
5%	2,430	160	2,150	120	3,860

WBO	EBL	EBT	EBR	EBI	EBtr
1,690	0	90	300	390	2%

WBtr	WBI	WBR	WBT	WBL	EBO
1%	1,610	700	750	160	270

SBO	NBL	NBT	NBR	NBI	NBtr
2,610	780	3,160	60	4,000	4%

Stoney Tr NE / McKnight Blvd NE — Interchange

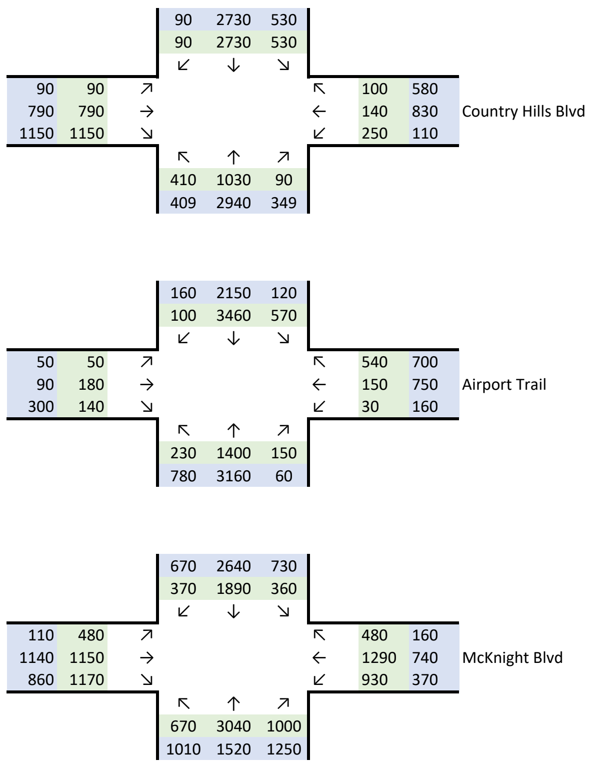
SBtr	SBI	SBR	SBT	SBL	NBO
3%	4,040	670	2,640	730	1,790

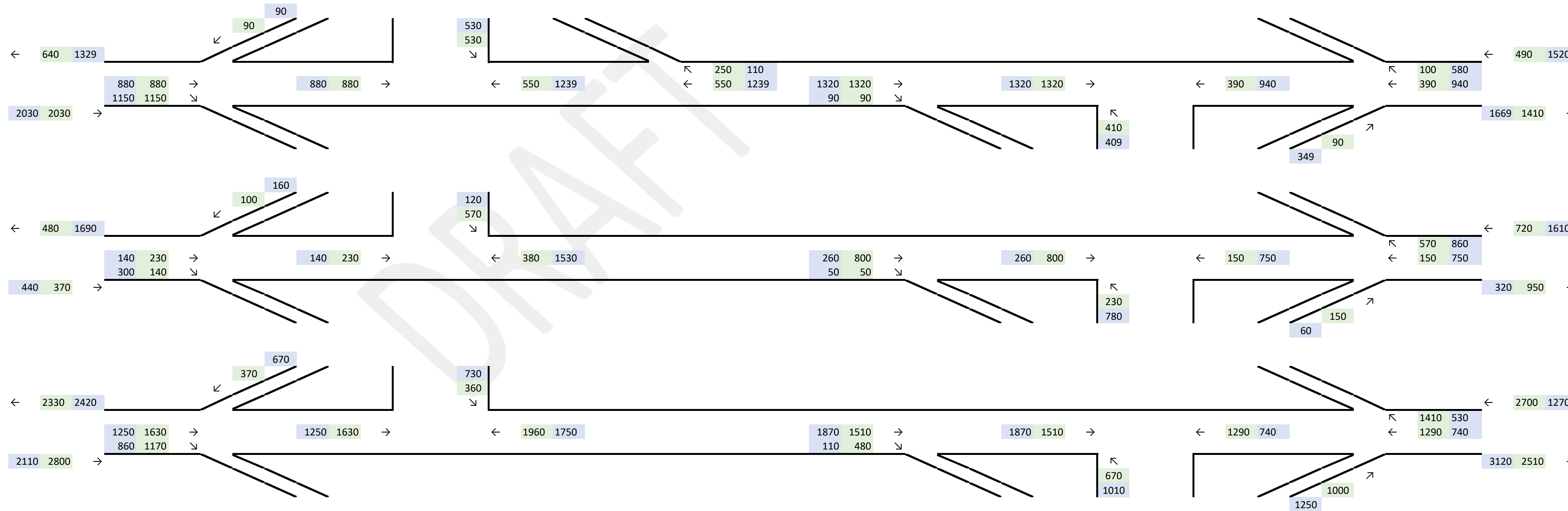
WBO	EBL	EBT	EBR	EBI	EBtr
2,420	110	1,140	860	2,110	1%

WBtr	WBI	WBR	WBT	WBL	EBO
3%	1,270	160	740	370	3,120

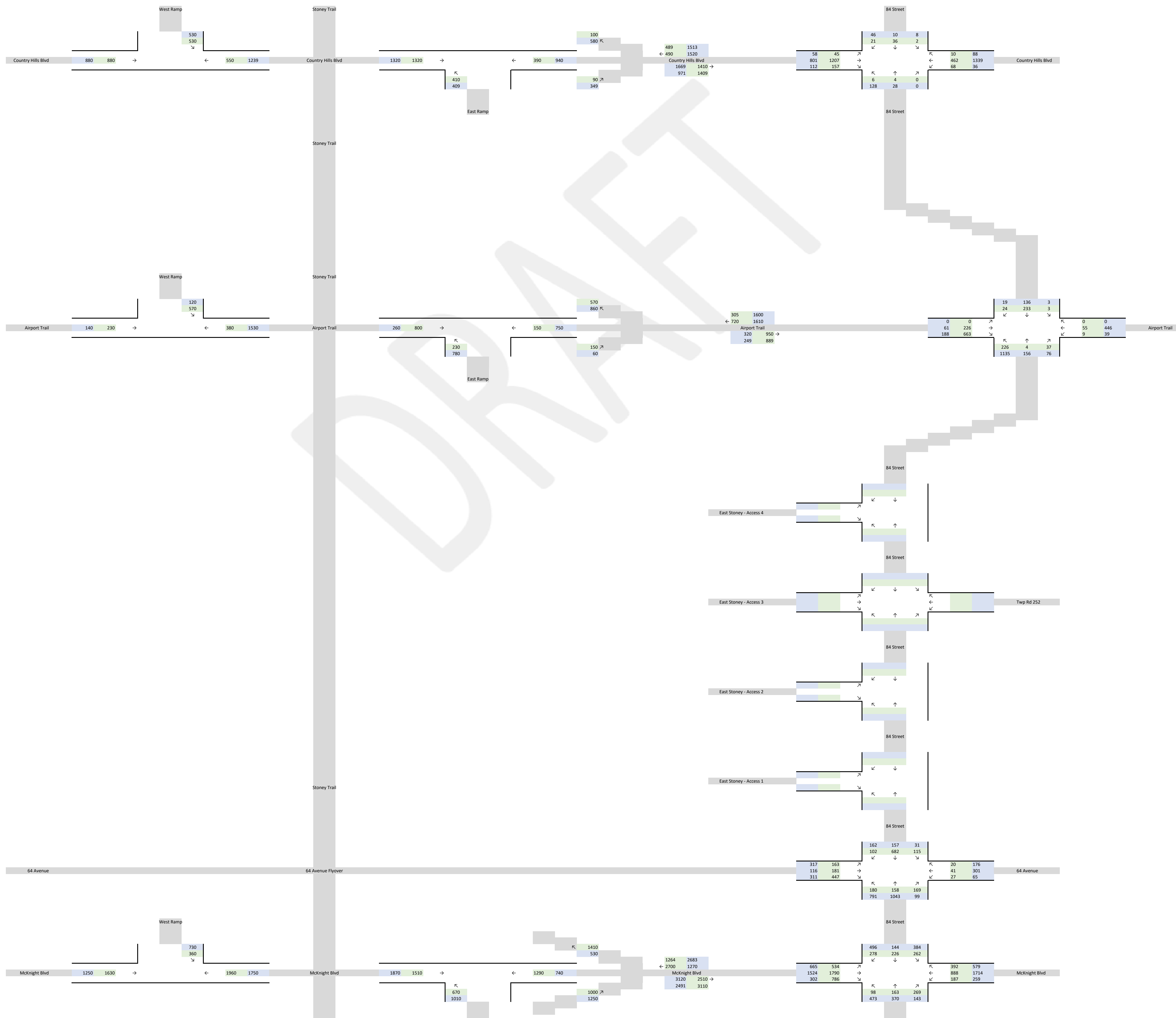
SBO	NBL	NBT	NBR	NBI	NBtr
3,870	1,010	1,520	1,250	3,780	5%

Future Interchange Volumes (Raw)

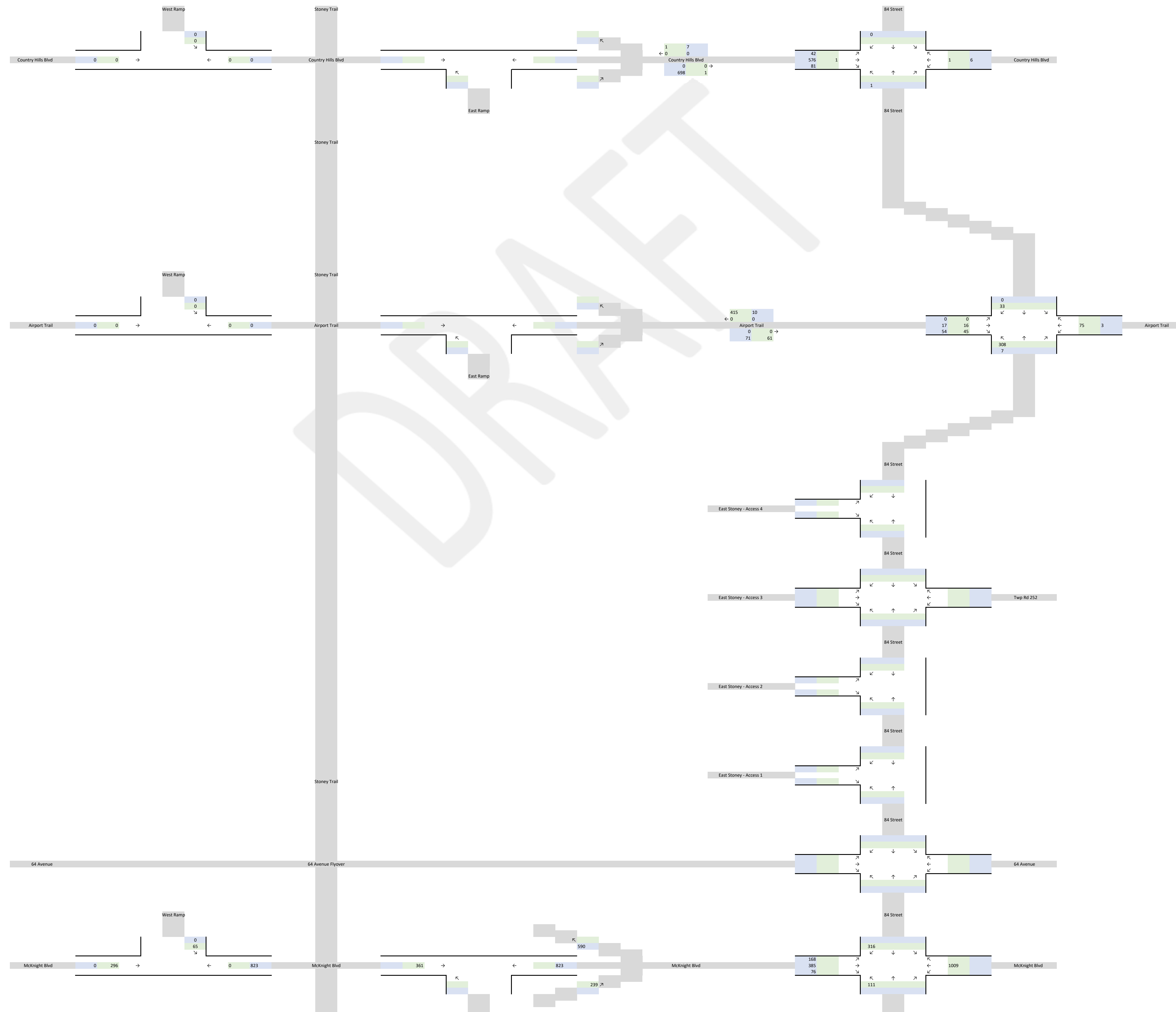




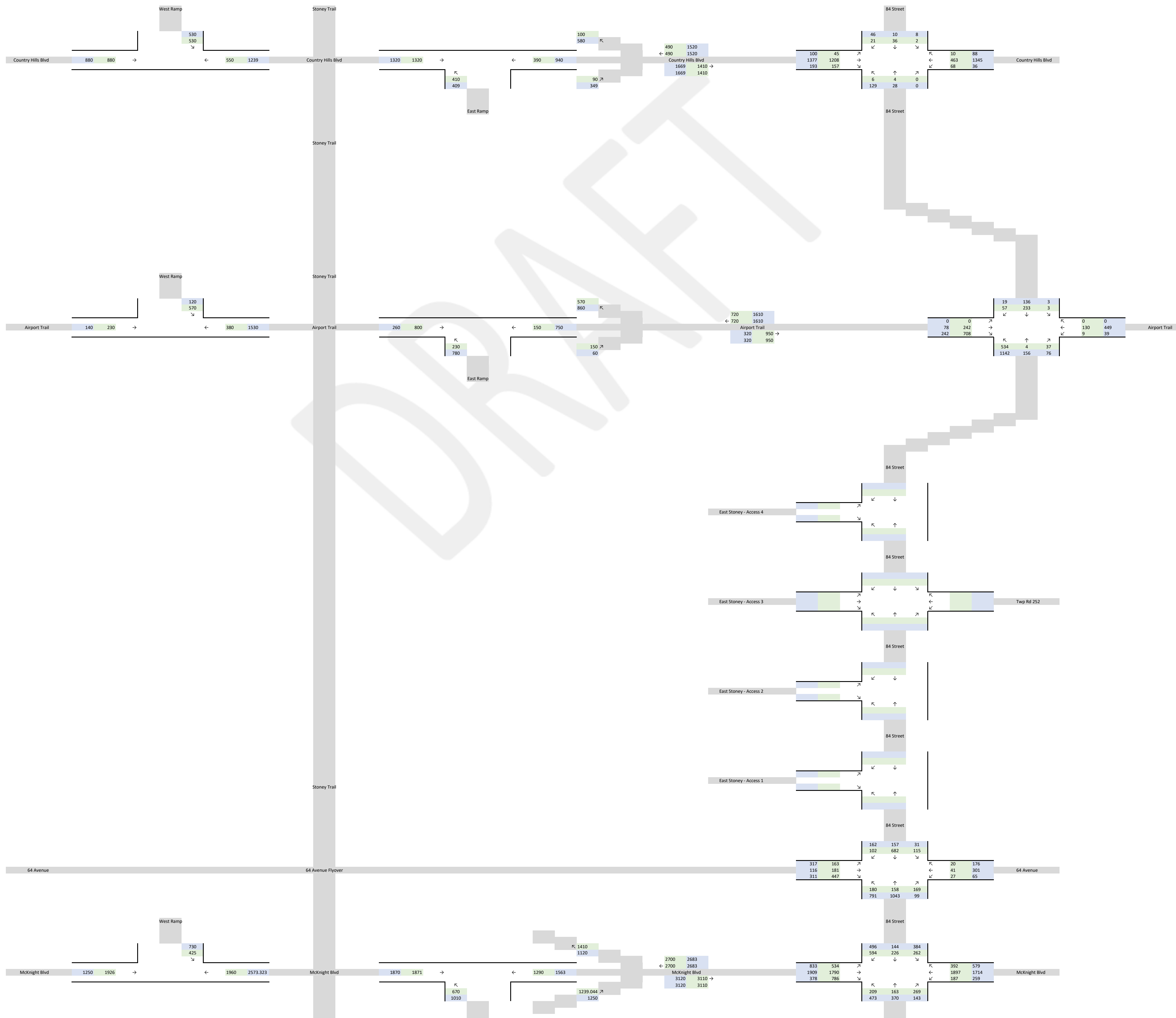
Future Background Traffic (Raw)



Future Background Traffic Volume Balancing Adjustments



Balanced Future Background Traffic Volumes



Appendix B

Trip Generation

Omni Trip Generation

Land Use	Intensity (ac)	Intensity (ft^2)	Intensity (Units / Rooms / Fueling Positions)	ITE Land Use #	ITE Land Use Description	ITE Land Use Independent Variable	Trip Generation A.M. Peak Hour Rate / Equation	A.M. IB%	A.M. OB%	A.M. Total	A.M. IB	A.M. OB	Trip Generation P.M. Peak Hour Rate / Equation	P.M. IB%	P.M. OB%	P.M. Total	P.M. IB	P.M. OB
Highway Commercial - Country Hills Boulevard (West of 84 Street) (HC1)																		
Tourist Accomodations			150	320	Motel	Rooms	0.45	36%	64%	68	24	43	0.47	54%	46%	71	38	32
Bank		4,000		912	Drive-in Bank	1,000 ft^2 GFA	12.08	57%	43%	48	28	21	24.30	50%	50%	97	49	49
Drive-Through Restaurant		4,000		934	Fast-Food Restaurant with Drive-Through Window	1,000 ft^2 GFA	45.42	51%	49%	182	93	89	32.65	52%	48%	131	68	63
High-Turnover Restaurant		6,000		932	High-Turnover (Sit Down) Restaurant	1,000 ft^2 GFA	10.81	55%	45%	65	36	29	9.85	60%	40%	59	35	24
Service Station			8	944	Gasoline / Service Station	Vehicle Fueling Positions	12.16	51%	49%	97	50	48	13.87	50%	50%	111	55	55
Sub-Total										**460**	**230**	**230**				**468**	**246**	**223**
Highway Commercial - Country Hills Boulevard (East of 84 Street) (HC2)																		
Tourist Accomodations			150	320	Motel	Rooms	0.45	36%	64%	68	24	43	0.47	54%	46%	71	38	32
Bank		4,000		912	Drive-in Bank	1,000 ft^2 GFA	12.08	57%	43%	48	28	21	24.30	50%	50%	97	49	49
Drive-Through Restaurant		4,000		934	Fast-Food Restaurant with Drive-Through Window	1,000 ft^2 GFA	45.42	51%	49%	182	93	89	32.65	52%	48%	131	68	63
Drive-Through Restaurant		4,000		934	Fast-Food Restaurant with Drive-Through Window	1,000 ft^2 GFA	45.42	51%	49%	182	93	89	32.65	52%	48%	131	68	63
High-Turnover Restaurant		6,000		932	High-Turnover (Sit Down) Restaurant	1,000 ft^2 GFA	10.81	55%	45%	65	36	29	9.85	60%	40%	59	35	24
High-Turnover Restaurant		6,000		932	High-Turnover (Sit Down) Restaurant	1,000 ft^2 GFA	10.81	55%	45%	65	36	29	9.85	60%	40%	59	35	24
Quality Restaurant[1]		9,000		931	Quality Restaurant	1,000 ft^2 GFA	0.81	55%	45%	7	4	3	7.49	67%	33%	67	45	22
Service Station			8	944	Gasoline / Service Station	Vehicle Fueling Positions	12.16	51%	49%	97	50	48	13.87	50%	50%	111	55	55
Sub-Total										**713**	**362**	**351**				**725**	**394**	**331**
Highway Commercial - Township Road 252 (HC3)																		
Car Dealership		33,000		841	Automobile Sales	1,000 ft^2 GFA	1.92	75%	25%	63	48	16	2.62	40%	60%	86	35	52
Car Dealership		33,000		841	Automobile Sales	1,000 ft^2 GFA	1.92	75%	25%	63	48	16	2.62	40%	60%	86	35	52
Car Dealership		33,000		841	Automobile Sales	1,000 ft^2 GFA	1.92	75%	25%	63	48	16	2.62	40%	60%	86	35	52
Car Dealership		33,000		841	Automobile Sales	1,000 ft^2 GFA	1.92	75%	25%	63	48	16	2.62	40%	60%	86	35	52
Bank		4,000		912	Drive-in Bank	1,000 ft^2 GFA	12.08	57%	43%	48	28	21	24.30	50%	50%	97	49	49
Drive-Through Restaurant		4,000		934	Fast-Food Restaurant with Drive-Through Window	1,000 ft^2 GFA	45.42	51%	49%	182	93	89	32.65	52%	48%	131	68	63
Drive-Through Restaurant		4,000		934	Fast-Food Restaurant with Drive-Through Window	1,000 ft^2 GFA	45.42	51%	49%	182	93	89	32.65	52%	48%	131	68	63
High-Turnover Restaurant		6,000		932	High-Turnover (Sit Down) Restaurant	1,000 ft^2 GFA	10.81	55%	45%	65	36	29	9.85	60%	40%	59	35	24
High-Turnover Restaurant		6,000		932	High-Turnover (Sit Down) Restaurant	1,000 ft^2 GFA	10.81	55%	45%	65	36	29	9.85	60%	40%	59	35	24
RV Dealership[2]		7,000		842	Recreational Vehicle Sales	1,000 ft^2 GFA							2.54	36%	64%	18	6	11
RV Dealership[2]		7,000		842	Recreational Vehicle Sales	1,000 ft^2 GFA							2.54	36%	64%	18	6	11
RV Dealership[2]		7,000		842	Recreational Vehicle Sales	1,000 ft^2 GFA							2.54	36%	64%	18	6	11
RV Dealership[2]		7,000		842	Recreational Vehicle Sales	1,000 ft^2 GFA							2.54	36%	64%	18	6	11
Service Station			8	944	Gasoline / Service Station	Vehicle Fueling Positions	12.16	51%	49%	97	50	48	13.87	50%	50%	111	55	55
Sub-Total										**892**	**524**	**368**				**1005**	**475**	**530**
Destination Commercial (DC)																		
Senior's Housing			250	251	Senior Adult Housing - Detached	Units	T = 0.17(X) + 29.95	35%	65%	72	25	47	Ln(T) = 0.75Ln(X) + 0.35	61%	39%	89	54	35
Hotel			600	310	Hotel	Rooms	0.53	59%	41%	318	188	130	0.60	51%	49%	360	184	176
Retail (Shopping)		1,624,539		820	Shopping Center	1,000 ft^2 GFA	0.96	62%	38%	1560	967	593	3.71	48%	52%	6027	2893	3134
Outlet Centre		768,523		823	Factory Outlet Center	1,000 ft^2 GFA	0.67	73%	27%	515	376	139	2.29	47%	53%	1760	827	933
Office Campus		1,182,343		750	Office Park	1,000 ft^2 GFA	1.71	89%	11%	2022	1799	222	1.48	14%	86%	1750	245	1505
Sub-Total										**4487**	**3355**	**1132**				**9986**	**4203**	**5783**
Industrial (I)																		
Industrial Park	507.78			130	Industrial Park	Acres	8.20	83%	17%	4164	3456	708	8.53	21%	79%	4331	910	3422
Sub-Total										**4164**	**3456**	**708**				**4331**	**910**	**3422**
Total										**10716**	**7927**	**2789**				**16516**	**6227**	**10289**

Land Use	Internal Capture Category	Internal Capture A.M. Peak Hour % TTL	A.M. IB%	A.M. OB%	A.M. Total	A.M. IB	A.M. OB	Internal Capture P.M. Peak Hour % TTL	P.M. IB%	P.M. OB%	P.M. Total	P.M. IB	P.M. OB	External Trips A.M. Peak Hour Total	A.M. IB	A.M. OB	External Trips P.M. Peak Hour Total	P.M. IB	P.M. OB	Pass-By / Diverted Link Trips A.M. Peak Hour %	A.M. Total	A.M. IB	A.M. OB	Pass-By / Diverted Link Trips P.M. Peak Hour %	P.M. Total	P.M. IB	P.M. OB	Primary Trips A.M. Peak Hour Total	A.M. IB	A.M. OB	Primary Trips P.M. Peak Hour Total	P.M. IB	P.M. OB
Highway Commercial - Country Hills Boulevard (West of 84 Street) (HC1)																																	
Tourist Accomodations														68	24	43	71	38	32									68	24	43	71	38	32
Bank														48	28	21	97	49	49					47%	46	23	23	48	28	21	52	26	26
Drive-Through Restaurant														182	93	89	131	68	63	49%	89	45	44	50%	65	34	31	93	47	45	65	34	31
High-Turnover Restaurant														65	36	29	59	35	24					43%	25	15	10	65	36	29	34	20	13
Service Station														97	50	48	111	55	55	58%	56	29	28	42%	47	23	23	41	21	20	64	32	32
Sub-Total														**460**	**230**	**230**	**468**	**246**	**223**		**145**	**74**	**71**		**183**	**95**	**88**	**314**	**156**	**159**	**285**	**150**	**135**
Highway Commercial - Country Hills Boulevard (East of 84 Street) (HC2)																																	
Tourist Accomodations														68	24	43	71	38	32									68	24	43	71	38	32
Bank														48	28	21	97	49	49					47%	46	23	23	48	28	21	52	26	26
Drive-Through Restaurant														182	93	89	131	68	63	49%	89	45	44	50%	65	34	31	93	47	45	65	34	31
Drive-Through Restaurant														182	93	89	131	68	63	49%	89	45	44	50%	65	34	31	93	47	45	65	34	31
High-Turnover Restaurant														65	36	29	59	35	24					43%	25	15	10	65	36	29	34	20	13
High-Turnover Restaurant														65	36	29	59	35	24					43%	25	15	10	65	36	29	34	20	13
Quality Restaurant[1]														7	4	3	67	45	22					44%	30	20	10	7	4	3	38	25	12
Service Station														97	50	48	111	55	55	58%	56	29	28	42%	47	23	23	41	21	20	64	32	32
Sub-Total														**713**	**362**	**351**	**725**	**394**	**331**		**234**	**120**	**115**		**303**	**164**	**139**	**479**	**243**	**236**	**422**	**230**	**192**
Highway Commercial - Township Road 252 (HC3)																																	
Car Dealership														63	48	16	86	35	52									63	48	16	86	35	52
Car Dealership														63	48	16	86	35	52									63	48	16	86	35	52
Car Dealership														63	48	16	86	35	52									63	48	16	86	35	52
Car Dealership														63	48	16	86	35	52									63	48	16	86	35	52
Bank														48	28	21	97	49	49					47%	46	23	23	48	28	21	52	26	26
Drive-Through Restaurant														182	93	89	131	68	63	49%	89	45	44	50%	65	34	31	93	47	45	65	34	31
Drive-Through Restaurant														182	93	89	131	68	63	49%	89	45	44	50%	65	34	31	93	47	45	65	34	31
High-Turnover Restaurant														65	36	29	59	35	24					43%	25	15	10	65	36	29	34	20	13
High-Turnover Restaurant														65	36	29	59	35	24					43%	25	15	10	65	36	29	34	20	13
RV Dealership[2]														0	0	0	18	6	11									0	0	0	18	6	11
RV Dealership[2]														0	0	0	18	6	11									0	0	0	18	6	11
RV Dealership[2]														0	0	0	18	6	11									0	0	0	18	6	11
RV Dealership[2]														0	0	0	18	6	11									0	0	0	18	6	11
Service Station														97	50	48	111	55	55	58%	56	29	28	42%	47	23	23	41	21	20	64	32	32
Sub-Total														**892**	**524**	**368**	**1005**	**475**	**530**		**234**	**120**	**115**		**274**	**145**	**129**	**658**	**404**	**253**	**731**	**330**	**401**
Destination Commercial (DC)																																	
Senior's Housing	Residential	3%	4%	2%	2	1	1	34%	50%	9%	30	27	3	70	24	46	59	27	32									70	24	46	59	27	32
Hotel	Hotel	36%	0%	89%	116	0	116	17%	17%	16%	59	31	28	202	188	14	301	152	148									202	188	14	301	152	148
Retail (Shopping)	Retail	24%	21%	29%	375	203	172	3%	2%	3%	152	58	94	1185	764	421	5875	2835	3040									1185	764	421	5875	2835	3040
Outlet Centre	Retail	23%	21%	29%	119	79	40	3%	2%	3%	45	17	28	396	297	99	1715	811	905									396	297	99	1715	811	905
Office Campus	Office	8%	6%	28%	170	108	62	2%	7%	1%	32	17	15	1852	1691	160	1718	228	1490									1852	1691	160	1718	228	1490
Sub-Total														**3704**	**2964**	**740**	**9668**	**4053**	**5614**		**0**	**0**	**0**		**0**	**0**	**0**	**3704**	**2964**	**740**	**9668**	**4053**	**5614**
Industrial (I)																																	
Industrial Park	Office	10%	6%	28%	406	207	198	2%	7%	1%	98	64	34	3758	3249	510	4233	846	3388									3758	3249	510	4233	846	3388
Sub-Total														**3758**	**3249**	**510**	**4233**	**846**	**3388**		**0**	**0**	**0**		**0**	**0**	**0**	**3758**	**3249**	**510**	**4233**	**846**	**3388**
Total														**9528**	**7329**	**2199**	**16099**	**6013**	**10086**		**614**	**313**	**301**		**760**	**404**	**356**	**8913**	**7015**	**1898**	**15339**	**5609**	**9730**

Notes:

[1] Direction distribution not available for Quality Restaurant during a.m. peak period; Distribution for High-Turnover restaurant used as proxy.

[2] No a.m. rate available for RV Dealerships.

Appendix C
Internal Capture

NCHRP 684 Internal Trip Capture Estimation Tool				
Project Name:	Omni		**Organization:**	CIMA+
Project Location:	Calgary, AB		**Performed By:**	DKR
Scenario Description:	Full Build-Out		**Date:**	9-May-18
Analysis Year:	Ultimate		**Checked By:**	
Analysis Period:	**AM Street Peak Hour**		**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)				Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units		Total	Entering	Exiting
Office					6,185	5,255	930
Retail					2,075	1,343	732
Restaurant					0		
Cinema/Entertainment					0		
Residential					72	25	47
Hotel					318	188	130
All Other Land Uses[2]					0		
					8,650	6,811	1,839

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips				Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized		Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.00	0%	0%		1.00	0%	0%
Retail	1.00	0%	0%		1.00	0%	0%
Restaurant	1.00	0%	0%		1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%		1.00	0%	0%
Residential	1.00	0%	0%		1.00	0%	0%
Hotel	1.00	0%	0%		1.00	0%	0%
All Other Land Uses[2]	1.00	0%	0%		1.00	0%	0%

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		260	0	0	0	0
Retail	210		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	0	0	0		0
Hotel	98	18	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	8,650	6,811	1,839
Internal Capture Percentage	14%	9%	32%
External Vehicle-Trips[5]	7,474	6,223	1,251
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	6%	28%
Retail	21%	29%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	4%	2%
Hotel	0%	89%

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Omni	**Organization:**	CIMA+
Project Location:	Calgary, AB	**Performed By:**	DKR
Scenario Description:	Full Build-Out	**Date:**	10-May-18
Analysis Year:	Ultimate	**Checked By:**	
Analysis Period:	PM Street Peak Hour	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				6,082	1,155	4,927
Retail				7,787	3,720	4,067
Restaurant				0		
Cinema/Entertainment				0		
Residential				89	54	35
Hotel				360	184	176
All Other Land Uses[2]				0		
				14,318	5,113	9,205

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses[2]	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2460	2460		2460	
Retail					2460	
Restaurant					2460	
Cinema/Entertainment					2460	
Residential		2460	2460			
Hotel					2460	

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		30	0	0	2	0
Retail	81		0	0	25	31
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	0	0		1
Hotel	0	28	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	14,318	5,113	9,205
Internal Capture Percentage	3%	4%	2%
External Vehicle-Trips[5]	13,918	4,913	9,005
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

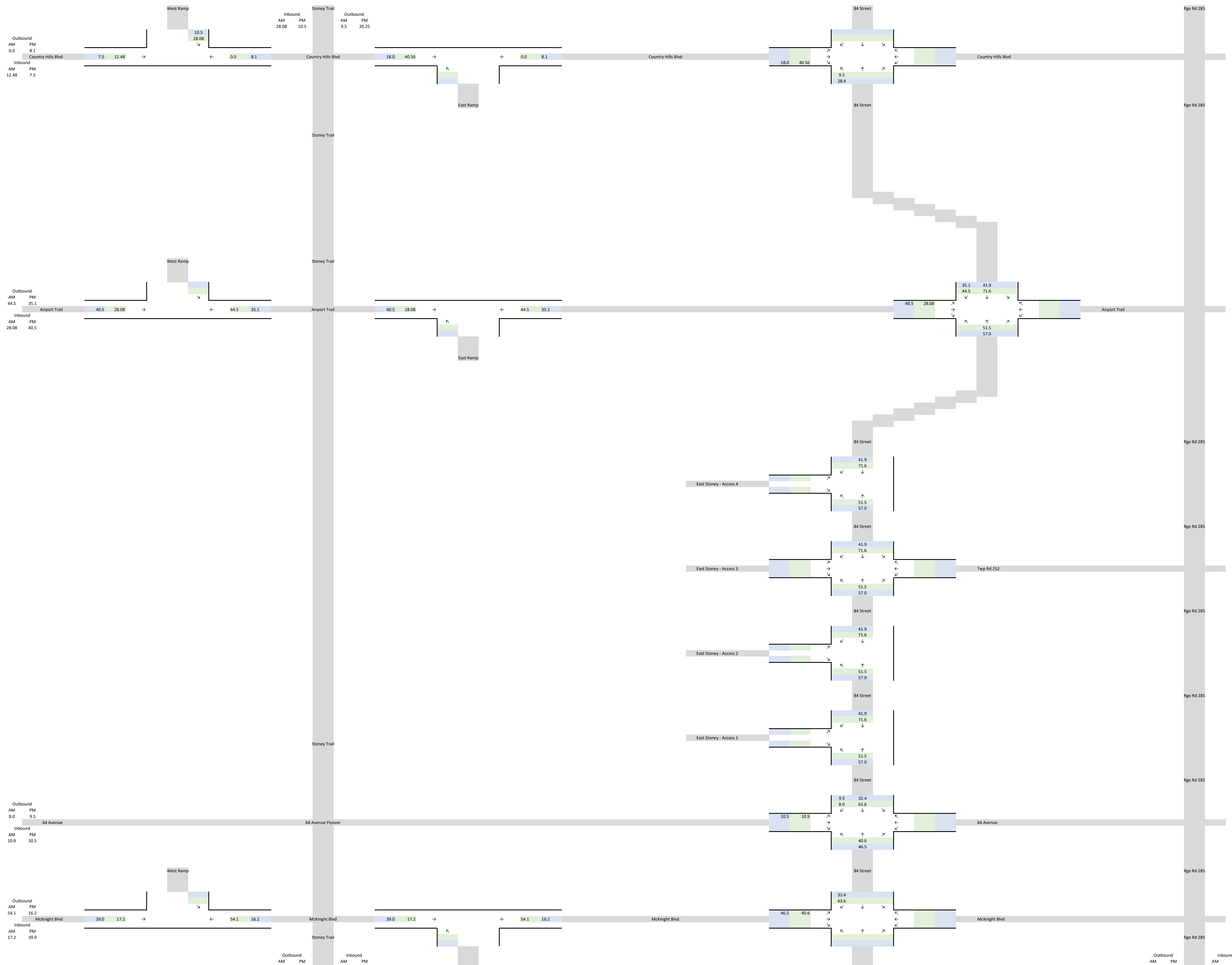
Land Use	Entering Trips	Exiting Trips
Office	7%	1%
Retail	2%	3%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	50%	9%
Hotel	17%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).
[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
[6]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Appendix D

Trip Assignment

Highway Commercial (Zone 1) - Primary Trip Assignment



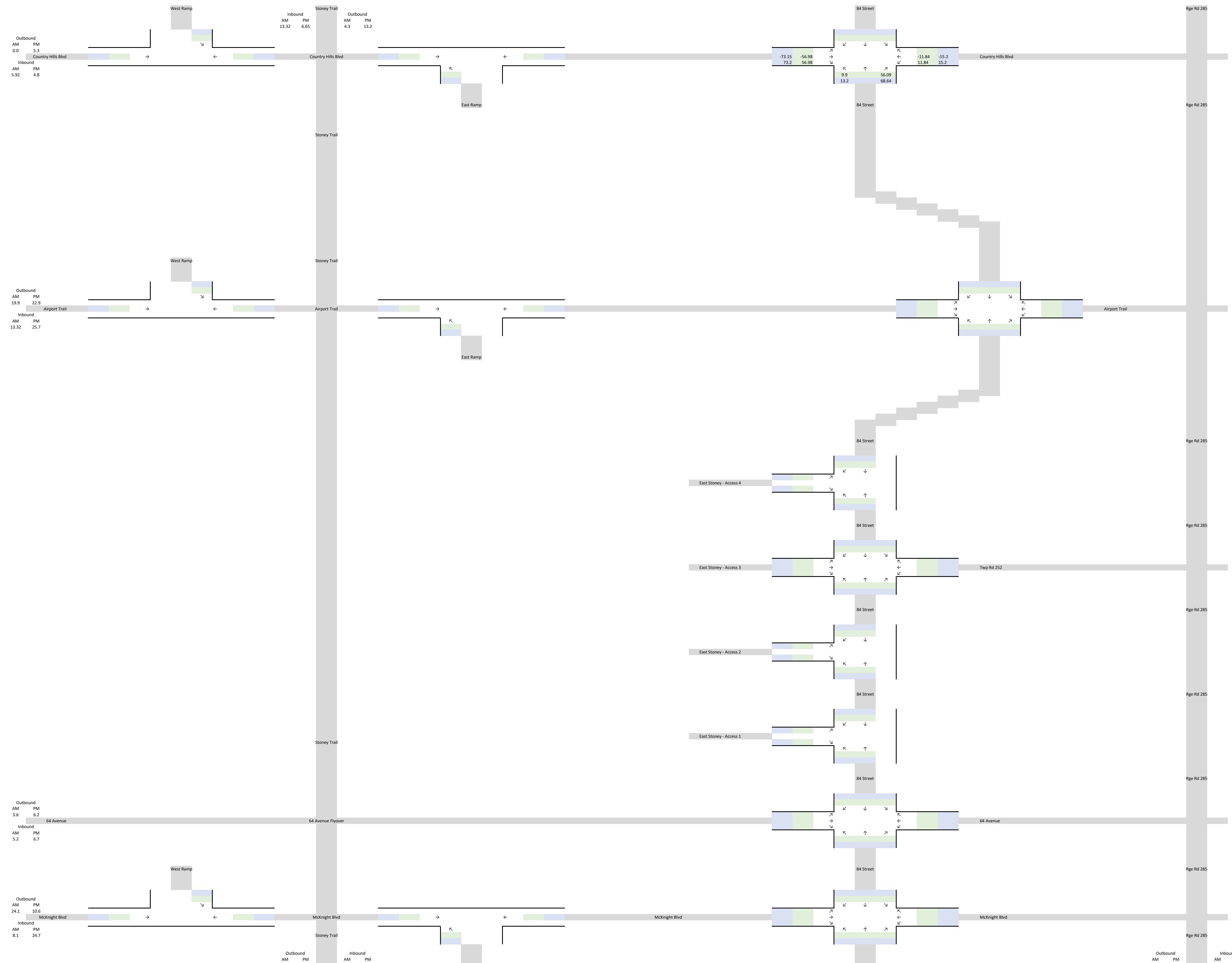
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
315	156	159	285	150	135

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
315.0	156.0	159.0	285.0	150.0	135.0

Highway Commercial (Zone 1) - Pass-By Trip Assignment



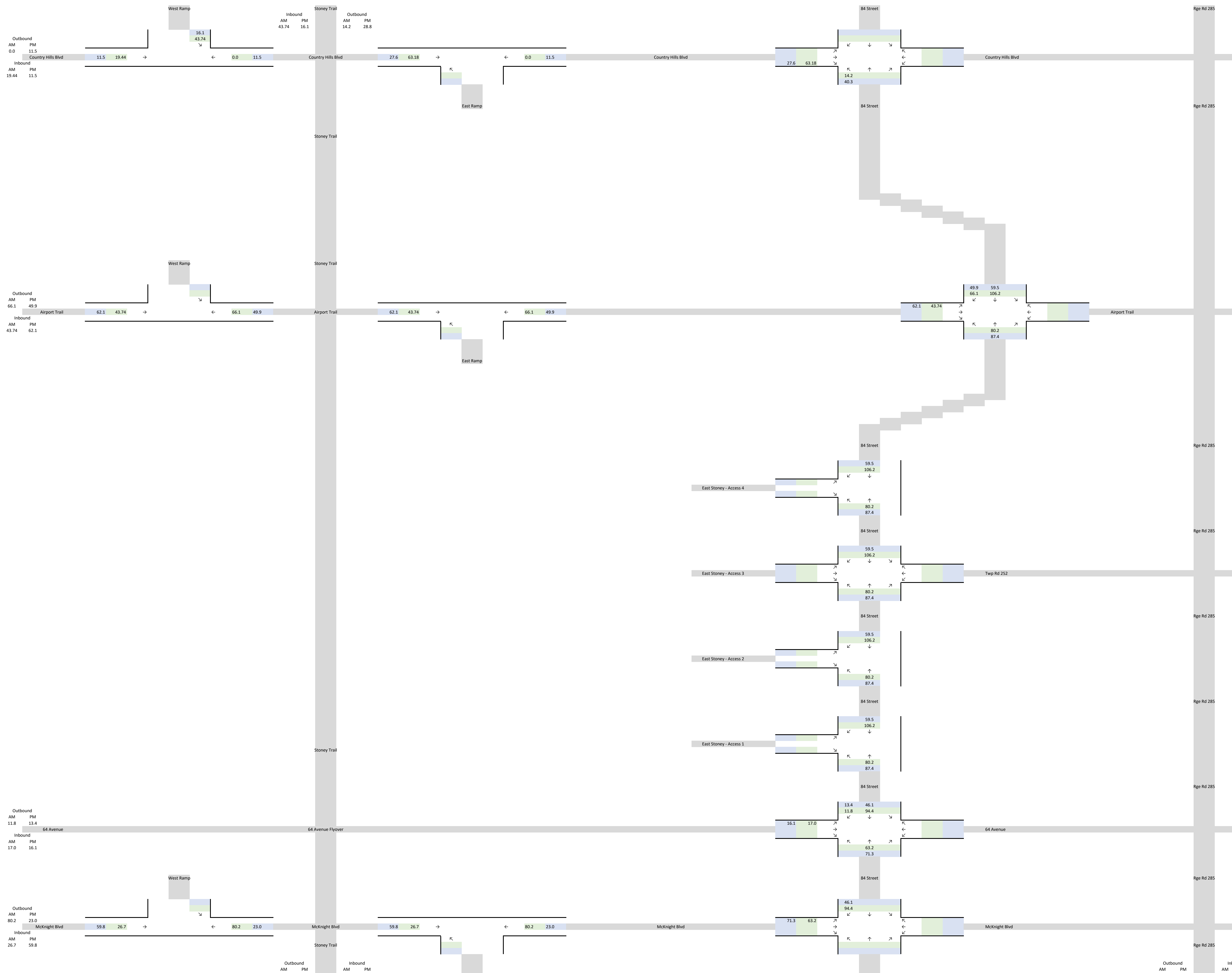
Pass-By Trips					
A.M. Peak			**P.M. Peak**		
TTL	**IB**	**OB**	**TTL**	**IB**	**OB**
145	74	71	183	95	88

Direction and Route	Distribution			
	A.M.		**P.M.**	
	In	**Out**	**In**	**Out**
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
145.0	74.0	71.0	183.0	95.0	88.0

Highway Commercial (Zone 2) - Primary Trip Assignment



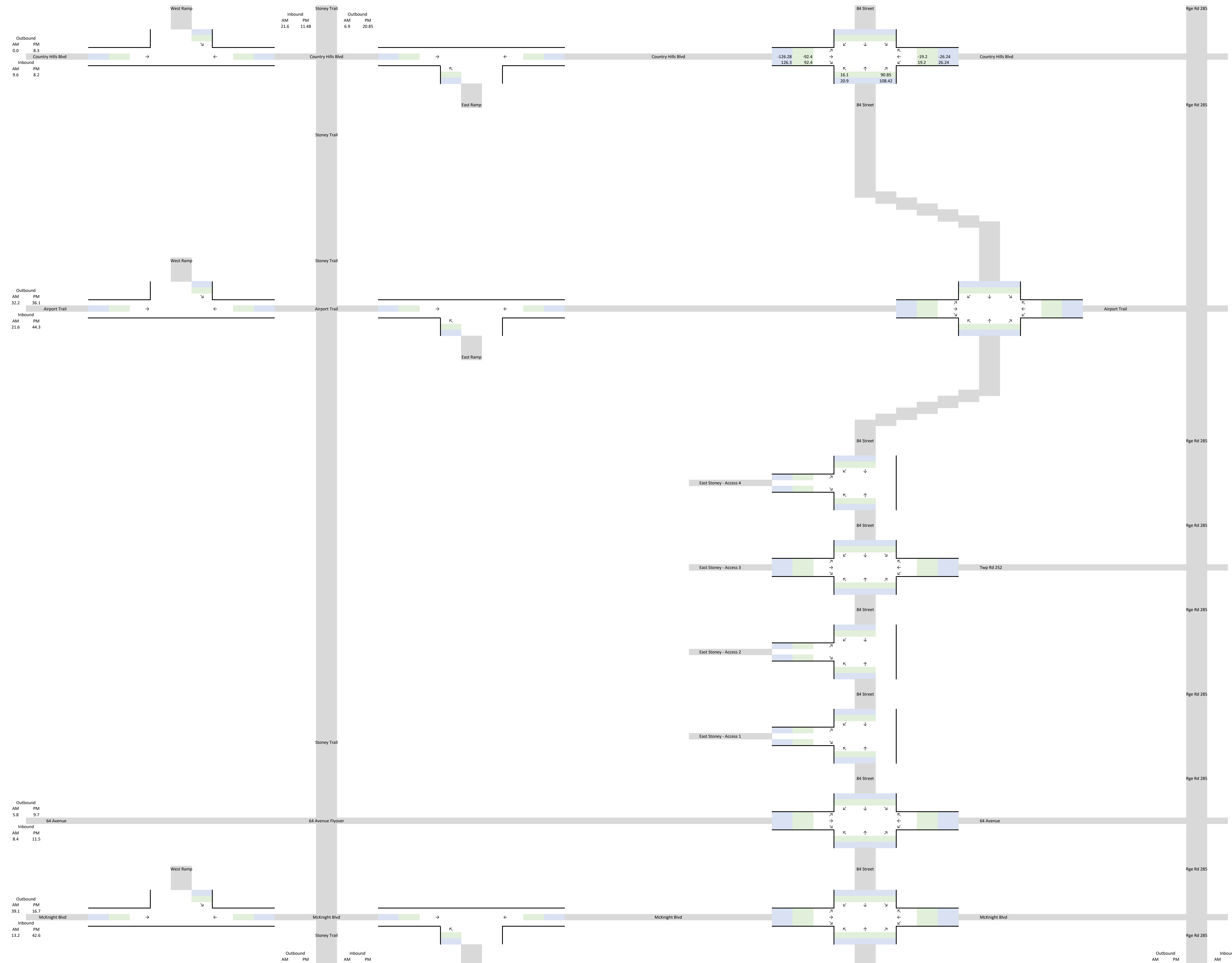
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
479	243	236	422	230	192

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
479.0	243.0	236.0	422.0	230.0	192.0

Highway Commercial (Zone 2) - Pass-By Trip Assignment



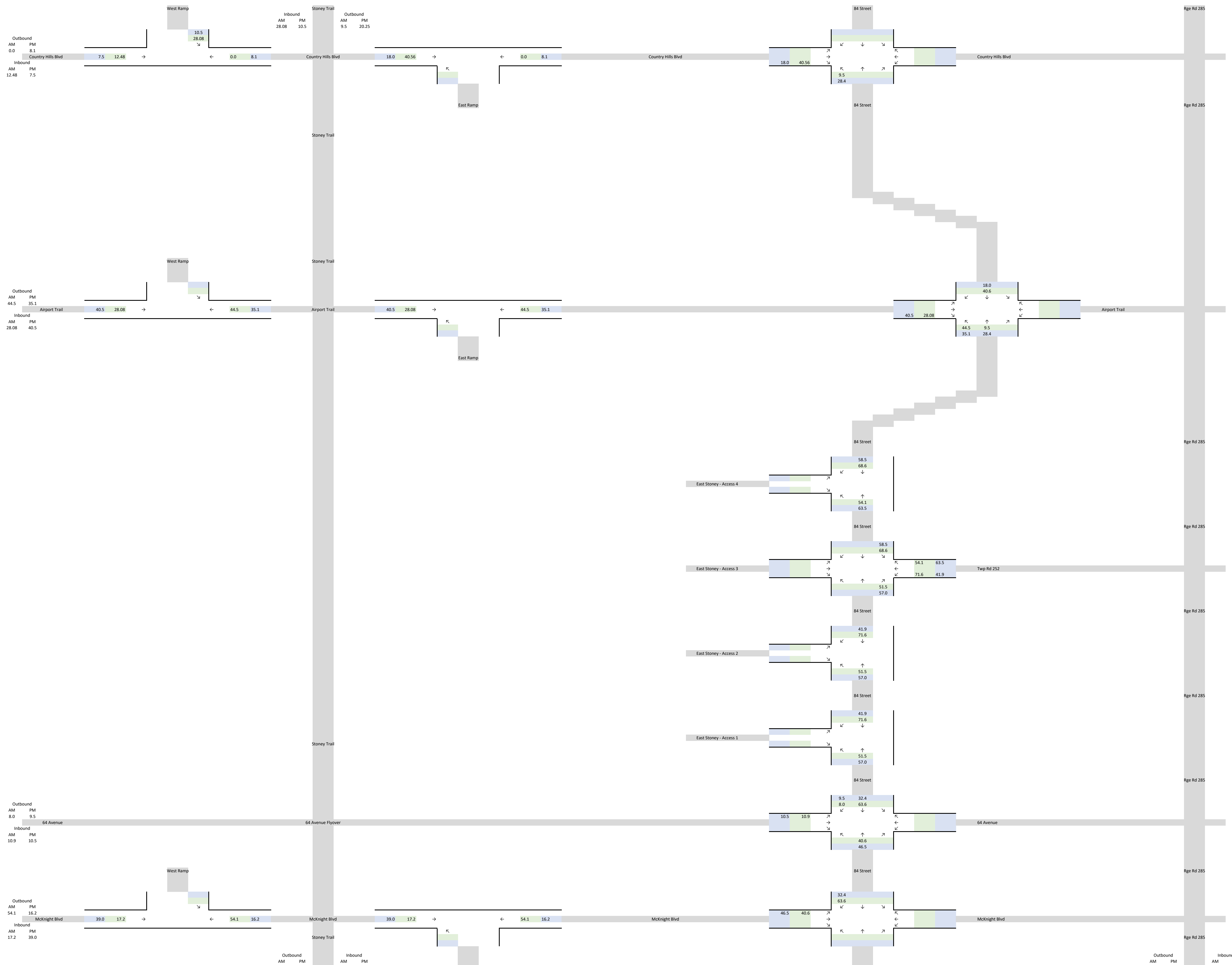
Pass-By Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
235	120	115	303	164	139

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
235.0	120.0	115.0	303.0	164.0	139.0

Highway Commercial (Zone 3) - Primary Trip Assignment



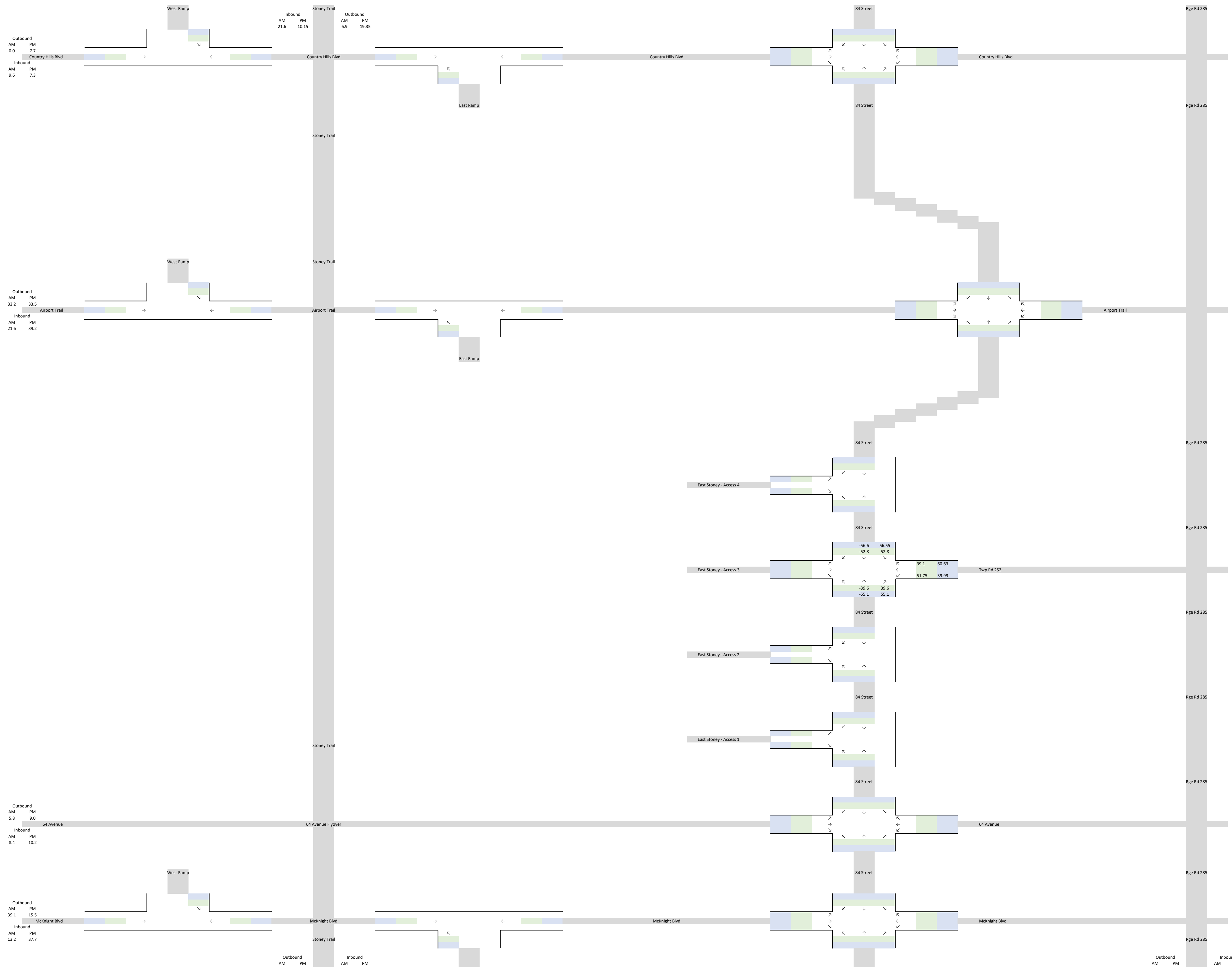
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
315	156	159	285	150	135

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
315.0	156.0	159.0	285.0	150.0	135.0

Highway Commercial (Zone 3) - Pass-By Trip Assignment



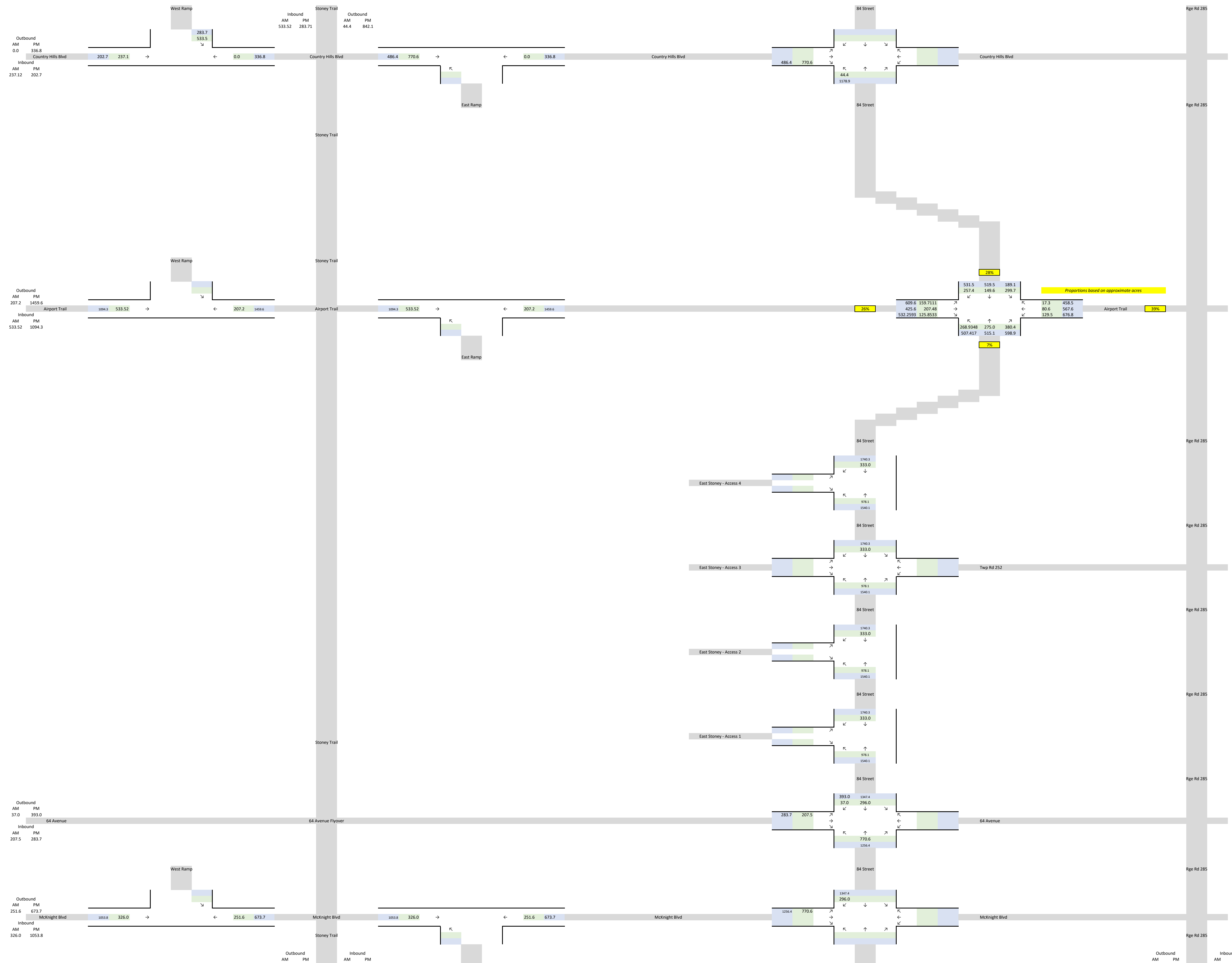
Pass-By Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
235	120	115	274	145	129

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
235.0	120.0	115.0	274.0	145.0	129.0

Destination Commercial - Primary Trip Assignment



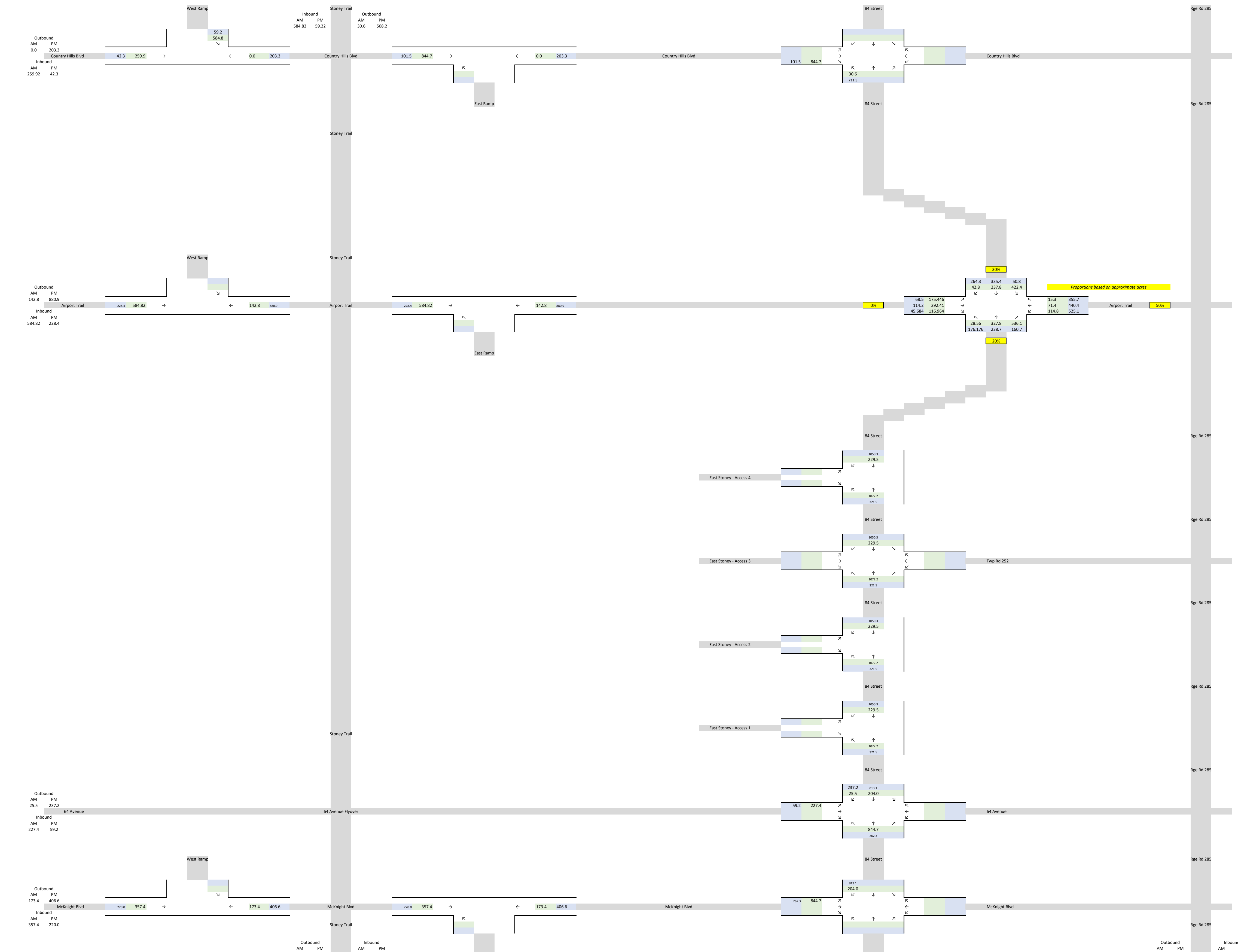
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
3704	2964	740	9667	4053	5614

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
3704.0	2964.0	740.0	9667.0	4053.0	5614.0

Industrial - Primary Trip Assignment



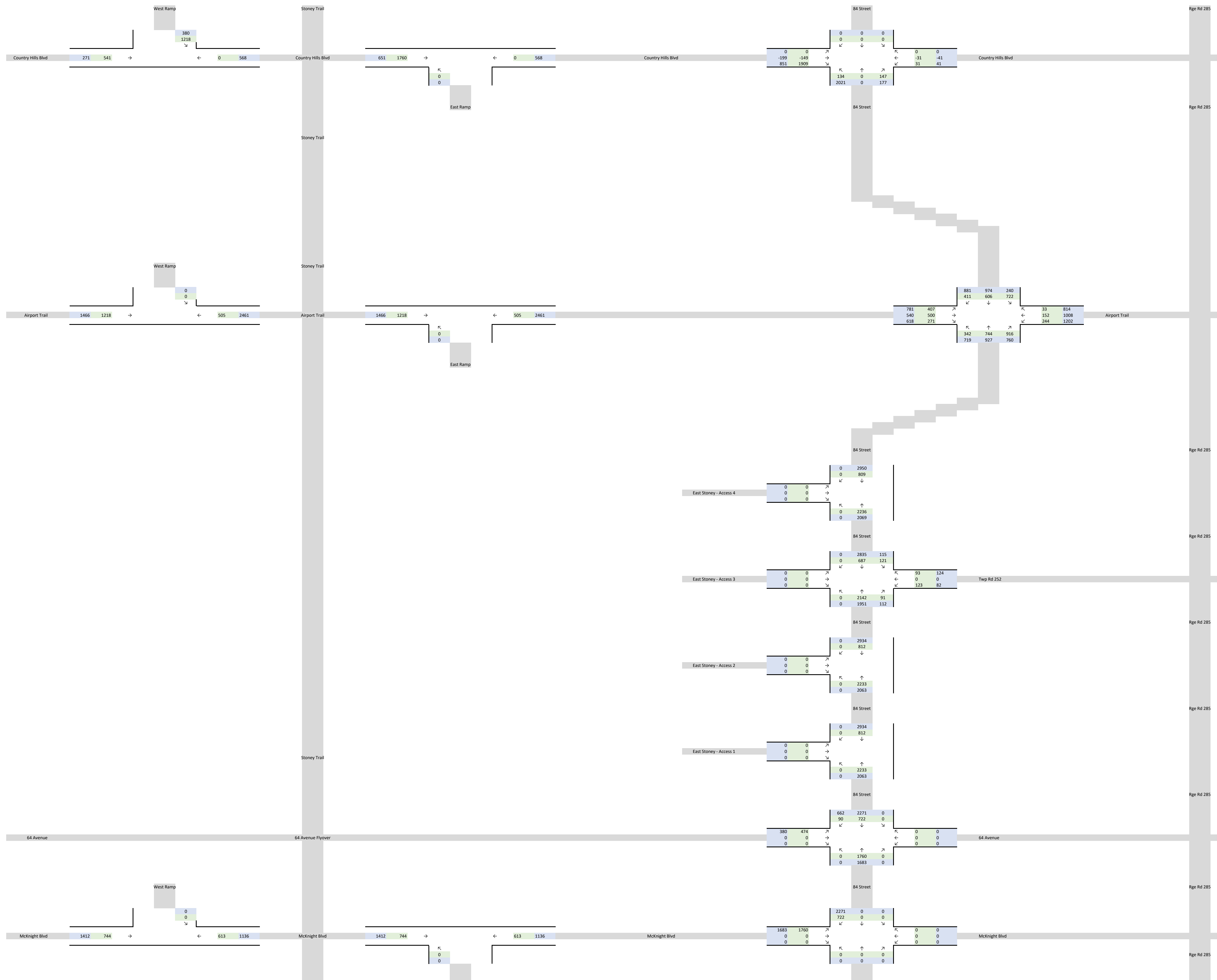
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
3759	3249	510	4234	846	3388

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

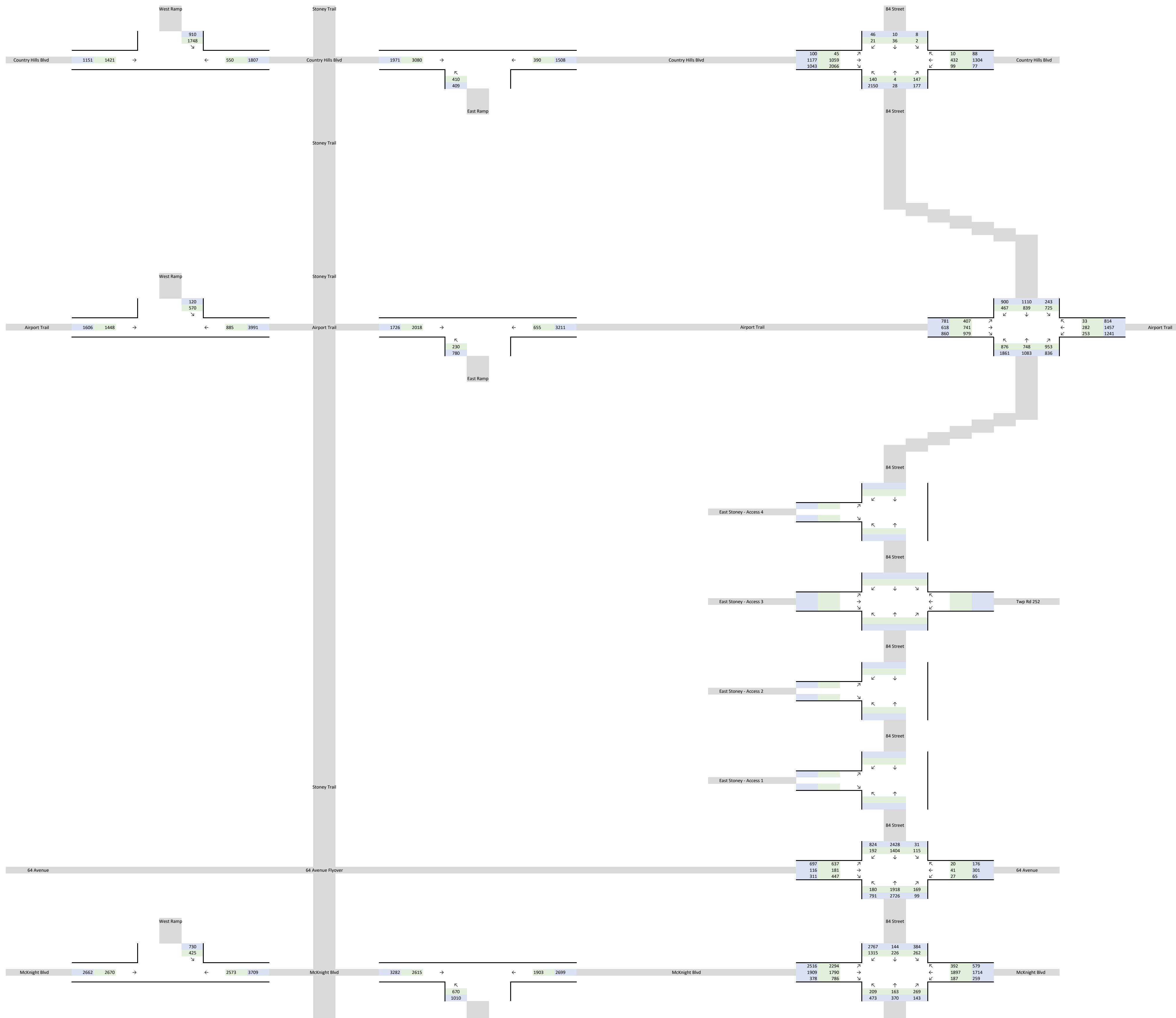
Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
3759.0	3249.0	510.0	4234.0	846.0	3388.0

Total Trip Assignment



Post-Development Traffic Volumes



Appendix E

Synchro Software Reports

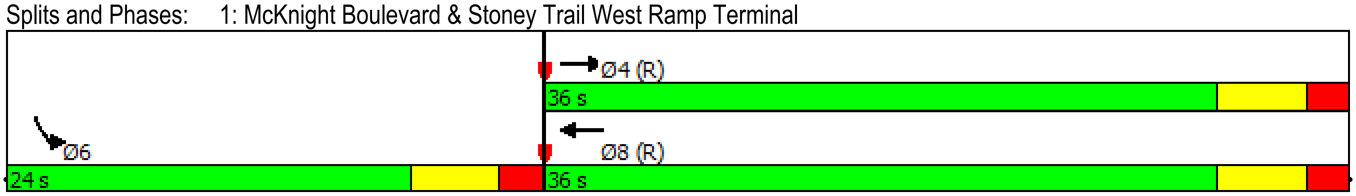
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1929	1960	0	425	0
Future Volume (vph)	0	1929	1960	0	425	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4256	4256	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4256	4256	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		781.0	409.9		174.4	
Travel Time (s)		40.2	21.1		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	20%	20%	5%	5%	5%
Adj. Flow (vph)	0	2097	2130	0	462	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2097	2130	0	462	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		36.0	36.0		24.0	
Total Split (%)		60.0%	60.0%		40.0%	
Maximum Green (s)		30.0	30.0		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		34.5	34.5		13.5	
Actuated g/C Ratio		0.58	0.58		0.22	
v/c Ratio		0.86	0.87		0.63	
Control Delay		16.8	15.6		24.7	
Queue Delay		0.0	0.0		0.0	
Total Delay		16.8	15.6		24.7	
LOS		B	B		C	
Approach Delay		16.8	15.6		24.7	
Approach LOS		B	B		C	
Queue Length 50th (m)		62.0	66.4		23.7	
Queue Length 95th (m)		#114.1	#113.5		33.2	
Internal Link Dist (m)		757.0	385.9		150.4	
Turn Bay Length (m)						
Base Capacity (vph)		2449	2449		984	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.86	0.87		0.47	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 17.0 Intersection LOS: B
Intersection Capacity Utilization 66.8% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: McKnight Boulevard & Stoney Trail West Ramp Terminal

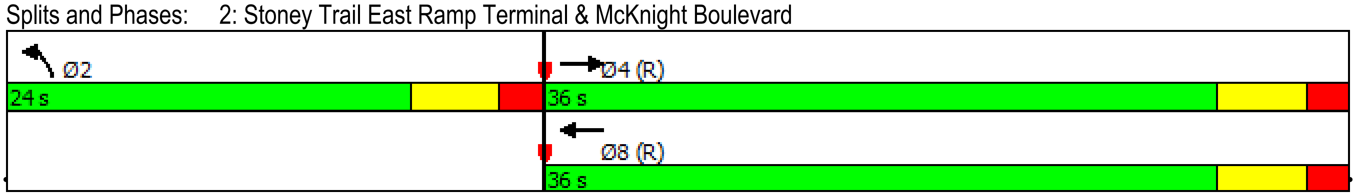


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1871	0	0	1290	670	0
Future Volume (vph)	1871	0	0	1290	670	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4256	0	0	4256	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4256	0	0	4256	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	409.9			978.3	151.6	
Travel Time (s)	21.1			50.3	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	5%	5%	20%	5%	5%
Adj. Flow (vph)	2034	0	0	1402	728	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2034	0	0	1402	728	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	36.0			36.0	24.0	
Total Split (%)	60.0%			60.0%	40.0%	
Maximum Green (s)	30.0			30.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	31.3			31.3	16.7	
Actuated g/C Ratio	0.52			0.52	0.28	
v/c Ratio	0.92			0.63	0.80	
Control Delay	20.7			12.2	27.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	20.7			12.2	27.3	
LOS	C			B	C	
Approach Delay	20.7			12.2	27.3	
Approach LOS	C			B	C	
Queue Length 50th (m)	59.0			38.8	36.6	
Queue Length 95th (m)	#107.8			52.1	53.5	
Internal Link Dist (m)	385.9			954.3	127.6	
Turn Bay Length (m)						
Base Capacity (vph)	2219			2219	984	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.92			0.63	0.74	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 19.0	Intersection LOS: B
Intersection Capacity Utilization 66.8%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 2: Stoney Trail East Ramp Terminal & McKnight Boulevard

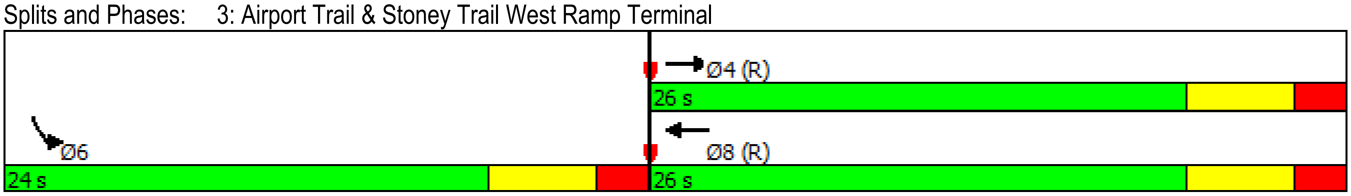


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	230	380	0	570	0
Future Volume (vph)	0	230	380	0	570	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3385	3385	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3385	3385	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		80	80		50	
Link Distance (m)		1057.6	470.1		295.9	
Travel Time (s)		47.6	21.2		21.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	250	413	0	620	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	250	413	0	620	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		26.0	26.0		24.0	
Total Split (%)		52.0%	52.0%		48.0%	
Maximum Green (s)		20.0	20.0		18.0	
Yellow Time (s)		4.0	4.0		4.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		23.6	23.6		14.4	
Actuated g/C Ratio		0.47	0.47		0.29	
v/c Ratio		0.16	0.26		0.65	
Control Delay		8.7	19.3		18.7	
Queue Delay		0.0	0.0		0.0	
Total Delay		8.7	19.3		18.7	
LOS		A	B		B	
Approach Delay		8.7	19.3		18.7	
Approach LOS		A	B		B	
Queue Length 50th (m)		6.1	18.4		24.5	
Queue Length 95th (m)		12.9	30.7		33.6	
Internal Link Dist (m)		1033.6	446.1		271.9	
Turn Bay Length (m)						
Base Capacity (vph)		1595	1595		1181	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.16	0.26		0.52	

Intersection Summary	
Area Type: Other	
Cycle Length: 50	
Actuated Cycle Length: 50	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 43.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Airport Trail & Stoney Trail West Ramp Terminal



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	800	0	0	150	230	0
Future Volume (vph)	800	0	0	150	230	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	3385	0	0	3385	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	3385	0	0	3385	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	80			80	50	
Link Distance (m)	470.1			907.6	226.7	
Travel Time (s)	21.2			40.8	16.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	870	0	0	163	250	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	870	0	0	163	250	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	26.0			26.0	24.0	
Total Split (%)	52.0%			52.0%	48.0%	
Maximum Green (s)	20.0			20.0	18.0	
Yellow Time (s)	4.0			4.0	4.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	27.7			27.7	10.3	
Actuated g/C Ratio	0.55			0.55	0.21	
v/c Ratio	0.46			0.09	0.37	
Control Delay	14.2			5.5	18.7	
Queue Delay	0.0			0.0	0.0	
Total Delay	14.2			5.5	18.7	
LOS	B			A	B	
Approach Delay	14.2			5.5	18.7	
Approach LOS	B			A	B	
Queue Length 50th (m)	42.4			3.0	10.0	
Queue Length 95th (m)	58.2			6.5	17.2	
Internal Link Dist (m)	446.1			883.6	202.7	
Turn Bay Length (m)						
Base Capacity (vph)	1875			1875	1181	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.46			0.09	0.21	

Intersection Summary

Area Type: Other

Cycle Length: 50

Actuated Cycle Length: 50

Offset: 22.5 (45%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

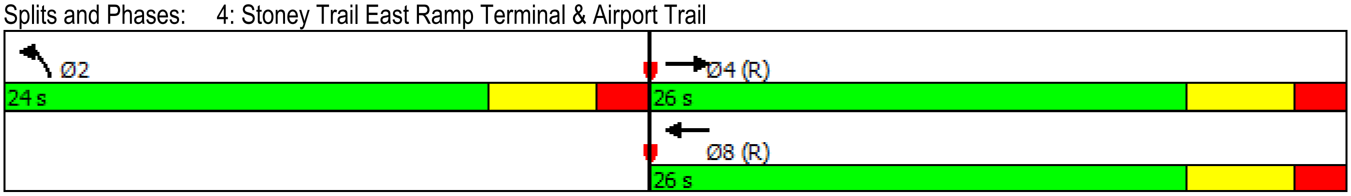
Maximum v/c Ratio: 0.46

Intersection Signal Delay: 14.0 Intersection LOS: B

Intersection Capacity Utilization 43.4% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: Stoney Trail East Ramp Terminal & Airport Trail

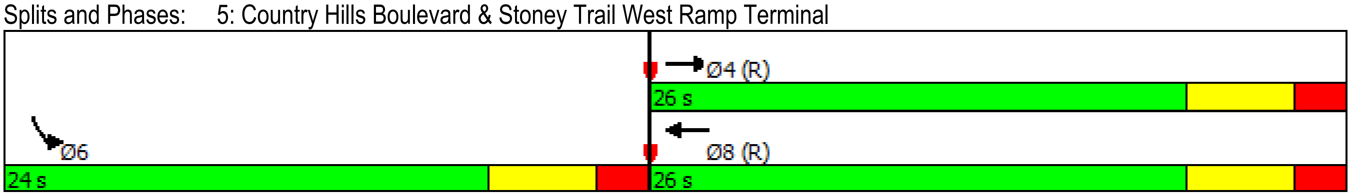


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	880	550	0	530	0
Future Volume (vph)	0	880	550	0	530	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3231	3231	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3231	3231	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		854.2	450.4		250.2	
Travel Time (s)		43.9	23.2		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	10%	10%	5%	5%	5%
Adj. Flow (vph)	0	957	598	0	576	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	957	598	0	576	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		26.0	26.0		24.0	
Total Split (%)		52.0%	52.0%		48.0%	
Maximum Green (s)		20.0	20.0		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		24.2	24.2		13.8	
Actuated g/C Ratio		0.48	0.48		0.28	
v/c Ratio		0.61	0.38		0.63	
Control Delay		12.4	9.9		18.8	
Queue Delay		0.0	0.0		0.0	
Total Delay		12.4	9.9		18.8	
LOS		B	A		B	
Approach Delay		12.4	9.9		18.8	
Approach LOS		B	A		B	
Queue Length 50th (m)		29.8	16.1		23.0	
Queue Length 95th (m)		54.5	30.5		30.9	
Internal Link Dist (m)		830.2	426.4		226.2	
Turn Bay Length (m)						
Base Capacity (vph)		1561	1561		1181	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.61	0.38		0.49	

Intersection Summary	
Area Type: Other	
Cycle Length: 50	
Actuated Cycle Length: 50	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 59.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Country Hills Boulevard & Stoney Trail West Ramp Terminal



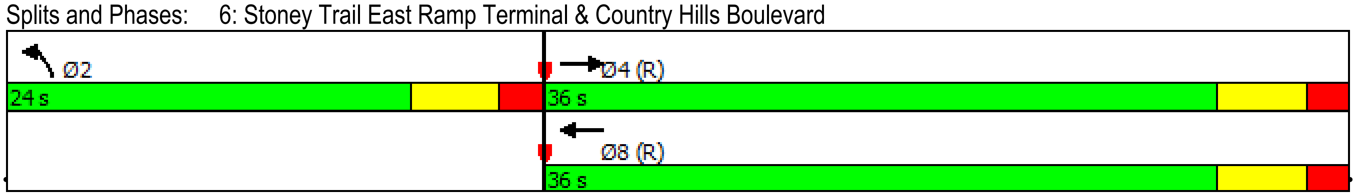
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1320	0	0	390	410	0
Future Volume (vph)	1320	0	0	390	410	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	3231	0	0	3231	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	3231	0	0	3231	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	450.4			1152.6	205.8	
Travel Time (s)	23.2			59.3	14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	5%	5%	10%	5%	5%
Adj. Flow (vph)	1435	0	0	424	446	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1435	0	0	424	446	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	36.0			36.0	24.0	
Total Split (%)	60.0%			60.0%	40.0%	
Maximum Green (s)	30.0			30.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	34.8			34.8	13.2	
Actuated g/C Ratio	0.58			0.58	0.22	
v/c Ratio	0.77			0.23	0.62	
Control Delay	14.3			7.0	24.6	
Queue Delay	0.0			0.0	0.0	
Total Delay	14.3			7.0	24.6	
LOS	B			A	C	
Approach Delay	14.3			7.0	24.6	
Approach LOS	B			A	C	
Queue Length 50th (m)	55.1			10.4	22.9	
Queue Length 95th (m)	#99.7			19.3	32.4	
Internal Link Dist (m)	426.4			1128.6	181.8	
Turn Bay Length (m)						
Base Capacity (vph)	1871			1871	984	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.77			0.23	0.45	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 59.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Stoney Trail East Ramp Terminal & Country Hills Boulevard



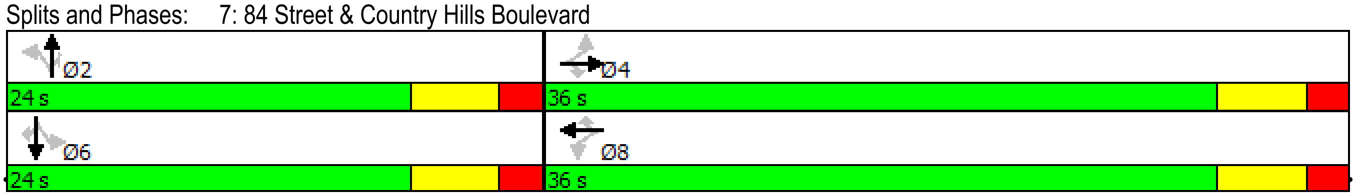
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	1208	157	68	463	10	6	4	0	2	36	2
Future Volume (vph)	45	1208	157	68	463	10	6	4	0	2	36	2
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850						0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1615	3231	1445	1615	3231	1445	1692	1781	1781	1692	1781	1514
Flt Permitted	0.467			0.187								
Satd. Flow (perm)	794	3231	1445	318	3231	1445	1781	1781	1781	1781	1781	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			171			55						55
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		1152.6			933.1			736.9			712.6	
Travel Time (s)		59.3			48.0			44.2			42.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	49	1313	171	74	503	11	7	4	0	2	39	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	1313	171	74	503	11	7	4	0	2	39	2
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0	24.0	24.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	36.0	36.0	36.0	36.0	36.0	36.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (%)	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0	30.0	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	37.7	37.7	37.7	37.7	37.7	37.7	10.1	10.1		10.1	10.1	10.1
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.83	0.83	0.22	0.22		0.22	0.22	0.22
v/c Ratio	0.07	0.49	0.14	0.28	0.19	0.01	0.02	0.01		0.01	0.10	0.01
Control Delay	4.3	5.1	1.4	8.9	3.4	0.0	16.7	16.8		16.5	17.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	4.3	5.1	1.4	8.9	3.4	0.0	16.7	16.8		16.5	17.1	0.0
LOS	A	A	A	A	A	A	B	B		B	B	A
Approach Delay		4.7			4.0			16.7			16.3	
Approach LOS		A			A			B			B	
Queue Length 50th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3		0.1	2.1	0.0
Queue Length 95th (m)	5.3	58.3	5.4	12.9	16.7	0.0	3.0	2.2		1.5	9.1	0.0
Internal Link Dist (m)		1128.6			909.1			712.9			688.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0			100.0		50.0
Base Capacity (vph)	660	2684	1229	264	2684	1209	715	715		715	715	641
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.07	0.49	0.14	0.28	0.19	0.01	0.01	0.01		0.00	0.05	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 45.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 4.8 Intersection LOS: A
Intersection Capacity Utilization 74.3% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 7: 84 Street & Country Hills Boulevard



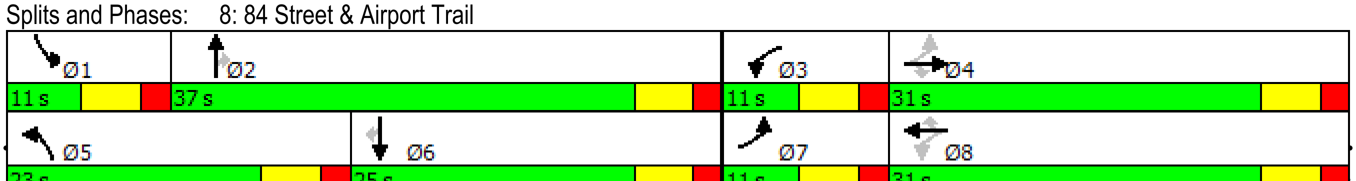
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	242	708	9	130	1	534	4	37	3	233	57
Future Volume (vph)	1	242	708	9	130	1	534	4	37	3	233	57
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Flt Permitted	0.663			0.589			0.950			0.950		
Satd. Flow (perm)	1181	3385	1514	1049	3385	1514	3283	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			614			255			182			255
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		907.6			1213.9			932.6			893.6	
Travel Time (s)		40.8			54.6			56.0			53.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	263	770	10	141	1	580	4	40	3	253	62
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	263	770	10	141	1	580	4	40	3	253	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	11.0	31.0	31.0	11.0	31.0	31.0	23.0	37.0	37.0	11.0	25.0	25.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	12.2%	34.4%	34.4%	12.2%	34.4%	34.4%	25.6%	41.1%	41.1%	12.2%	27.8%	27.8%
Maximum Green (s)	5.0	25.0	25.0	5.0	25.0	25.0	17.0	31.0	31.0	5.0	19.0	19.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	19.4	18.6	18.6	19.4	18.6	18.6	16.3	31.3	31.3	5.2	10.4	10.4
Actuated g/C Ratio	0.29	0.28	0.28	0.29	0.28	0.28	0.25	0.48	0.48	0.08	0.16	0.16
v/c Ratio	0.00	0.27	0.89	0.03	0.15	0.00	0.71	0.00	0.05	0.02	0.47	0.14
Control Delay	15.0	19.8	19.5	15.2	18.9	0.0	31.3	15.8	0.1	35.3	30.5	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.0	19.8	19.5	15.2	18.9	0.0	31.3	15.8	0.1	35.3	30.5	0.6
LOS	B	B	B	B	B	A	C	B	A	D	C	A
Approach Delay		19.5			18.6			29.2			24.7	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	0.1	12.4	14.5	0.9	6.4	0.0	33.8	0.1	0.0	0.4	15.4	0.0
Queue Length 95th (m)	1.0	26.9	#101.8	3.8	15.7	0.0	#76.0	1.3	0.0	3.0	31.0	0.0
Internal Link Dist (m)		883.6			1189.9			908.6			869.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	388	1338	969	360	1338	752	882	1718	858	133	1017	633
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.20	0.79	0.03	0.11	0.00	0.66	0.00	0.05	0.02	0.25	0.10

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 65.8
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 23.1 — Intersection LOS: C
Intersection Capacity Utilization 70.8% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 84 Street & Airport Trail



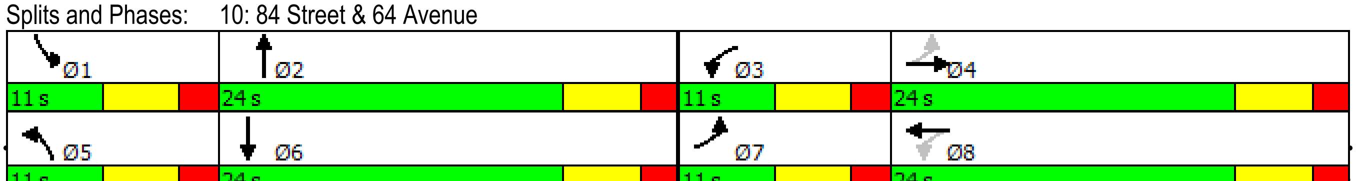
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑		↰	↑↑		↰↰	↑↑		↰	↑↑	
Traffic Volume (vph)	163	181	447	27	41	20	180	158	169	102	682	115
Future Volume (vph)	163	181	447	27	41	20	180	158	169	102	682	115
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	2		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	0.95	0.95	1.00	0.95	0.95
Frt		0.893			0.951			0.922			0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	3023	0	1692	3219	0	3283	3121	0	1692	3310	0
Flt Permitted	0.537			0.404			0.950			0.950		
Satd. Flow (perm)	957	3023	0	720	3219	0	3283	3121	0	1692	3310	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		368			22			184			26	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		3331.9			1417.4			673.7			487.6	
Travel Time (s)		171.4			72.9			40.4			29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	177	197	486	29	45	22	196	172	184	111	741	125
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	683	0	29	67	0	196	356	0	111	866	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	4.0		6.1	4.0		6.1	4.0		6.1	4.0	
Trailing Detector (m)	0.0	2.0		0.0	2.0		0.0	2.0		0.0	2.0	
Detector 1 Position(m)	0.0	2.0		0.0	2.0		0.0	2.0		0.0	2.0	
Detector 1 Size(m)	6.1	2.0		6.1	2.0		6.1	2.0		6.1	2.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	24.0		11.0	24.0		11.0	24.0		11.0	24.0	
Total Split (s)	11.0	24.0		11.0	24.0		11.0	24.0		11.0	24.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	15.7%	34.3%		15.7%	34.3%		15.7%	34.3%		15.7%	34.3%	
Maximum Green (s)	5.0	18.0		5.0	18.0		5.0	18.0		5.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	14.8	13.1		12.5	10.0		5.1	18.4		5.1	18.4	
Actuated g/C Ratio	0.25	0.22		0.21	0.17		0.09	0.31		0.09	0.31	
v/c Ratio	0.56	0.71		0.12	0.12		0.69	0.32		0.76	0.82	
Control Delay	23.8	14.2		14.6	15.8		44.2	9.9		65.6	29.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.8	14.2		14.6	15.8		44.2	9.9		65.6	29.5	
LOS	C	B		B	B		D	A		E	C	
Approach Delay		16.2			15.5			22.1			33.6	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	14.6	13.7		2.2	2.3		10.6	6.8		11.8	42.8	
Queue Length 95th (m)	27.0	34.4		6.5	6.6		#29.8	19.3		#42.3	#95.8	
Internal Link Dist (m)		3307.9			1393.4			649.7			463.6	
Turn Bay Length (m)	50.0			50.0			50.0			50.0		
Base Capacity (vph)	317	1199		238	1023		285	1103		146	1054	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.56	0.57		0.12	0.07		0.69	0.32		0.76	0.82	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 58.8	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 24.3	Intersection LOS: C
Intersection Capacity Utilization 66.4%	ICU Level of Service C
Analysis Period (min) 15	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 84 Street & 64 Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	534	1790	786	187	1897	392	209	163	269	262	226	594
Future Volume (vph)	534	1790	786	187	1897	392	209	163	269	262	226	594
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			365			196			196			234
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		978.3			924.1			716.9			299.4	
Travel Time (s)		50.3			47.5			43.0			18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	20%	20%	20%	20%	20%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	580	1946	854	203	2062	426	227	177	292	285	246	646
Shared Lane Traffic (%)												
Lane Group Flow (vph)	580	1946	854	203	2062	426	227	177	292	285	246	646
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	78.0	78.0	16.0	64.0	64.0	14.0	34.0	34.0	22.0	42.0	42.0
Total Split (%)	20.0%	52.0%	52.0%	10.7%	42.7%	42.7%	9.3%	22.7%	22.7%	14.7%	28.0%	28.0%
Maximum Green (s)	24.0	72.0	72.0	10.0	58.0	58.0	8.0	28.0	28.0	16.0	36.0	36.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	24.0	72.0	72.0	10.0	58.0	58.0	8.0	28.4	28.4	15.6	36.0	36.0
Actuated g/C Ratio	0.16	0.48	0.48	0.07	0.39	0.39	0.05	0.19	0.19	0.10	0.24	0.24
v/c Ratio	1.26	0.95	1.04	1.06	1.25	0.67	1.30	0.28	0.65	0.84	0.30	1.19
Control Delay	184.4	49.0	63.0	146.8	158.2	25.7	221.6	53.5	26.1	86.9	48.0	135.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	184.4	49.0	63.0	146.8	158.2	25.7	221.6	53.5	26.1	86.9	48.0	135.1
LOS	F	D	E	F	F	C	F	D	C	F	D	F
Approach Delay		75.8			136.4			96.8			105.2	
Approach LOS		E			F			F			F	
Queue Length 50th (m)	~111.2	199.7	~212.1	~34.0	~279.9	58.0	~44.3	24.1	26.1	43.4	31.8	~176.1
Queue Length 95th (m)	#148.5	#237.3	#291.5	#60.4	#307.6	98.3	#71.6	35.6	59.5	#64.7	44.6	#251.1
Internal Link Dist (m)		954.3			900.1			692.9			275.4	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	459	2042	825	191	1645	632	175	641	446	350	812	541
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.26	0.95	1.04	1.06	1.25	0.67	1.30	0.28	0.65	0.81	0.30	1.19

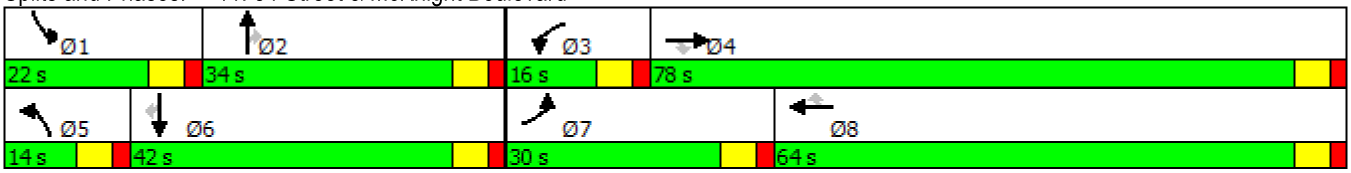
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 102.5 — Intersection LOS: F
Intersection Capacity Utilization 96.5% — ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: 84 Street & McKnight Boulevard



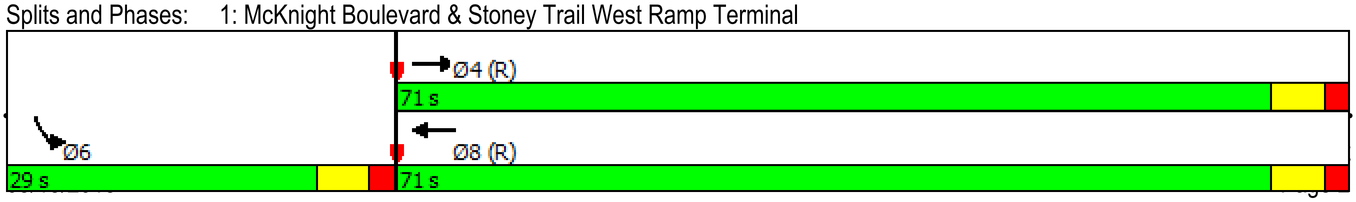
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑		↰↰	
Traffic Volume (vph)	0	1250	2573	0	730	0
Future Volume (vph)	0	1250	2573	0	730	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4256	4256	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4256	4256	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		781.0	409.9		174.4	
Travel Time (s)		40.2	21.1		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	20%	20%	5%	5%	5%
Adj. Flow (vph)	0	1359	2797	0	793	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1359	2797	0	793	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		71.0	71.0		29.0	
Total Split (%)		71.0%	71.0%		29.0%	
Maximum Green (s)		65.0	65.0		23.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		65.0	65.0		23.0	
Actuated g/C Ratio		0.65	0.65		0.23	
v/c Ratio		0.49	1.01		1.05	
Control Delay		9.7	38.3		85.1	
Queue Delay		0.0	0.0		0.0	
Total Delay		9.7	38.3		85.1	
LOS		A	D		F	
Approach Delay		9.7	38.3		85.1	
Approach LOS		A	D		F	
Queue Length 50th (m)		44.8	~189.4		~86.8	
Queue Length 95th (m)		54.7	#238.2		#122.5	
Internal Link Dist (m)		757.0	385.9		150.4	
Turn Bay Length (m)						
Base Capacity (vph)		2766	2766		755	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.49	1.01		1.05	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 38.0 Intersection LOS: D
Intersection Capacity Utilization 82.4% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: McKnight Boulevard & Stoney Trail West Ramp Terminal



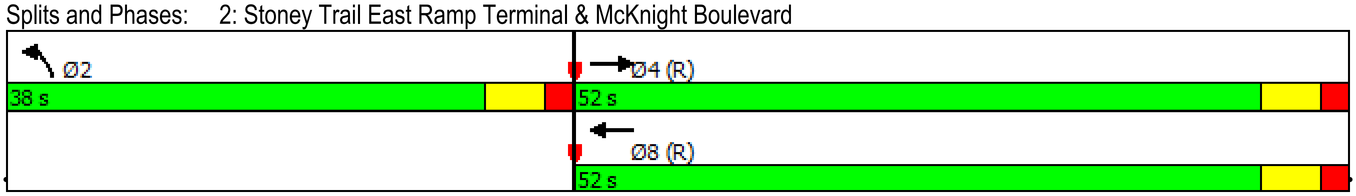
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1870	0	0	1563	1010	0
Future Volume (vph)	1870	0	0	1563	1010	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4256	0	0	4256	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4256	0	0	4256	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	409.9			978.3	151.6	
Travel Time (s)	21.1			50.3	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	5%	5%	20%	5%	5%
Adj. Flow (vph)	2033	0	0	1699	1098	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2033	0	0	1699	1098	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	52.0			52.0	38.0	
Total Split (%)	57.8%			57.8%	42.2%	
Maximum Green (s)	46.0			46.0	32.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	46.3			46.3	31.7	
Actuated g/C Ratio	0.51			0.51	0.35	
v/c Ratio	0.93			0.78	0.95	
Control Delay	29.7			20.9	46.1	
Queue Delay	0.0			0.0	0.0	
Total Delay	29.7			20.9	46.1	
LOS	C			C	D	
Approach Delay	29.7			20.9	46.1	
Approach LOS	C			C	D	
Queue Length 50th (m)	114.5			83.2	93.4	
Queue Length 95th (m)	#154.9			102.4	#133.9	
Internal Link Dist (m)	385.9			954.3	127.6	
Turn Bay Length (m)						
Base Capacity (vph)	2188			2188	1167	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.93			0.78	0.94	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 30.3 Intersection LOS: C
Intersection Capacity Utilization 82.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Stoney Trail East Ramp Terminal & McKnight Boulevard

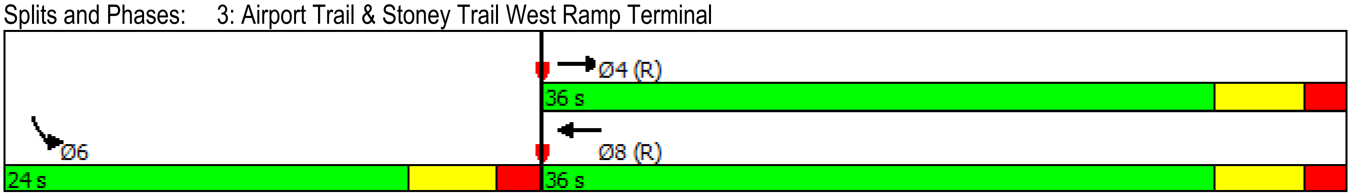


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	140	1530	0	120	0
Future Volume (vph)	0	140	1530	0	120	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3385	3385	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3385	3385	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		80	80		50	
Link Distance (m)		1057.6	470.1		295.9	
Travel Time (s)		47.6	21.2		21.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	152	1663	0	130	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	152	1663	0	130	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		36.0	36.0		24.0	
Total Split (%)		60.0%	60.0%		40.0%	
Maximum Green (s)		30.0	30.0		18.0	
Yellow Time (s)		4.0	4.0		4.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		42.4	42.4		10.0	
Actuated g/C Ratio		0.71	0.71		0.17	
v/c Ratio		0.06	0.70		0.24	
Control Delay		4.2	9.1		23.0	
Queue Delay		0.0	0.0		0.0	
Total Delay		4.2	9.1		23.0	
LOS		A	A		C	
Approach Delay		4.2	9.1		23.0	
Approach LOS		A	A		C	
Queue Length 50th (m)		2.8	58.3		6.4	
Queue Length 95th (m)		5.3	83.3		12.8	
Internal Link Dist (m)		1033.6	446.1		271.9	
Turn Bay Length (m)						
Base Capacity (vph)		2391	2391		984	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.06	0.70		0.13	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 9.6	Intersection LOS: A
Intersection Capacity Utilization 61.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Airport Trail & Stoney Trail West Ramp Terminal



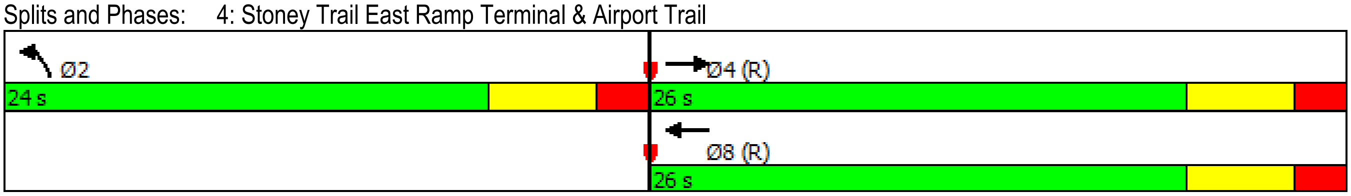
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰↰	
Traffic Volume (vph)	260	0	0	750	780	0
Future Volume (vph)	260	0	0	750	780	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	3385	0	0	3385	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	3385	0	0	3385	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	80			80	50	
Link Distance (m)	470.1			907.6	226.7	
Travel Time (s)	21.2			40.8	16.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	0	0	815	848	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	283	0	0	815	848	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	26.0			26.0	24.0	
Total Split (%)	52.0%			52.0%	48.0%	
Maximum Green (s)	20.0			20.0	18.0	
Yellow Time (s)	4.0			4.0	4.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	21.4			21.4	16.6	
Actuated g/C Ratio	0.43			0.43	0.33	
v/c Ratio	0.20			0.56	0.78	
Control Delay	9.9			13.1	20.6	
Queue Delay	0.0			0.0	0.0	
Total Delay	9.9			13.1	20.6	
LOS	A			B	C	
Approach Delay	9.9			13.1	20.6	
Approach LOS	A			B	C	
Queue Length 50th (m)	8.2			28.6	32.3	
Queue Length 95th (m)	14.4			43.0	48.7	
Internal Link Dist (m)	446.1			883.6	202.7	
Turn Bay Length (m)						
Base Capacity (vph)	1450			1450	1181	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.20			0.56	0.72	

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 22.5 (45%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 15.9 Intersection LOS: B
Intersection Capacity Utilization 61.8% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Stoney Trail East Ramp Terminal & Airport Trail



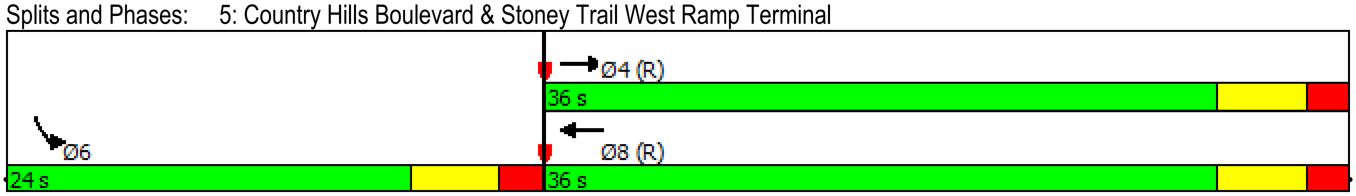
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	880	1239	0	530	0
Future Volume (vph)	0	880	1239	0	530	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3231	3231	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3231	3231	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		854.2	450.4		250.2	
Travel Time (s)		43.9	23.2		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	10%	10%	5%	5%	5%
Adj. Flow (vph)	0	957	1347	0	576	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	957	1347	0	576	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		36.0	36.0		24.0	
Total Split (%)		60.0%	60.0%		40.0%	
Maximum Green (s)		30.0	30.0		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		32.9	32.9		15.1	
Actuated g/C Ratio		0.55	0.55		0.25	
v/c Ratio		0.54	0.76		0.70	
Control Delay		10.7	13.3		25.0	
Queue Delay		0.0	0.0		0.0	
Total Delay		10.7	13.3		25.0	
LOS		B	B		C	
Approach Delay		10.7	13.3		25.0	
Approach LOS		B	B		C	
Queue Length 50th (m)		32.3	27.2		29.3	
Queue Length 95th (m)		52.1	#85.5		40.9	
Internal Link Dist (m)		830.2	426.4		226.2	
Turn Bay Length (m)						
Base Capacity (vph)		1772	1772		984	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.54	0.76		0.59	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 14.8 Intersection LOS: B
Intersection Capacity Utilization 60.7% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Country Hills Boulevard & Stoney Trail West Ramp Terminal



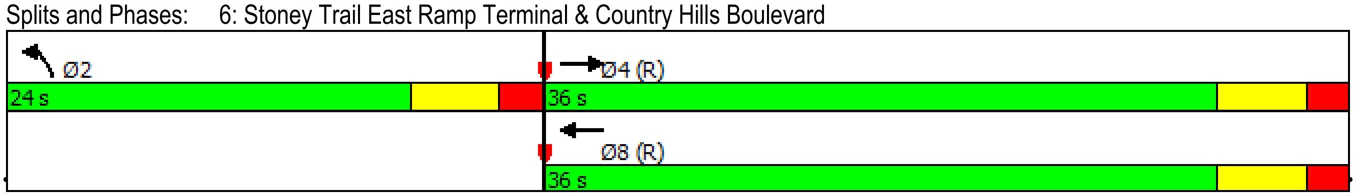
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1320	0	0	940	409	0
Future Volume (vph)	1320	0	0	940	409	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	3231	0	0	3231	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	3231	0	0	3231	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	450.4			1152.6	205.8	
Travel Time (s)	23.2			59.3	14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	5%	5%	10%	5%	5%
Adj. Flow (vph)	1435	0	0	1022	445	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1435	0	0	1022	445	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	36.0			36.0	24.0	
Total Split (%)	60.0%			60.0%	40.0%	
Maximum Green (s)	30.0			30.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	34.8			34.8	13.2	
Actuated g/C Ratio	0.58			0.58	0.22	
v/c Ratio	0.77			0.55	0.62	
Control Delay	12.5			9.6	24.7	
Queue Delay	0.0			0.0	0.0	
Total Delay	12.5			9.6	24.7	
LOS	B			A	C	
Approach Delay	12.5			9.6	24.7	
Approach LOS	B			A	C	
Queue Length 50th (m)	24.7			31.8	22.9	
Queue Length 95th (m)	#96.9			53.9	32.5	
Internal Link Dist (m)	426.4			1128.6	181.8	
Turn Bay Length (m)						
Base Capacity (vph)	1874			1874	984	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.77			0.55	0.45	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 13.4 Intersection LOS: B
Intersection Capacity Utilization 60.7% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Stoney Trail East Ramp Terminal & Country Hills Boulevard



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1377	193	36	1345	88	129	28	1	8	10	46
Future Volume (vph)	100	1377	193	36	1345	88	129	28	1	8	10	46
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1615	3231	1445	1615	3231	1445	1692	3385	1514	1692	3385	1514
Flt Permitted	0.140			0.132			0.750			0.737		
Satd. Flow (perm)	238	3231	1445	224	3231	1445	1336	3385	1514	1313	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			210			96			41			47
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		1152.6			933.1			736.9			712.6	
Travel Time (s)		59.3			48.0			44.2			42.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	109	1497	210	39	1462	96	140	30	1	9	11	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	109	1497	210	39	1462	96	140	30	1	9	11	50
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0	24.0	24.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	56.0	56.0	56.0	56.0	56.0	56.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0	50.0	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	49.3	49.3	49.3	49.3	49.3	49.3	13.4	13.4	13.4	13.4	13.4	13.4
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.72	0.72	0.20	0.20	0.20	0.20	0.20	0.20
v/c Ratio	0.64	0.64	0.19	0.24	0.63	0.09	0.54	0.05	0.00	0.04	0.02	0.15
Control Delay	32.7	9.5	1.4	11.0	9.3	1.6	36.0	25.1	0.0	25.2	24.8	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.7	9.5	1.4	11.0	9.3	1.6	36.0	25.1	0.0	25.2	24.8	10.2
LOS	C	A	A	B	A	A	D	C	A	C	C	B
Approach Delay		10.0			8.9			33.9			14.4	
Approach LOS		A			A			C			B	
Queue Length 50th (m)	8.0	58.6	0.0	1.9	56.1	0.0	18.5	1.8	0.0	1.1	0.6	0.4
Queue Length 95th (m)	#41.0	99.5	6.8	8.7	95.2	4.8	35.3	5.1	0.0	4.6	2.6	8.4
Internal Link Dist (m)		1128.6			909.1			712.9			688.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	175	2387	1122	165	2387	1093	367	932	446	361	932	451
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.63	0.19	0.24	0.61	0.09	0.38	0.03	0.00	0.02	0.01	0.11

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 68.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 84.8% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: 84 Street & Country Hills Boulevard

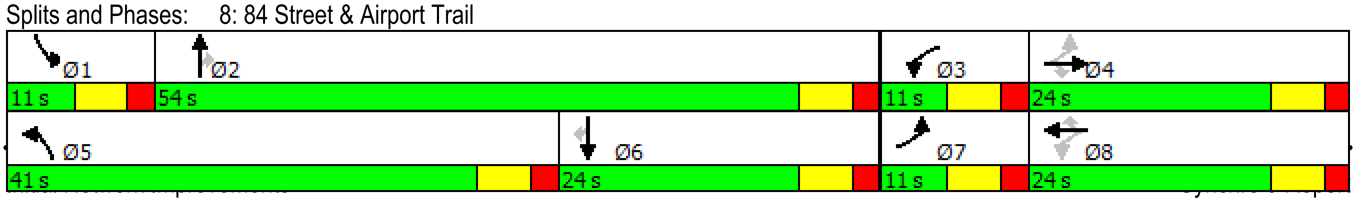
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	78	242	39	449	1	1142	156	76	3	136	19
Future Volume (vph)	1	78	242	39	449	1	1142	156	76	3	136	19
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Flt Permitted	0.330			0.618			0.950			0.950		
Satd. Flow (perm)	588	3385	1514	1101	3385	1514	3283	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			263			229			164			229
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		907.6			1213.9			932.6			893.6	
Travel Time (s)		40.8			54.6			56.0			53.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	85	263	42	488	1	1241	170	83	3	148	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	85	263	42	488	1	1241	170	83	3	148	21
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	41.0	54.0	54.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	11.0%	24.0%	24.0%	11.0%	24.0%	24.0%	41.0%	54.0%	54.0%	11.0%	24.0%	24.0%
Maximum Green (s)	5.0	18.0	18.0	5.0	18.0	18.0	35.0	48.0	48.0	5.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	15.0	12.1	12.1	17.4	16.5	16.5	35.3	48.3	48.3	5.0	8.8	8.8
Actuated g/C Ratio	0.19	0.15	0.15	0.22	0.20	0.20	0.44	0.60	0.60	0.06	0.11	0.11
v/c Ratio	0.01	0.17	0.58	0.15	0.71	0.00	0.86	0.08	0.09	0.03	0.40	0.06
Control Delay	23.0	32.8	10.3	25.5	36.8	0.0	30.1	9.1	0.2	40.3	38.0	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	32.8	10.3	25.5	36.8	0.0	30.1	9.1	0.2	40.3	38.0	0.3
LOS	C	C	B	C	D	A	C	A	A	D	D	A
Approach Delay		15.9			35.8			26.0			33.4	
Approach LOS		B			D			C			C	
Queue Length 50th (m)	0.1	6.4	0.0	5.1	35.2	0.0	84.7	4.8	0.0	0.5	11.2	0.0
Queue Length 95th (m)	1.3	13.1	19.8	12.8	61.5	0.0	#162.1	15.1	0.0	3.4	22.2	0.0
Internal Link Dist (m)		883.6			1189.9			908.6			869.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	178	761	544	274	777	524	1436	2074	991	105	761	518
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.11	0.48	0.15	0.63	0.00	0.86	0.08	0.08	0.03	0.19	0.04

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 80.7
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 27.2 Intersection LOS: C
Intersection Capacity Utilization 65.4% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 84 Street & Airport Trail



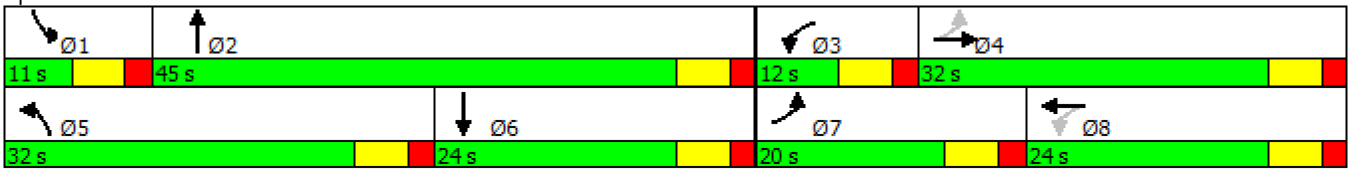
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	317	116	311	66	301	176	791	1043	99	31	157	162
Future Volume (vph)	317	116	311	66	301	176	791	1043	99	31	157	162
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	2		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	0.95	0.95	1.00	0.95	0.95
Frt		0.891			0.945			0.987			0.924	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	3016	0	1692	3199	0	3283	3341	0	1692	3128	0
Flt Permitted	0.170			0.485			0.950			0.950		
Satd. Flow (perm)	303	3016	0	864	3199	0	3283	3341	0	1692	3128	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		338			102			12			176	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		3331.9			1417.4			673.7			487.6	
Travel Time (s)		171.4			72.9			40.4			29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	126	338	72	327	191	860	1134	108	34	171	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	345	464	0	72	518	0	860	1242	0	34	347	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	4.0		6.1	4.0		6.1	4.0		6.1	4.0	
Trailing Detector (m)	0.0	2.0		0.0	2.0		0.0	2.0		0.0	2.0	
Detector 1 Position(m)	0.0	2.0		0.0	2.0		0.0	2.0		0.0	2.0	
Detector 1 Size(m)	6.1	2.0		6.1	2.0		6.1	2.0		6.1	2.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	24.0		11.0	24.0		11.0	24.0		11.0	24.0	
Total Split (s)	20.0	32.0		12.0	24.0		32.0	45.0		11.0	24.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	20.0%	32.0%		12.0%	24.0%		32.0%	45.0%		11.0%	24.0%	
Maximum Green (s)	14.0	26.0		6.0	18.0		26.0	39.0		5.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	36.6	27.1		22.5	16.6		26.0	43.5		5.0	18.0	
Actuated g/C Ratio	0.37	0.27		0.23	0.17		0.26	0.44		0.05	0.18	
v/c Ratio	1.12	0.43		0.29	0.83		0.99	0.84		0.40	0.49	
Control Delay	113.4	9.9		24.6	44.4		66.5	32.3		59.9	20.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	113.4	9.9		24.6	44.4		66.5	32.3		59.9	20.2	
LOS	F	A		C	D		E	C		E	C	
Approach Delay		54.0			42.0			46.3			23.7	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	~62.1	9.9		8.9	41.1		~87.1	119.5		6.5	15.2	
Queue Length 95th (m)	#115.9	22.8		18.0	#61.1		#126.9	#165.3		16.4	28.7	
Internal Link Dist (m)		3307.9			1393.4			649.7			463.6	
Turn Bay Length (m)	50.0			50.0			50.0			50.0		
Base Capacity (vph)	309	1083		248	667		866	1481		85	715	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.12	0.43		0.29	0.78		0.99	0.84		0.40	0.49	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 98.6
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 45.1 Intersection LOS: D
Intersection Capacity Utilization 89.4% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 84 Street & 64 Avenue



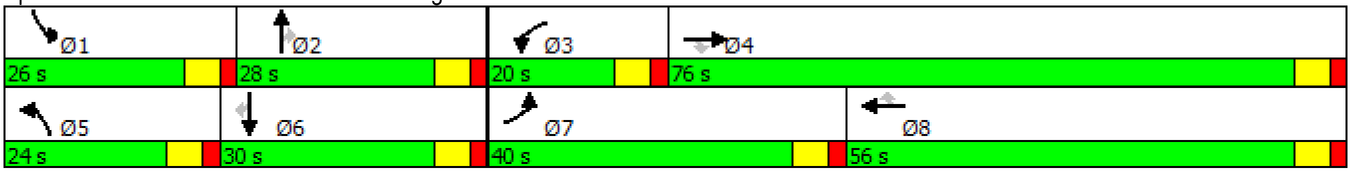
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	833	1909	378	259	1714	579	473	370	143	384	144	496
Future Volume (vph)	833	1909	378	259	1714	579	473	370	143	384	144	496
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			184			252			155			319
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		978.3			924.1			716.9			299.4	
Travel Time (s)		50.3			47.5			43.0			18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	20%	20%	20%	20%	20%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	905	2075	411	282	1863	629	514	402	155	417	157	539
Shared Lane Traffic (%)												
Lane Group Flow (vph)	905	2075	411	282	1863	629	514	402	155	417	157	539
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	76.0	76.0	20.0	56.0	56.0	24.0	28.0	28.0	26.0	30.0	30.0
Total Split (%)	26.7%	50.7%	50.7%	13.3%	37.3%	37.3%	16.0%	18.7%	18.7%	17.3%	20.0%	20.0%
Maximum Green (s)	34.0	70.0	70.0	14.0	50.0	50.0	18.0	22.0	22.0	20.0	24.0	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	34.0	70.0	70.0	14.0	50.0	50.0	18.0	22.0	22.0	20.0	24.0	24.0
Actuated g/C Ratio	0.23	0.47	0.47	0.09	0.33	0.33	0.12	0.15	0.15	0.13	0.16	0.16
v/c Ratio	1.39	1.04	0.57	1.05	1.31	1.03	1.31	0.81	0.44	0.95	0.29	1.06
Control Delay	227.0	71.9	18.7	132.5	186.2	74.2	205.1	75.5	12.0	96.8	57.2	79.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	227.0	71.9	18.7	132.5	186.2	74.2	205.1	75.5	12.0	96.8	57.2	79.4
LOS	F	E	B	F	F	E	F	E	B	F	E	E
Approach Delay		106.9			155.4			128.5			82.8	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~184.1	~244.3	48.0	~47.0	~260.5	~146.9	~100.7	61.8	0.0	64.4	21.9	~90.5
Queue Length 95th (m)	#224.5	#272.1	81.5	#76.5	#289.2	#221.2	#136.7	#84.3	20.5	#97.0	33.2	#161.7
Internal Link Dist (m)		954.3			900.1			692.9			275.4	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	651	1986	716	268	1418	609	393	496	354	437	541	510
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.39	1.04	0.57	1.05	1.31	1.03	1.31	0.81	0.44	0.95	0.29	1.06

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.39
Intersection Signal Delay: 122.6 — Intersection LOS: F
Intersection Capacity Utilization 100.2% — ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: 84 Street & McKnight Boulevard



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑		↰↰	
Traffic Volume (vph)	0	2670	2573	0	425	0
Future Volume (vph)	0	2670	2573	0	425	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4256	4256	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4256	4256	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		781.0	409.9		174.4	
Travel Time (s)		40.2	21.1		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	20%	20%	5%	5%	5%
Adj. Flow (vph)	0	2902	2797	0	462	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2902	2797	0	462	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		66.0	66.0		24.0	
Total Split (%)		73.3%	73.3%		26.7%	
Maximum Green (s)		60.0	60.0		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		61.6	61.6		16.4	
Actuated g/C Ratio		0.68	0.68		0.18	
v/c Ratio		1.00	0.96		0.77	
Control Delay		31.6	15.9		44.2	
Queue Delay		0.0	0.0		0.0	
Total Delay		31.6	15.9		44.2	
LOS		C	B		D	
Approach Delay		31.6	15.9		44.2	
Approach LOS		C	B		D	
Queue Length 50th (m)		~173.7	81.3		38.8	
Queue Length 95th (m)		#225.8	m#202.6		54.5	
Internal Link Dist (m)		757.0	385.9		150.4	
Turn Bay Length (m)						
Base Capacity (vph)		2911	2911		656	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		1.00	0.96		0.70	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 25.5 Intersection LOS: C
Intersection Capacity Utilization 81.5% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: McKnight Boulevard & Stoney Trail West Ramp Terminal

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	
Traffic Volume (vph)	2615	0	0	1903	670	0
Future Volume (vph)	2615	0	0	1903	670	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4256	0	0	4256	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4256	0	0	4256	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	409.9			978.3	151.6	
Travel Time (s)	21.1			50.3	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	5%	5%	20%	5%	5%
Adj. Flow (vph)	2842	0	0	2068	728	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2842	0	0	2068	728	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	64.0			64.0	26.0	
Total Split (%)	71.1%			71.1%	28.9%	
Maximum Green (s)	58.0			58.0	20.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	58.0			58.0	20.0	
Actuated g/C Ratio	0.64			0.64	0.22	
v/c Ratio	1.04			0.75	1.00	
Control Delay	35.9			13.3	69.5	
Queue Delay	0.0			0.0	0.0	
Total Delay	35.9			13.3	69.5	
LOS	D			B	E	
Approach Delay	35.9			13.3	69.5	
Approach LOS	D			B	E	
Queue Length 50th (m)	~193.8			80.9	65.1	
Queue Length 95th (m)	m#198.6			99.4	#101.7	
Internal Link Dist (m)	385.9			954.3	127.6	
Turn Bay Length (m)						
Base Capacity (vph)	2742			2742	729	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	1.04			0.75	1.00	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 32.0 Intersection LOS: C

Intersection Capacity Utilization 81.5% ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

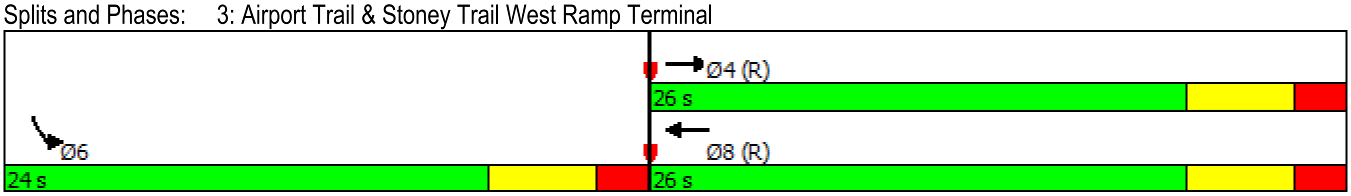
Splits and Phases: 2: Stoney Trail East Ramp Terminal & McKnight Boulevard

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1448	885	0	570	0
Future Volume (vph)	0	1448	885	0	570	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4863	4863	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4863	4863	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		80	80		50	
Link Distance (m)		1057.6	470.1		295.9	
Travel Time (s)		47.6	21.2		21.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1574	962	0	620	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1574	962	0	620	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		26.0	26.0		24.0	
Total Split (%)		52.0%	52.0%		48.0%	
Maximum Green (s)		20.0	20.0		18.0	
Yellow Time (s)		4.0	4.0		4.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		23.6	23.6		14.4	
Actuated g/C Ratio		0.47	0.47		0.29	
v/c Ratio		0.69	0.42		0.65	
Control Delay		13.3	10.1		18.7	
Queue Delay		0.0	0.0		0.0	
Total Delay		13.3	10.1		18.7	
LOS		B	B		B	
Approach Delay		13.3	10.1		18.7	
Approach LOS		B	B		B	
Queue Length 50th (m)		36.8	18.9		24.5	
Queue Length 95th (m)		58.5	31.5		33.6	
Internal Link Dist (m)		1033.6	446.1		271.9	
Turn Bay Length (m)						
Base Capacity (vph)		2291	2291		1181	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.69	0.42		0.52	

Intersection Summary	
Area Type: Other	
Cycle Length: 50	
Actuated Cycle Length: 50	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 58.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Airport Trail & Stoney Trail West Ramp Terminal

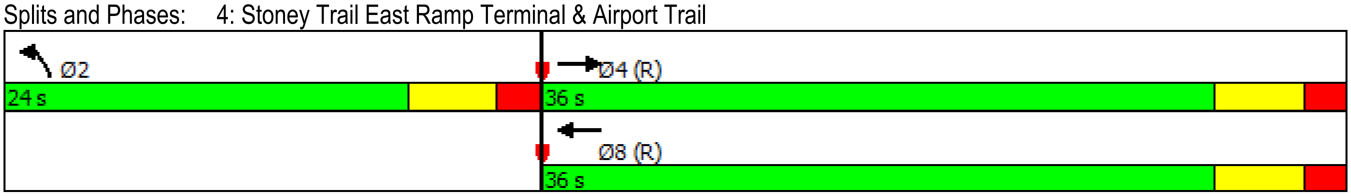


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2018	0	0	655	230	0
Future Volume (vph)	2018	0	0	655	230	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4863	0	0	4863	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4863	0	0	4863	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	80			80	50	
Link Distance (m)	470.1			907.6	226.7	
Travel Time (s)	21.2			40.8	16.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2193	0	0	712	250	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2193	0	0	712	250	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	36.0			36.0	24.0	
Total Split (%)	60.0%			60.0%	40.0%	
Maximum Green (s)	30.0			30.0	18.0	
Yellow Time (s)	4.0			4.0	4.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	37.3			37.3	10.7	
Actuated g/C Ratio	0.62			0.62	0.18	
v/c Ratio	0.72			0.24	0.43	
Control Delay	9.8			5.4	24.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	9.8			5.4	24.3	
LOS	A			A	C	
Approach Delay	9.8			5.4	24.3	
Approach LOS	A			A	C	
Queue Length 50th (m)	49.5			10.3	12.9	
Queue Length 95th (m)	74.4			16.8	20.9	
Internal Link Dist (m)	446.1			883.6	202.7	
Turn Bay Length (m)						
Base Capacity (vph)	3026			3026	984	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.72			0.24	0.25	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 9.9	Intersection LOS: A
Intersection Capacity Utilization 58.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Stoney Trail East Ramp Terminal & Airport Trail



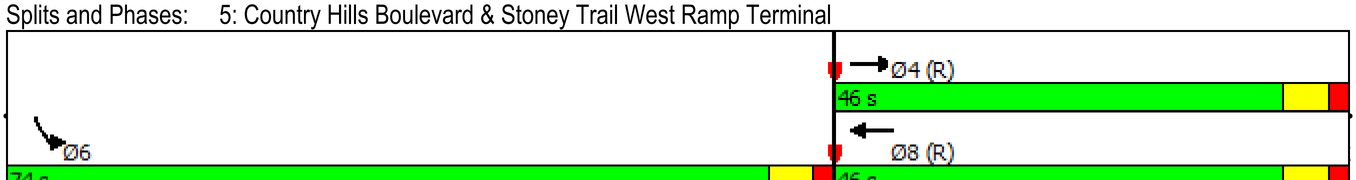
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1421	550	0	1748	0
Future Volume (vph)	0	1421	550	0	1748	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4642	4642	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4642	4642	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		854.2	450.4		250.2	
Travel Time (s)		43.9	23.2		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	10%	10%	5%	5%	5%
Adj. Flow (vph)	0	1545	598	0	1900	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1545	598	0	1900	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		46.0	46.0		74.0	
Total Split (%)		38.3%	38.3%		61.7%	
Maximum Green (s)		40.0	40.0		68.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		40.0	40.0		68.0	
Actuated g/C Ratio		0.33	0.33		0.57	
v/c Ratio		1.00	0.39		1.02	
Control Delay		62.7	31.5		52.9	
Queue Delay		0.0	0.0		0.0	
Total Delay		62.7	31.5		52.9	
LOS		E	C		D	
Approach Delay		62.7	31.5		52.9	
Approach LOS		E	C		D	
Queue Length 50th (m)		132.5	39.3		~244.9	
Queue Length 95th (m)		#167.8	50.0		#286.3	
Internal Link Dist (m)		830.2	426.4		226.2	
Turn Bay Length (m)						
Base Capacity (vph)		1547	1547		1860	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		1.00	0.39		1.02	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 53.5 Intersection LOS: D
Intersection Capacity Utilization 89.4% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Country Hills Boulevard & Stoney Trail West Ramp Terminal



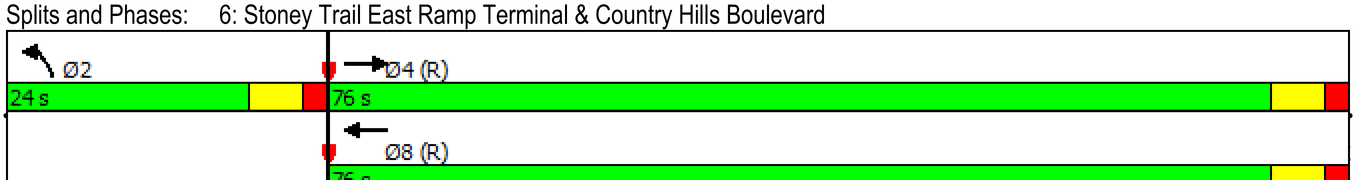
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3080	0	0	390	410	0
Future Volume (vph)	3080	0	0	390	410	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4642	0	0	4642	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4642	0	0	4642	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	450.4			1152.6	205.8	
Travel Time (s)	23.2			59.3	14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	5%	5%	10%	5%	5%
Adj. Flow (vph)	3348	0	0	424	446	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3348	0	0	424	446	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	76.0			76.0	24.0	
Total Split (%)	76.0%			76.0%	24.0%	
Maximum Green (s)	70.0			70.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	71.1			71.1	16.9	
Actuated g/C Ratio	0.71			0.71	0.17	
v/c Ratio	1.01			0.13	0.81	
Control Delay	35.1			4.8	52.0	
Queue Delay	0.0			0.0	0.0	
Total Delay	35.1			4.8	52.0	
LOS	D			A	D	
Approach Delay	35.1			4.8	52.0	
Approach LOS	D			A	D	
Queue Length 50th (m)	~256.0			8.6	42.6	
Queue Length 95th (m)	#282.6			11.9	59.3	
Internal Link Dist (m)	426.4			1128.6	181.8	
Turn Bay Length (m)						
Base Capacity (vph)	3301			3301	590	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	1.01			0.13	0.76	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 33.8 Intersection LOS: C
Intersection Capacity Utilization 89.4% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Stoney Trail East Ramp Terminal & Country Hills Boulevard



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	1059	2066	99	432	10	140	4	147	2	36	21
Future Volume (vph)	45	1059	2066	99	432	10	140	4	147	2	36	21
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		2	1		1	3		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.91	0.88	1.00	0.91	1.00	0.94	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1615	4642	2544	1615	4642	1445	4773	3385	1514	1692	3385	1514
Flt Permitted	0.473			0.222			0.950			0.950		
Satd. Flow (perm)	804	4642	2544	378	4642	1445	4773	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			1439			70			160			70
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		1152.6			933.1			736.9			712.6	
Travel Time (s)		59.3			48.0			44.2			42.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	49	1151	2246	108	470	11	152	4	160	2	39	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	1151	2246	108	470	11	152	4	160	2	39	23
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	105.0	105.0	105.0	105.0	105.0	105.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	7.9%	17.1%	17.1%	7.9%	17.1%	17.1%
Maximum Green (s)	99.0	99.0	99.0	99.0	99.0	99.0	5.0	18.0	18.0	5.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)	99.2	99.2	99.2	99.2	99.2	99.2	6.1	17.2	17.2	5.0	10.7	10.7
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76	0.76	0.05	0.13	0.13	0.04	0.08	0.08
v/c Ratio	0.08	0.33	0.99	0.38	0.13	0.01	0.68	0.01	0.47	0.03	0.14	0.12
Control Delay	5.1	5.6	22.5	10.5	4.6	0.0	78.2	51.5	13.0	63.5	57.8	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	5.6	22.5	10.5	4.6	0.0	78.2	51.5	13.0	63.5	57.8	1.3
LOS	A	A	C	B	A	A	E	D	B	E	E	A
Approach Delay		16.6			5.6			44.8			37.7	
Approach LOS		B			A			D			D	
Queue Length 50th (m)	3.0	32.0	136.0	8.6	10.9	0.0	14.2	0.4	0.0	0.5	5.1	0.0
Queue Length 95th (m)	7.1	42.1	#335.0	21.2	15.8	0.0	#28.1	2.4	20.9	3.5	10.9	0.0
Internal Link Dist (m)		1128.6			909.1			712.9			688.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	611	3527	2278	287	3527	1115	222	513	365	65	467	269
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.33	0.99	0.38	0.13	0.01	0.68	0.01	0.44	0.03	0.08	0.09

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 130.5
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 17.5 Intersection LOS: B
Intersection Capacity Utilization 114.2% ICU Level of Service H
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: 84 Street & Country Hills Boulevard

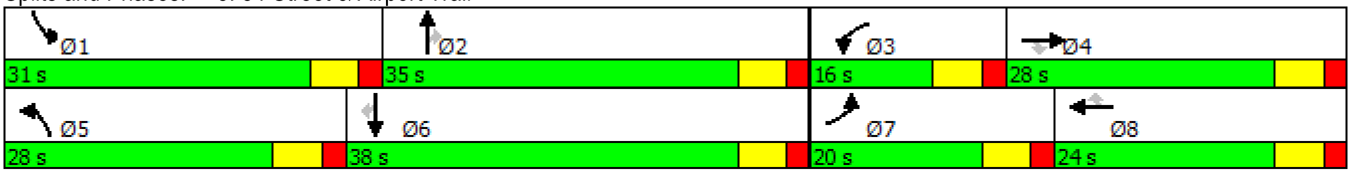
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	407	741	979	253	282	33	876	748	953	725	839	467
Future Volume (vph)	407	741	979	253	282	33	876	748	953	725	839	467
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		2	2		2	3		2	2		2
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	0.88	0.97	0.91	0.88	0.94	0.95	0.88	0.97	0.95	0.88
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			710			149			394			370
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		907.6			1213.9			932.6			893.6	
Travel Time (s)		40.8			54.6			56.0			53.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	442	805	1064	275	307	36	952	813	1036	788	912	508
Shared Lane Traffic (%)												
Lane Group Flow (vph)	442	805	1064	275	307	36	952	813	1036	788	912	508
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	20.0	28.0	28.0	16.0	24.0	24.0	28.0	35.0	35.0	31.0	38.0	38.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	18.2%	25.5%	25.5%	14.5%	21.8%	21.8%	25.5%	31.8%	31.8%	28.2%	34.5%	34.5%
Maximum Green (s)	14.0	22.0	22.0	10.0	18.0	18.0	22.0	29.0	29.0	25.0	32.0	32.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	14.0	21.9	21.9	10.0	17.9	17.9	22.0	29.0	29.0	25.0	32.0	32.0
Actuated g/C Ratio	0.13	0.20	0.20	0.09	0.16	0.16	0.20	0.26	0.26	0.23	0.29	0.29
v/c Ratio	1.06	0.83	0.97	0.92	0.39	0.06	1.00	0.91	1.04	1.05	0.93	0.49
Control Delay	106.7	50.9	35.6	85.7	42.7	0.2	72.7	54.7	65.8	89.9	53.9	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	106.7	50.9	35.6	85.7	42.7	0.2	72.7	54.7	65.8	89.9	53.9	10.3
LOS	F	D	D	F	D	A	E	D	E	F	D	B
Approach Delay		54.5			59.4			64.9			56.7	
Approach LOS		D			E			E			E	
Queue Length 50th (m)	~53.8	61.1	49.5	30.7	21.7	0.0	73.0	89.2	~99.2	~95.7	99.8	12.5
Queue Length 95th (m)	#84.7	76.3	#99.6	#55.1	30.9	0.0	#101.7	#124.1	#143.0	#132.4	#137.5	28.2
Internal Link Dist (m)		883.6			1189.9			908.6			869.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	418	973	1101	298	796	561	955	893	993	747	985	1038
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.06	0.83	0.97	0.92	0.39	0.06	1.00	0.91	1.04	1.05	0.93	0.49

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 109.9
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 59.2 Intersection LOS: E
Intersection Capacity Utilization 85.2% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 84 Street & Airport Trail



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	637	181	447	27	41	20	180	1918	169	115	1404	192
Future Volume (vph)	637	181	447	27	41	20	180	1918	169	115	1404	192
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			146			153			153			153
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		3331.9			1417.4			673.7			487.6	
Travel Time (s)		171.4			72.9			40.4			29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	692	197	486	29	45	22	196	2085	184	125	1526	209
Shared Lane Traffic (%)												
Lane Group Flow (vph)	692	197	486	29	45	22	196	2085	184	125	1526	209
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1
Trailing Detector (m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Position(m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Size(m)	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	31.0	44.0	44.0	11.0	24.0	24.0	16.0	80.0	80.0	15.0	79.0	79.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	20.7%	29.3%	29.3%	7.3%	16.0%	16.0%	10.7%	53.3%	53.3%	10.0%	52.7%	52.7%
Maximum Green (s)	25.0	38.0	38.0	5.0	18.0	18.0	10.0	74.0	74.0	9.0	73.0	73.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	27.8	38.1	38.1	5.0	13.1	13.1	10.0	74.1	74.1	9.0	73.1	73.1
Actuated g/C Ratio	0.19	0.26	0.26	0.03	0.09	0.09	0.07	0.51	0.51	0.06	0.50	0.50
v/c Ratio	1.11	0.22	0.97	0.50	0.15	0.08	0.87	1.21	0.22	1.20	0.90	0.25
Control Delay	121.2	43.8	69.8	98.9	60.8	0.6	100.9	133.4	5.4	206.4	41.8	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	121.2	43.8	69.8	98.9	60.8	0.6	100.9	133.4	5.4	206.4	41.8	7.1
LOS	F	D	E	F	E	A	F	F	A	F	D	A
Approach Delay		92.0			58.5			121.3			49.0	
Approach LOS		F			E			F			D	
Queue Length 50th (m)	~132.9	24.6	109.4	8.7	6.3	0.0	30.4	~405.7	4.7	~45.8	219.3	8.7
Queue Length 95th (m)	#171.8	35.8	#183.3	#22.7	12.7	0.0	#53.6	#445.6	17.7	#88.3	#259.1	23.7
Internal Link Dist (m)		3307.9			1393.4			649.7			463.6	
Turn Bay Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Base Capacity (vph)	626	884	503	58	419	321	225	1722	845	104	1699	836
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.11	0.22	0.97	0.50	0.11	0.07	0.87	1.21	0.22	1.20	0.90	0.25

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 145.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.21
Intersection Signal Delay: 90.1 Intersection LOS: F
Intersection Capacity Utilization 101.3% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 84 Street & 64 Avenue

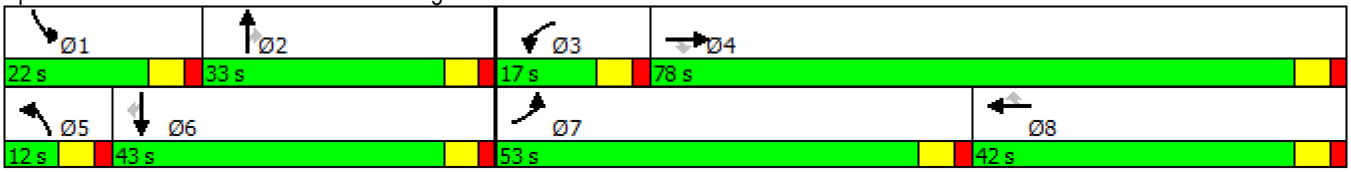
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2294	1790	786	187	1897	392	209	163	269	262	226	1315
Future Volume (vph)	2294	1790	786	187	1897	392	209	163	269	262	226	1315
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			335			196			196			539
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		978.3			924.1			716.9			299.4	
Travel Time (s)		50.3			47.5			43.0			18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	20%	20%	20%	20%	20%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	2493	1946	854	203	2062	426	227	177	292	285	246	1429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2493	1946	854	203	2062	426	227	177	292	285	246	1429
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	53.0	78.0	78.0	17.0	42.0	42.0	12.0	33.0	33.0	22.0	43.0	43.0
Total Split (%)	35.3%	52.0%	52.0%	11.3%	28.0%	28.0%	8.0%	22.0%	22.0%	14.7%	28.7%	28.7%
Maximum Green (s)	47.0	72.0	72.0	11.0	36.0	36.0	6.0	27.0	27.0	16.0	37.0	37.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	47.0	72.0	72.0	11.0	36.0	36.0	6.0	27.4	27.4	15.6	37.0	37.0
Actuated g/C Ratio	0.31	0.48	0.48	0.07	0.24	0.24	0.04	0.18	0.18	0.10	0.25	0.25
v/c Ratio	2.77	0.95	1.05	0.97	2.02	0.91	1.73	0.29	0.67	0.84	0.29	1.83
Control Delay	820.2	49.0	70.4	121.9	491.2	54.7	398.2	54.5	27.0	86.9	47.1	400.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	820.2	49.0	70.4	121.9	491.2	54.7	398.2	54.5	27.0	86.9	47.1	400.5
LOS	F	D	E	F	F	D	F	D	C	F	D	F
Approach Delay		415.7			394.3			155.1			310.6	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~649.3	199.7	~222.0	31.6	~350.4	73.7	~51.2	24.2	26.3	43.4	31.5	~517.7
Queue Length 95th (m)	#685.2	#237.3	#301.4	#57.4	#378.2	#138.1	#78.6	36.0	60.1	#64.7	44.2	#600.2
Internal Link Dist (m)		954.3			900.1			692.9			275.4	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	900	2042	810	210	1021	466	131	619	437	350	834	779
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	2.77	0.95	1.05	0.97	2.02	0.91	1.73	0.29	0.67	0.81	0.29	1.83

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.77
Intersection Signal Delay: 373.9 Intersection LOS: F
Intersection Capacity Utilization 142.4% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: 84 Street & McKnight Boulevard



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	2662	3709	0	730	0
Future Volume (vph)	0	2662	3709	0	730	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4256	4256	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4256	4256	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		781.0	409.9		174.4	
Travel Time (s)		40.2	21.1		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	20%	20%	5%	5%	5%
Adj. Flow (vph)	0	2893	4032	0	793	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2893	4032	0	793	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		115.0	115.0		35.0	
Total Split (%)		76.7%	76.7%		23.3%	
Maximum Green (s)		109.0	109.0		29.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		109.0	109.0		29.0	
Actuated g/C Ratio		0.73	0.73		0.19	
v/c Ratio		0.94	1.30		1.25	
Control Delay		24.9	157.0		173.8	
Queue Delay		0.0	0.0		0.0	
Total Delay		24.9	157.0		173.8	
LOS		C	F		F	
Approach Delay		24.9	157.0		173.8	
Approach LOS		C	F		F	
Queue Length 50th (m)		245.0	~563.3		~151.1	
Queue Length 95th (m)		273.4	m#477.3		#190.9	
Internal Link Dist (m)		757.0	385.9		150.4	
Turn Bay Length (m)						
Base Capacity (vph)		3092	3092		634	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.94	1.30		1.25	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 109.2 Intersection LOS: F
Intersection Capacity Utilization 105.0% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: McKnight Boulevard & Stoney Trail West Ramp Terminal

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3282	0	0	2699	1010	0
Future Volume (vph)	3282	0	0	2699	1010	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4256	0	0	4256	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4256	0	0	4256	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	409.9			978.3	151.6	
Travel Time (s)	21.1			50.3	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	5%	5%	20%	5%	5%
Adj. Flow (vph)	3567	0	0	2934	1098	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3567	0	0	2934	1098	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	104.0			104.0	46.0	
Total Split (%)	69.3%			69.3%	30.7%	
Maximum Green (s)	98.0			98.0	40.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	98.0			98.0	40.0	
Actuated g/C Ratio	0.65			0.65	0.27	
v/c Ratio	1.28			1.06	1.25	
Control Delay	150.9			60.2	168.7	
Queue Delay	0.0			0.0	0.0	
Total Delay	150.9			60.2	168.7	
LOS	F			E	F	
Approach Delay	150.9			60.2	168.7	
Approach LOS	F			E	F	
Queue Length 50th (m)	~492.7			~348.6	~209.8	
Queue Length 95th (m)	m#472.0			#371.2	#251.4	
Internal Link Dist (m)	385.9			954.3	127.6	
Turn Bay Length (m)						
Base Capacity (vph)	2780			2780	875	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	1.28			1.06	1.25	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.28
Intersection Signal Delay: 118.5 Intersection LOS: F
Intersection Capacity Utilization 105.0% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Stoney Trail East Ramp Terminal & McKnight Boulevard

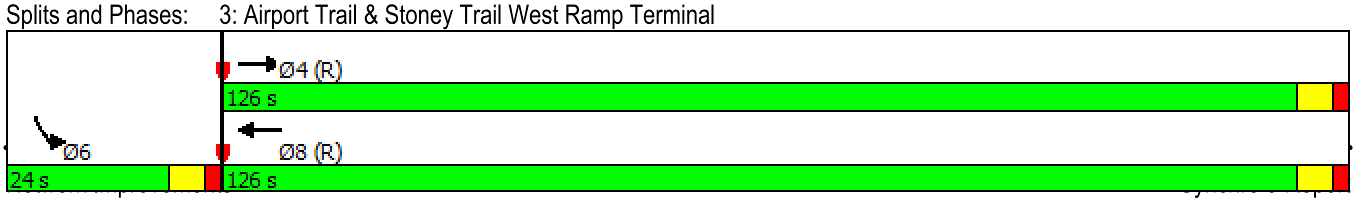
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1606	3991	0	120	0
Future Volume (vph)	0	1606	3991	0	120	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4863	4863	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4863	4863	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		80	80		50	
Link Distance (m)		1057.6	470.1		295.9	
Travel Time (s)		47.6	21.2		21.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1746	4338	0	130	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1746	4338	0	130	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		126.0	126.0		24.0	
Total Split (%)		84.0%	84.0%		16.0%	
Maximum Green (s)		120.0	120.0		18.0	
Yellow Time (s)		4.0	4.0		4.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		126.4	126.4		11.6	
Actuated g/C Ratio		0.84	0.84		0.08	
v/c Ratio		0.43	1.06		0.52	
Control Delay		3.3	46.3		73.7	
Queue Delay		0.0	0.0		0.0	
Total Delay		3.3	46.3		73.7	
LOS		A	D		E	
Approach Delay		3.3	46.3		73.7	
Approach LOS		A	D		E	
Queue Length 50th (m)		36.1	~515.2		19.5	
Queue Length 95th (m)		48.0	#536.8		30.0	
Internal Link Dist (m)		1033.6	446.1		271.9	
Turn Bay Length (m)						
Base Capacity (vph)		4099	4099		393	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.43	1.06		0.33	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 97.5% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Airport Trail & Stoney Trail West Ramp Terminal



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1726	0	0	3211	780	0
Future Volume (vph)	1726	0	0	3211	780	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4863	0	0	4863	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4863	0	0	4863	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	80			80	50	
Link Distance (m)	470.1			907.6	226.7	
Travel Time (s)	21.2			40.8	16.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1876	0	0	3490	848	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1876	0	0	3490	848	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	101.0			101.0	39.0	
Total Split (%)	72.1%			72.1%	27.9%	
Maximum Green (s)	95.0			95.0	33.0	
Yellow Time (s)	4.0			4.0	4.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	95.0			95.0	33.0	
Actuated g/C Ratio	0.68			0.68	0.24	
v/c Ratio	0.57			1.06	1.10	
Control Delay	12.6			56.9	111.2	
Queue Delay	0.0			0.0	0.0	
Total Delay	12.6			56.9	111.2	
LOS	B			E	F	
Approach Delay	12.6			56.9	111.2	
Approach LOS	B			E	F	
Queue Length 50th (m)	92.1			~387.1	~136.5	
Queue Length 95th (m)	103.5			#407.1	#176.1	
Internal Link Dist (m)	446.1			883.6	202.7	
Turn Bay Length (m)						
Base Capacity (vph)	3299			3299	773	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.57			1.06	1.10	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 51.0 Intersection LOS: D
Intersection Capacity Utilization 97.5% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Stoney Trail East Ramp Terminal & Airport Trail

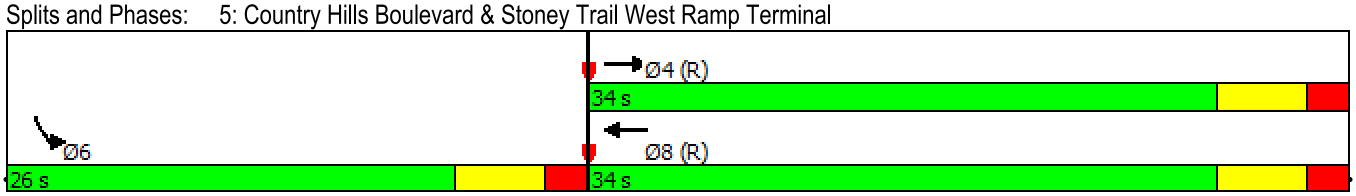
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1151	1807	0	910	0
Future Volume (vph)	0	1151	1807	0	910	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4642	4642	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4642	4642	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		854.2	450.4		250.2	
Travel Time (s)		43.9	23.2		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	10%	10%	5%	5%	5%
Adj. Flow (vph)	0	1251	1964	0	989	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1251	1964	0	989	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		34.0	34.0		26.0	
Total Split (%)		56.7%	56.7%		43.3%	
Maximum Green (s)		28.0	28.0		20.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		28.3	28.3		19.7	
Actuated g/C Ratio		0.47	0.47		0.33	
v/c Ratio		0.57	0.90		0.92	
Control Delay		12.8	22.0		34.7	
Queue Delay		0.0	0.0		0.0	
Total Delay		12.8	22.0		34.7	
LOS		B	C		C	
Approach Delay		12.8	22.0		34.7	
Approach LOS		B	C		C	
Queue Length 50th (m)		34.5	68.5		52.3	
Queue Length 95th (m)		46.0	#103.4		#85.8	
Internal Link Dist (m)		830.2	426.4		226.2	
Turn Bay Length (m)						
Base Capacity (vph)		2189	2189		1094	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.57	0.90		0.90	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 22.3 Intersection LOS: C
Intersection Capacity Utilization 72.5% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Country Hills Boulevard & Stoney Trail West Ramp Terminal



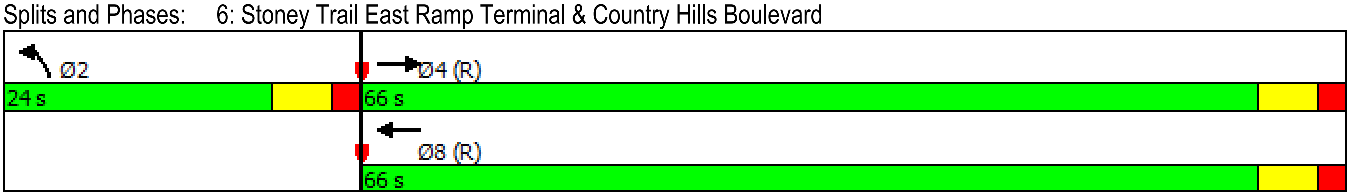
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1971	0	0	1508	409	0
Future Volume (vph)	1971	0	0	1508	409	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4642	0	0	4642	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4642	0	0	4642	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	450.4			1152.6	205.8	
Travel Time (s)	23.2			59.3	14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	5%	5%	10%	5%	5%
Adj. Flow (vph)	2142	0	0	1639	445	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2142	0	0	1639	445	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	66.0			66.0	24.0	
Total Split (%)	73.3%			73.3%	26.7%	
Maximum Green (s)	60.0			60.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	61.5			61.5	16.5	
Actuated g/C Ratio	0.68			0.68	0.18	
v/c Ratio	0.68			0.52	0.74	
Control Delay	10.1			8.0	42.4	
Queue Delay	0.0			0.0	0.0	
Total Delay	10.1			8.0	42.4	
LOS	B			A	D	
Approach Delay	10.1			8.0	42.4	
Approach LOS	B			A	D	
Queue Length 50th (m)	71.1			45.3	37.5	
Queue Length 95th (m)	92.3			59.1	51.9	
Internal Link Dist (m)	426.4			1128.6	181.8	
Turn Bay Length (m)						
Base Capacity (vph)	3187			3187	668	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.67			0.51	0.67	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 12.7 — Intersection LOS: B
Intersection Capacity Utilization 72.5% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: Stoney Trail East Ramp Terminal & Country Hills Boulevard



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1177	1043	77	1304	88	2150	28	177	8	10	46
Future Volume (vph)	100	1177	1043	77	1304	88	2150	28	177	8	10	46
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		2	1		1	3		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.91	0.88	1.00	0.91	1.00	0.94	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1615	4642	2544	1615	4642	1445	4773	3385	1514	1692	3385	1514
Flt Permitted	0.110			0.140			0.950			0.950		
Satd. Flow (perm)	187	4642	2544	238	4642	1445	4773	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			787			109			74			109
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		1152.6			933.1			736.9			712.6	
Travel Time (s)		59.3			48.0			44.2			42.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	109	1279	1134	84	1417	96	2337	30	192	9	11	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	109	1279	1134	84	1417	96	2337	30	192	9	11	50
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	72.0	72.0	72.0	72.0	72.0	72.0	53.0	67.0	67.0	11.0	25.0	25.0
Total Split (%)	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	35.3%	44.7%	44.7%	7.3%	16.7%	16.7%
Maximum Green (s)	66.0	66.0	66.0	66.0	66.0	66.0	47.0	61.0	61.0	5.0	19.0	19.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)	66.2	66.2	66.2	66.2	66.2	66.2	47.1	57.5	57.5	5.0	10.0	10.0
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48	0.48	0.34	0.42	0.42	0.04	0.07	0.07
v/c Ratio	1.22	0.57	0.70	0.74	0.64	0.13	1.43	0.02	0.28	0.15	0.04	0.24
Control Delay	201.2	27.6	10.4	69.4	29.0	3.1	232.8	24.7	17.6	71.4	61.6	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	201.2	27.6	10.4	69.4	29.0	3.1	232.8	24.7	17.6	71.4	61.6	2.6
LOS	F	C	B	E	C	A	F	C	B	E	E	A
Approach Delay		27.3			29.6			214.2			20.7	
Approach LOS		C			C			F			C	
Queue Length 50th (m)	~37.8	94.3	41.7	18.9	108.8	0.0	~316.3	2.4	19.5	2.5	1.5	0.0
Queue Length 95th (m)	#76.5	108.9	69.1	#51.1	125.0	7.6	#342.5	6.4	42.2	8.7	4.8	0.0
Internal Link Dist (m)		1128.6			909.1			712.9			688.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	89	2228	1630	114	2228	750	1632	1530	725	61	468	303
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.22	0.57	0.70	0.74	0.64	0.13	1.43	0.02	0.26	0.15	0.02	0.17

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 137.8

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.43

Intersection Signal Delay: 98.7 Intersection LOS: F

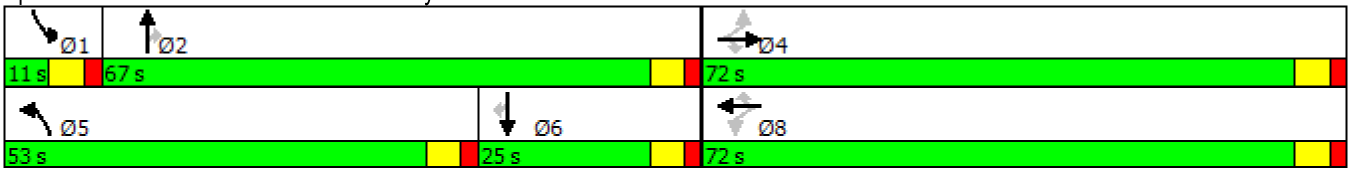
Intersection Capacity Utilization 106.2% ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: 84 Street & Country Hills Boulevard



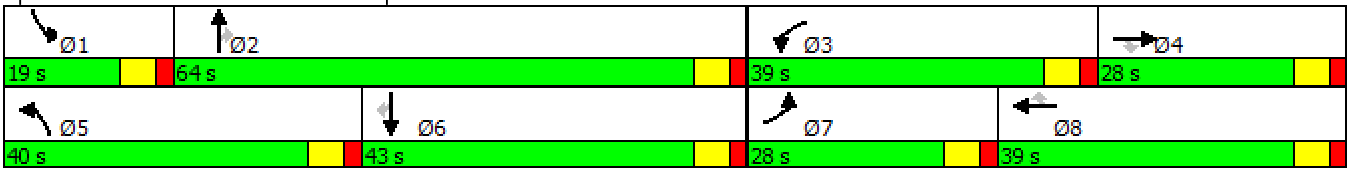
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	781	618	860	1241	1457	814	1861	1083	836	243	1110	900
Future Volume (vph)	781	618	860	1241	1457	814	1861	1083	836	243	1110	900
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		2	2		2	3		2	2		2
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	0.88	0.97	0.91	0.88	0.94	0.95	0.88	0.97	0.95	0.88
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			585			305			436			372
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		907.6			1213.9			932.6			893.6	
Travel Time (s)		40.8			54.6			56.0			53.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	849	672	935	1349	1584	885	2023	1177	909	264	1207	978
Shared Lane Traffic (%)												
Lane Group Flow (vph)	849	672	935	1349	1584	885	2023	1177	909	264	1207	978
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	28.0	28.0	28.0	39.0	39.0	39.0	40.0	64.0	64.0	19.0	43.0	43.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	18.7%	18.7%	18.7%	26.0%	26.0%	26.0%	26.7%	42.7%	42.7%	12.7%	28.7%	28.7%
Maximum Green (s)	22.0	22.0	22.0	33.0	33.0	33.0	34.0	58.0	58.0	13.0	37.0	37.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	22.0	22.0	22.0	33.0	33.0	33.0	34.0	58.0	58.0	13.0	37.0	37.0
Actuated g/C Ratio	0.15	0.15	0.15	0.22	0.22	0.22	0.23	0.39	0.39	0.09	0.25	0.25
v/c Ratio	1.77	0.94	1.05	1.87	1.48	1.07	1.87	0.90	0.70	0.93	1.45	1.04
Control Delay	388.0	85.2	66.6	427.8	261.6	88.6	427.2	53.6	22.3	105.2	247.8	74.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	388.0	85.2	66.6	427.8	261.6	88.6	427.2	53.6	22.3	105.2	247.8	74.8
LOS	F	F	E	F	F	F	F	D	C	F	F	E
Approach Delay		182.8			280.2			230.6			163.3	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~193.3	73.5	~82.0	~314.0	~236.9	~123.1	~324.0	172.4	69.2	40.9	~256.2	~128.1
Queue Length 95th (m)	#233.7	#98.5	#127.5	#355.9	#266.5	#168.6	#351.2	203.8	96.3	#67.9	#298.7	#173.9
Internal Link Dist (m)		883.6			1189.9			908.6			869.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	481	713	890	722	1069	824	1081	1308	1297	284	834	937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.77	0.94	1.05	1.87	1.48	1.07	1.87	0.90	0.70	0.93	1.45	1.04

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.87
Intersection Signal Delay: 223.4 Intersection LOS: F
Intersection Capacity Utilization 139.7% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 84 Street & Airport Trail



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	697	116	311	65	301	176	791	2726	99	31	2428	824
Future Volume (vph)	697	116	311	65	301	176	791	2726	99	31	2428	824
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			201			196			153			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		3331.9			1417.4			673.7			487.6	
Travel Time (s)		171.4			72.9			40.4			29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	758	126	338	71	327	191	860	2963	108	34	2639	896
Shared Lane Traffic (%)												
Lane Group Flow (vph)	758	126	338	71	327	191	860	2963	108	34	2639	896
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1
Trailing Detector (m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Position(m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Size(m)	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	25.0	34.0	34.0	15.0	24.0	24.0	27.0	90.0	90.0	11.0	74.0	74.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	16.7%	22.7%	22.7%	10.0%	16.0%	16.0%	18.0%	60.0%	60.0%	7.3%	49.3%	49.3%
Maximum Green (s)	19.0	28.0	28.0	9.0	18.0	18.0	21.0	84.0	84.0	5.0	68.0	68.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	19.0	27.7	27.7	8.7	17.4	17.4	21.0	86.3	86.3	5.0	68.0	68.0
Actuated g/C Ratio	0.13	0.19	0.19	0.06	0.12	0.12	0.14	0.58	0.58	0.03	0.46	0.46
v/c Ratio	1.82	0.20	0.76	0.72	0.83	0.55	1.87	1.52	0.12	0.61	1.71	1.11
Control Delay	412.3	52.5	35.0	106.1	82.7	13.3	431.1	262.2	0.8	111.0	352.1	96.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	412.3	52.5	35.0	106.1	82.7	13.3	431.1	262.2	0.8	111.0	352.1	96.6
LOS	F	D	C	F	F	B	F	F	A	F	F	F
Approach Delay		270.8			63.0			292.0			285.7	
Approach LOS		F			E			F			F	
Queue Length 50th (m)	~174.8	16.8	40.0	21.1	50.6	0.0	~200.3	~654.0	0.0	10.2	~607.4	~268.2
Queue Length 95th (m)	#214.2	26.5	77.7	#45.8	#72.3	21.6	#240.3	#686.1	2.6	#27.6	#642.8	#347.6
Internal Link Dist (m)		3307.9			1393.4			649.7			463.6	
Turn Bay Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Base Capacity (vph)	417	634	447	101	408	355	461	1954	939	56	1540	806
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.82	0.20	0.76	0.70	0.80	0.54	1.87	1.52	0.12	0.61	1.71	1.11

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 149.4
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.87
Intersection Signal Delay: 272.3 Intersection LOS: F
Intersection Capacity Utilization 141.1% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 84 Street & 64 Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2516	1909	378	259	1714	579	473	370	143	384	144	2767
Future Volume (vph)	2516	1909	378	259	1714	579	473	370	143	384	144	2767
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			160			206			196			497
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		978.3			924.1			716.9			299.4	
Travel Time (s)		50.3			47.5			43.0			18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	20%	20%	20%	20%	20%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	2735	2075	411	282	1863	629	514	402	155	417	157	3008
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2735	2075	411	282	1863	629	514	402	155	417	157	3008
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	43.0	64.0	64.0	13.0	34.0	34.0	15.0	40.0	40.0	33.0	58.0	58.0
Total Split (%)	28.7%	42.7%	42.7%	8.7%	22.7%	22.7%	10.0%	26.7%	26.7%	22.0%	38.7%	38.7%
Maximum Green (s)	37.0	58.0	58.0	7.0	28.0	28.0	9.0	34.0	34.0	27.0	52.0	52.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	37.0	58.0	58.0	7.0	28.0	28.0	9.0	37.5	37.5	23.5	52.0	52.0
Actuated g/C Ratio	0.25	0.39	0.39	0.05	0.19	0.19	0.06	0.25	0.25	0.16	0.35	0.35
v/c Ratio	3.86	1.26	0.67	2.10	2.35	1.52	2.62	0.48	0.30	0.81	0.13	3.54
Control Delay	1307.1	161.4	28.7	552.5	635.5	272.5	769.1	50.8	3.6	73.9	34.0	1161.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1307.1	161.4	28.7	552.5	635.5	272.5	769.1	50.8	3.6	73.9	34.0	1161.1
LOS	F	F	C	F	F	F	F	D	A	E	C	F
Approach Delay		751.1			544.8			388.7			985.1	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~756.7	~282.8	63.1	~68.3	~331.0	~208.7	~132.0	54.3	0.0	62.3	16.8	~1508.1
Queue Length 95th (m)	#790.1	#310.6	103.0	#97.8	#359.7	#283.1	#167.9	73.0	8.1	79.3	25.4	#1568.8
Internal Link Dist (m)		954.3			900.1			692.9			275.4	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	708	1645	610	134	794	414	196	845	525	590	1173	849
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	3.86	1.26	0.67	2.10	2.35	1.52	2.62	0.48	0.30	0.71	0.13	3.54

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 150

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 3.86

Intersection Signal Delay: 741.4 — Intersection LOS: F

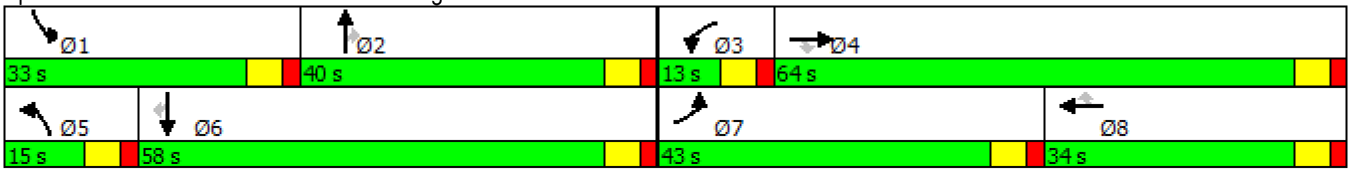
Intersection Capacity Utilization 238.8% — ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

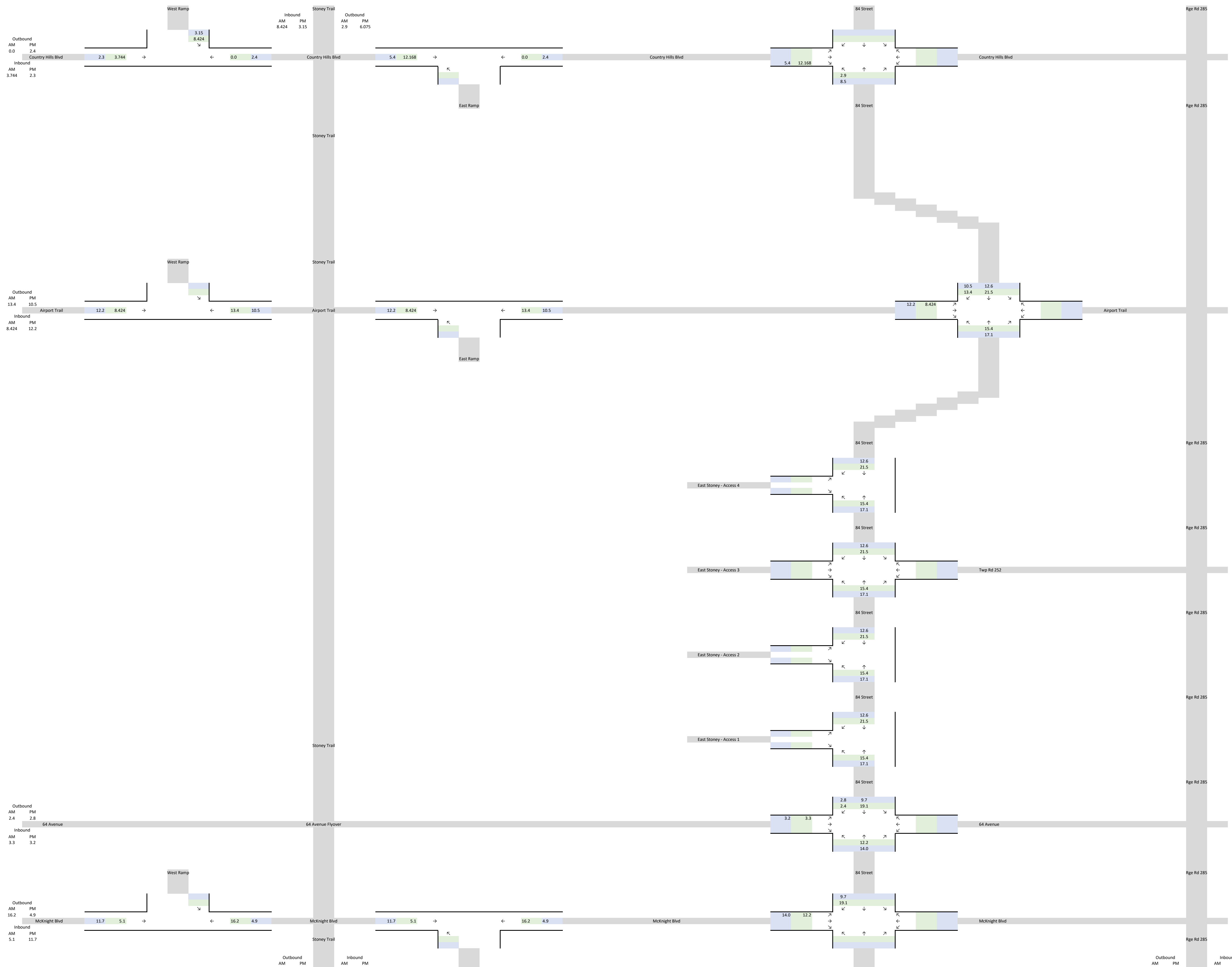
Splits and Phases: 11: 84 Street & McKnight Boulevard



Appendix F

Forecast & Analysis for 30% Scenario

Highway Commercial (Zone 1) - Primary Trip Assignment (30% Scenario)



Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
94.5	46.8	47.7	85.5	45	40.5

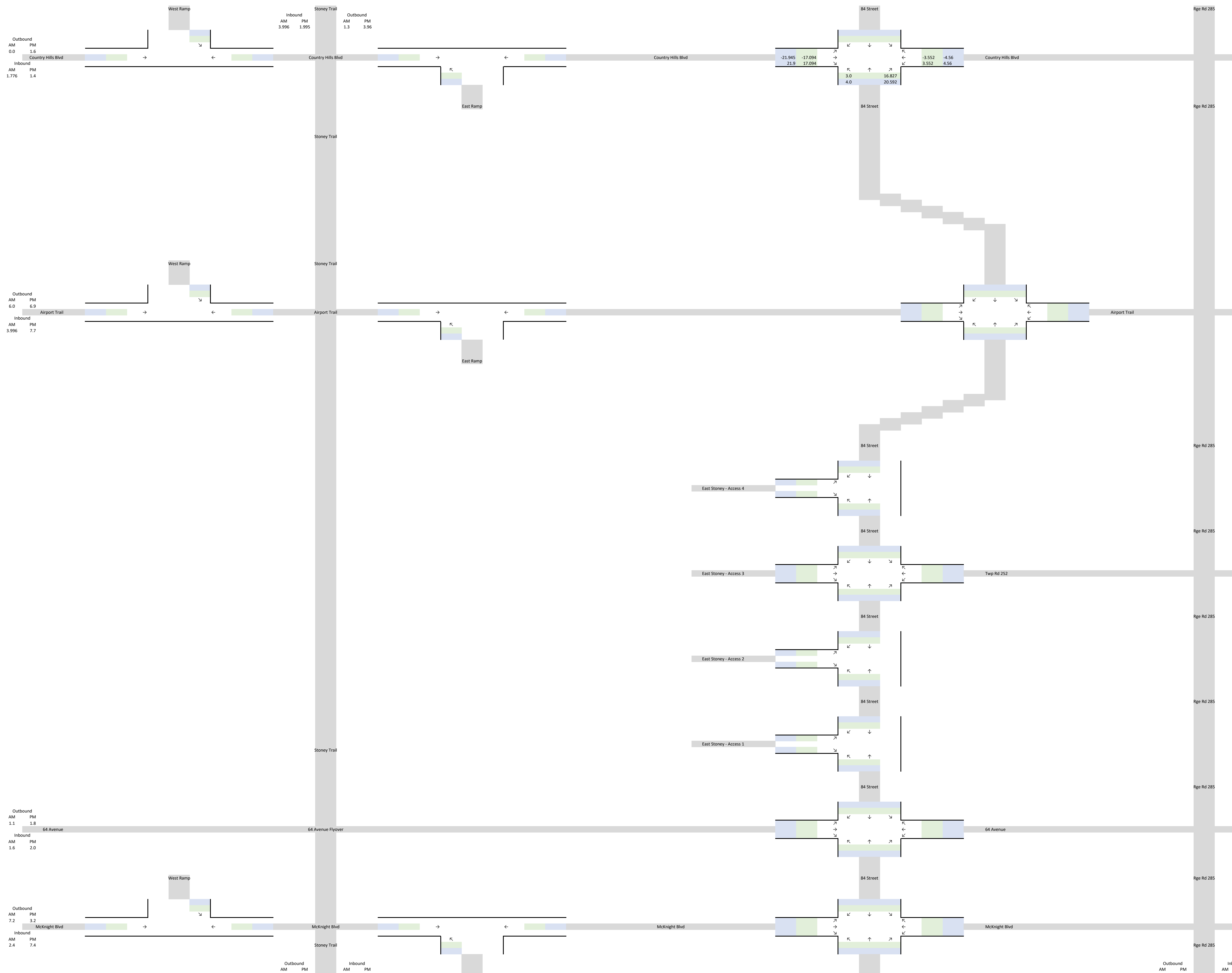
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
94.5	46.8	47.7	85.5	45.0	40.5

Highway Commercial (Zone 1) - Pass-By Trip Assignment (30% Scenario)



Pass-By Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
43.5	22.2	21.3	54.9	28.5	26.4

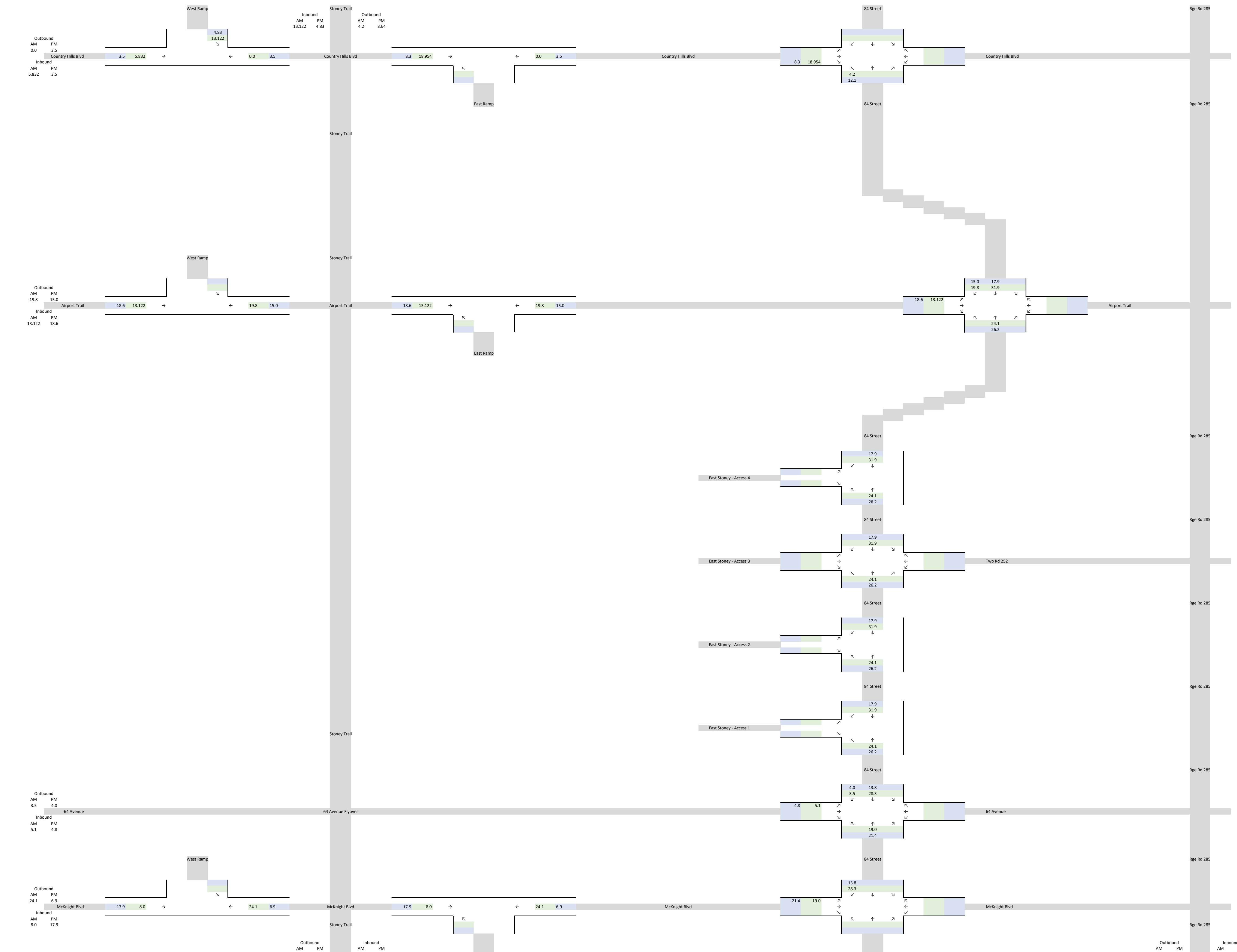
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
43.5	22.2	21.3	54.9	28.5	26.4

Highway Commercial (Zone 2) - Primary Trip Assignment (30% Scenario)



% Development: 30%

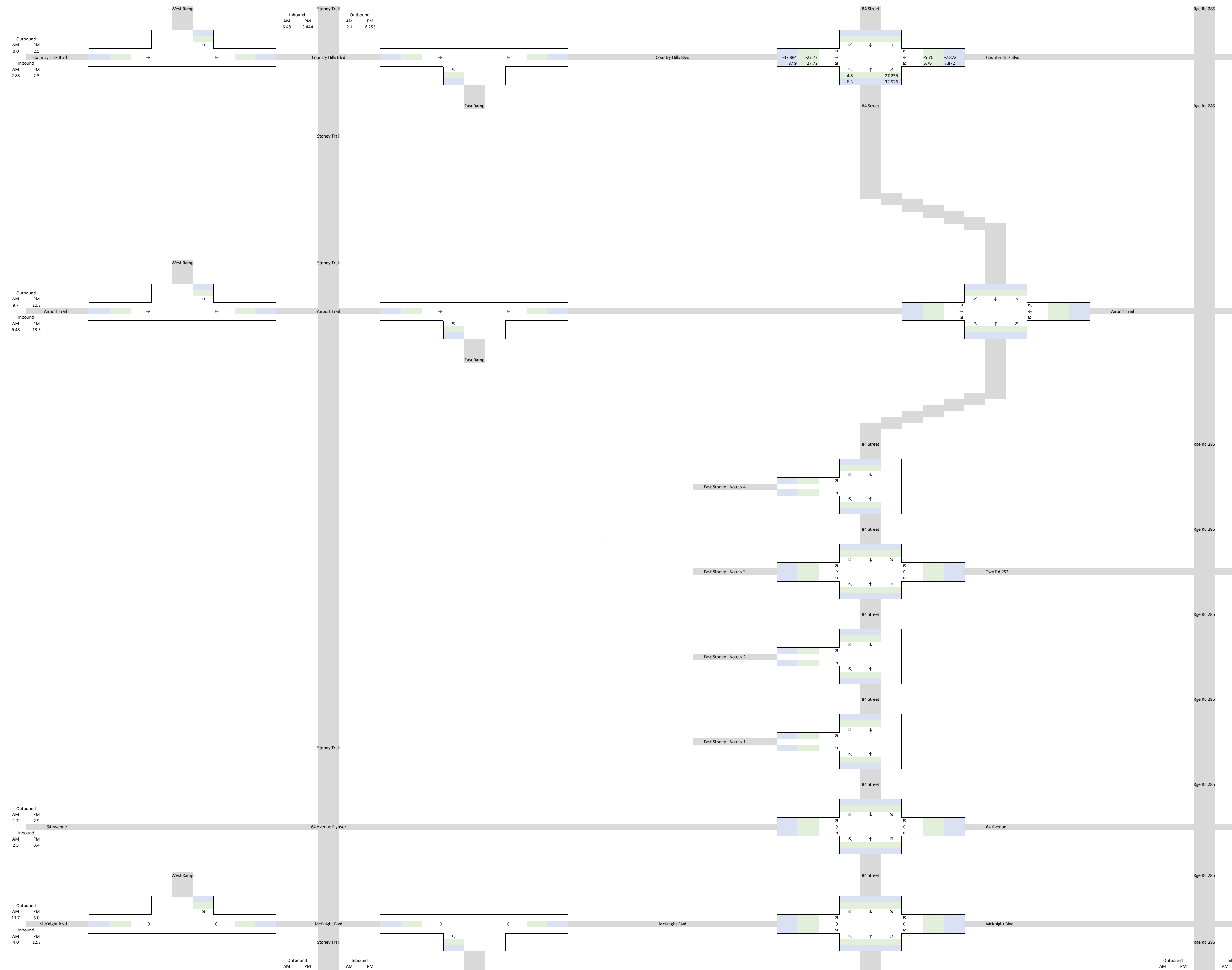
Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
143.7	72.9	70.8	126.6	69	57.6

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
143.7	72.9	70.8	126.6	69.0	57.6

Highway Commercial (Zone 2) - Pass-By Trip Assignment (30% Scenario)



Pass-By Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
70.5	36	34.5	90.9	49.2	41.7

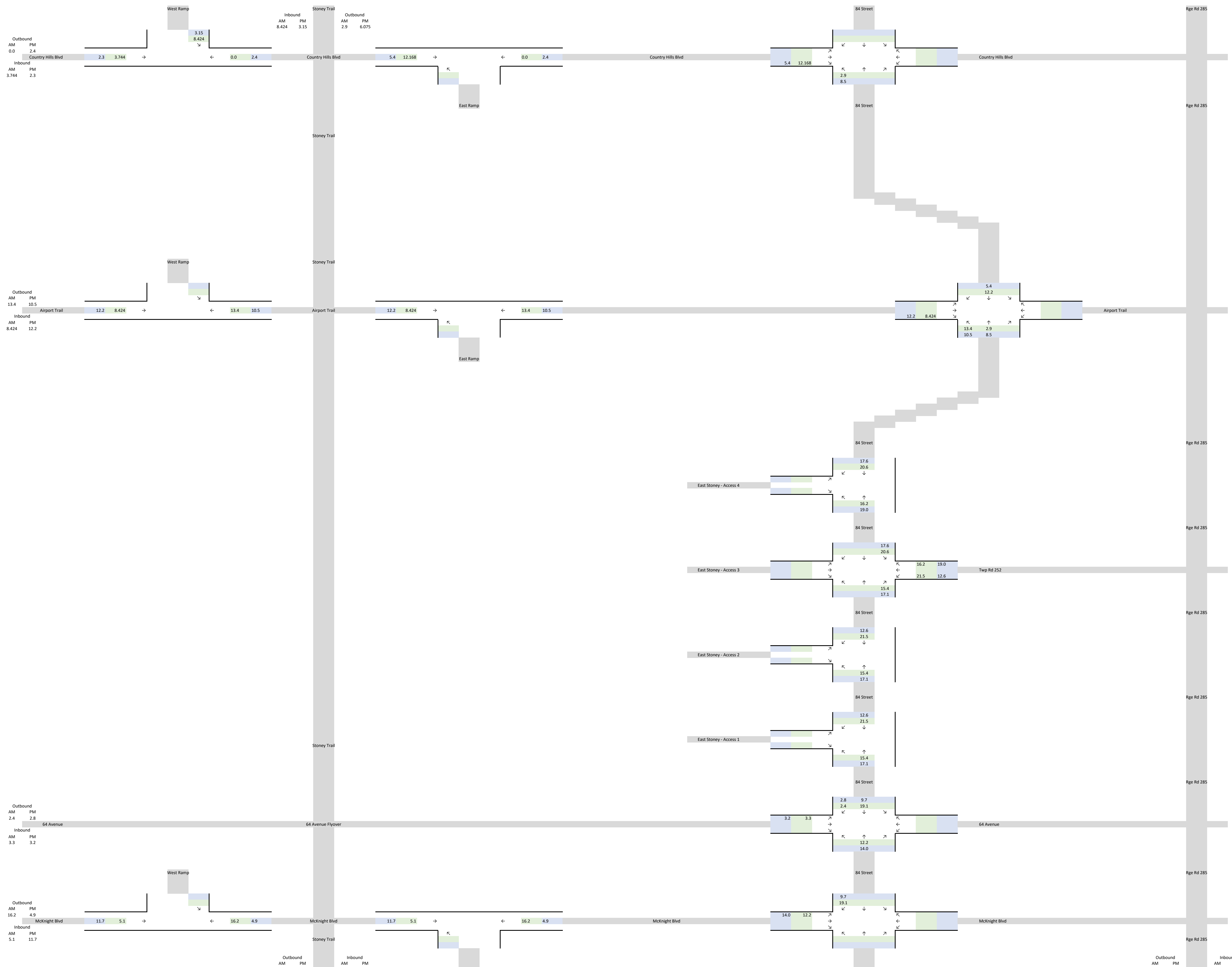
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
70.5	36.0	34.5	90.9	49.2	41.7

Highway Commercial (Zone 3) - Primary Trip Assignment (30% Scenario)



Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
94.5	46.8	47.7	85.5	45	40.5

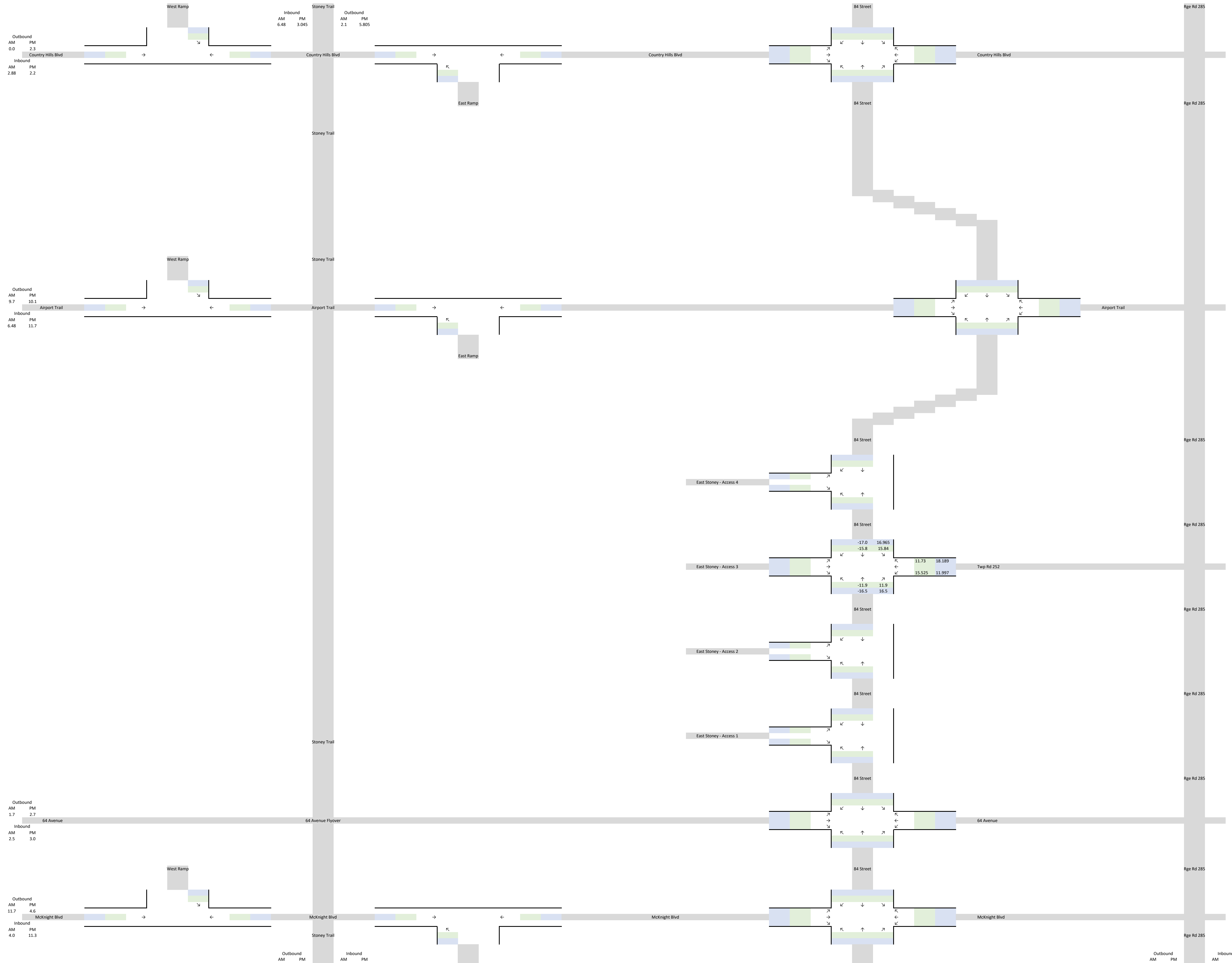
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
94.5	46.8	47.7	85.5	45.0	40.5

Highway Commercial (Zone 3) - Pass-By Trip Assignment (30% Scenario)



Pass-By Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
70.5	36	34.5	82.2	43.5	38.7

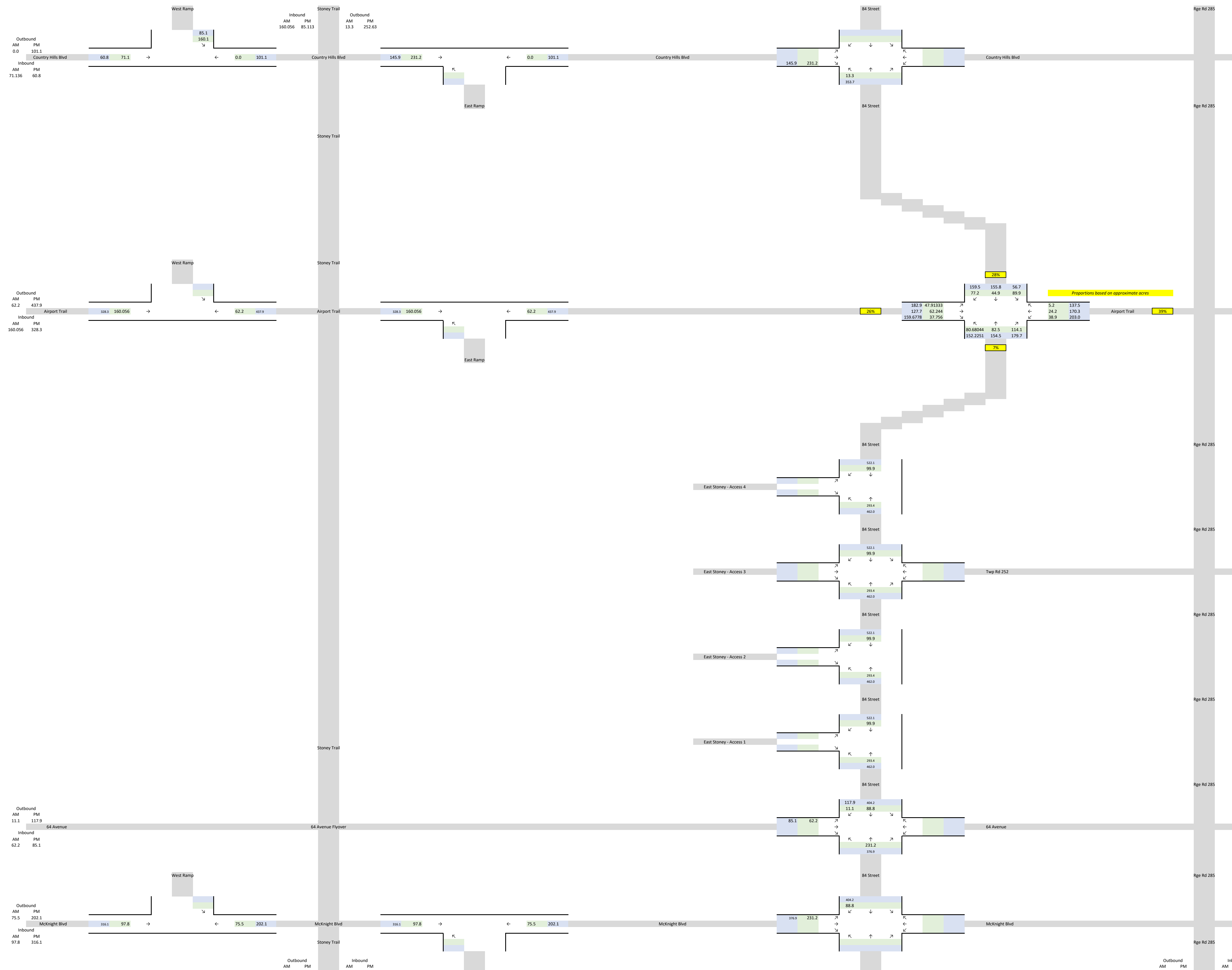
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
70.5	36.0	34.5	82.2	43.5	38.7

Destination Commercial - Primary Trip Assignment (30% Scenario)



Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
1111.2	889.2	222	2900.1	1215.9	1684.2

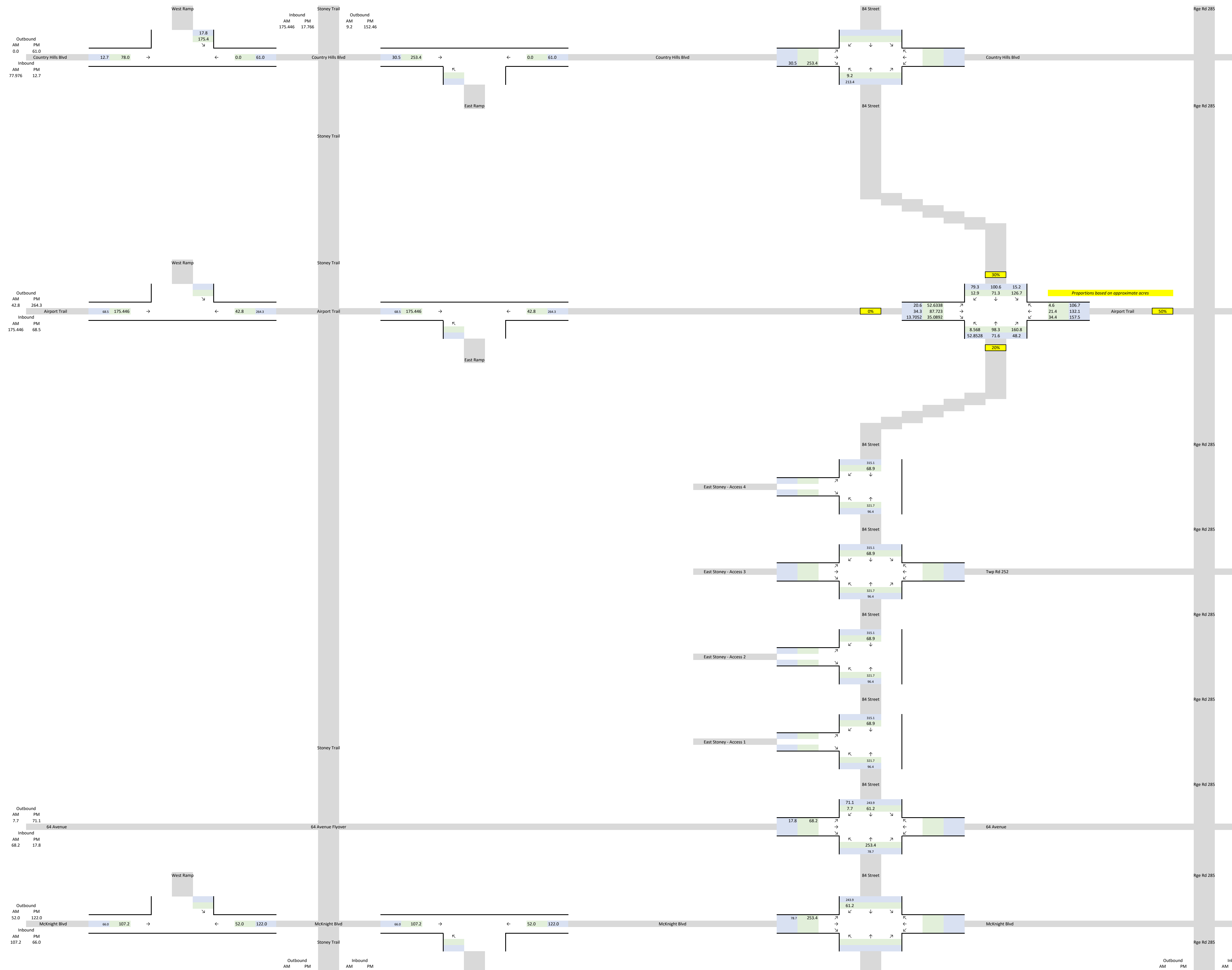
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
1111.2	889.2	222.0	2900.1	1215.9	1684.2

Industrial - Primary Trip Assignment (30% Scenario)



Primary Trips					
A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
1127.7	974.7	153	1270.2	253.8	1016.4

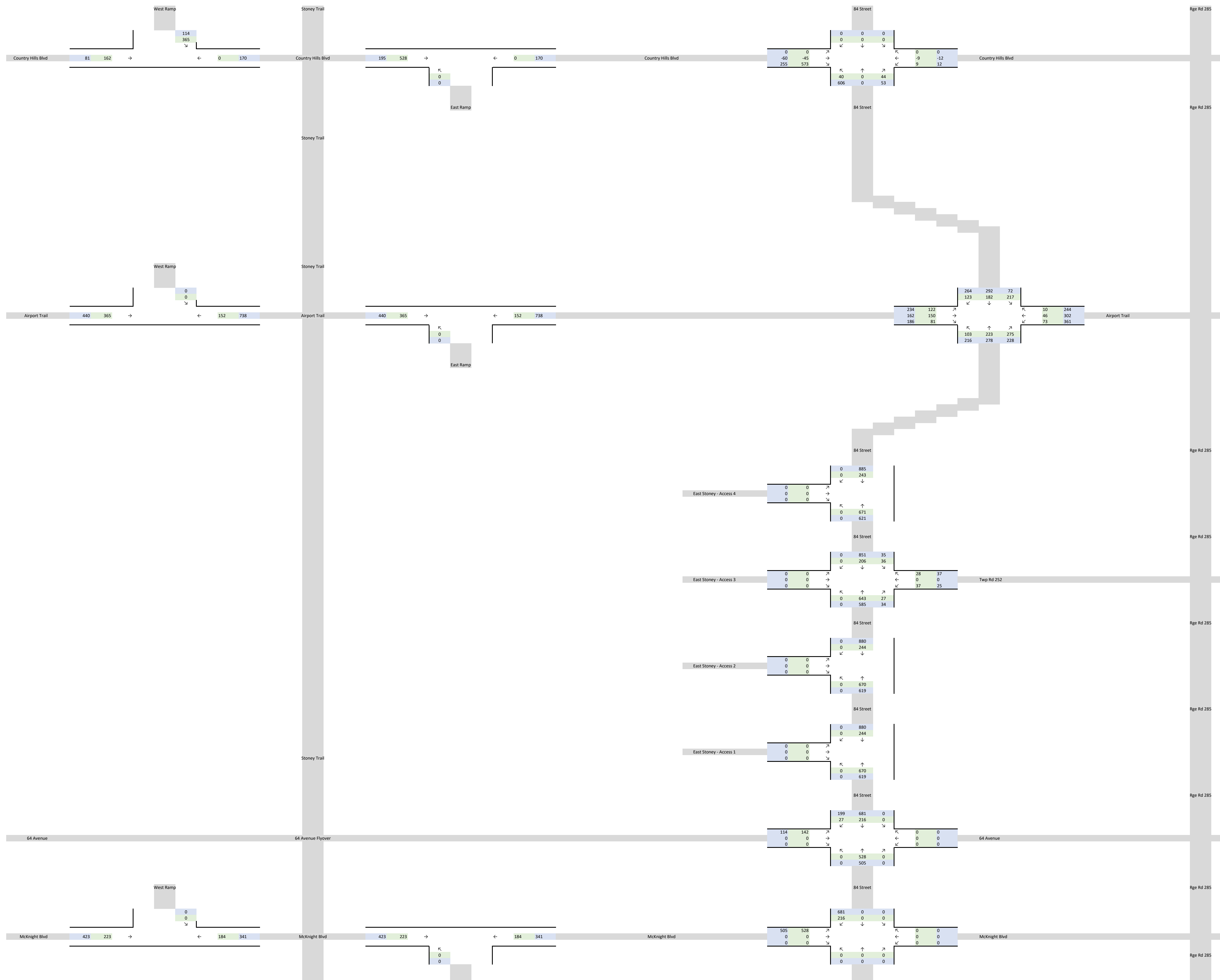
% Development: 30%

Direction and Route	Distribution			
	A.M.		P.M.	
	In	Out	In	Out
Stoney Trail North via Country Hills	18%	6%	7%	15%
West via Country Hills	8%	0%	5%	6%
West via Airport Trail	18%	28%	27%	26%
West via 64th Ave	7%	5%	7%	7%
West via McKnight	11%	34%	26%	12%
East via 16th Ave E	7%	3%	3%	7%
Stoney Trail South via McKnight	15%	6%	5%	12%
Conrich	3%	3%	3%	3%
East Stoney	4%	4%	4%	4%
Chestermere via Range Rd 285	5%	3%	5%	4%
Belvedere via Range Rd 285	4%	8%	8%	4%
TOTAL	100%	100%	100%	100%

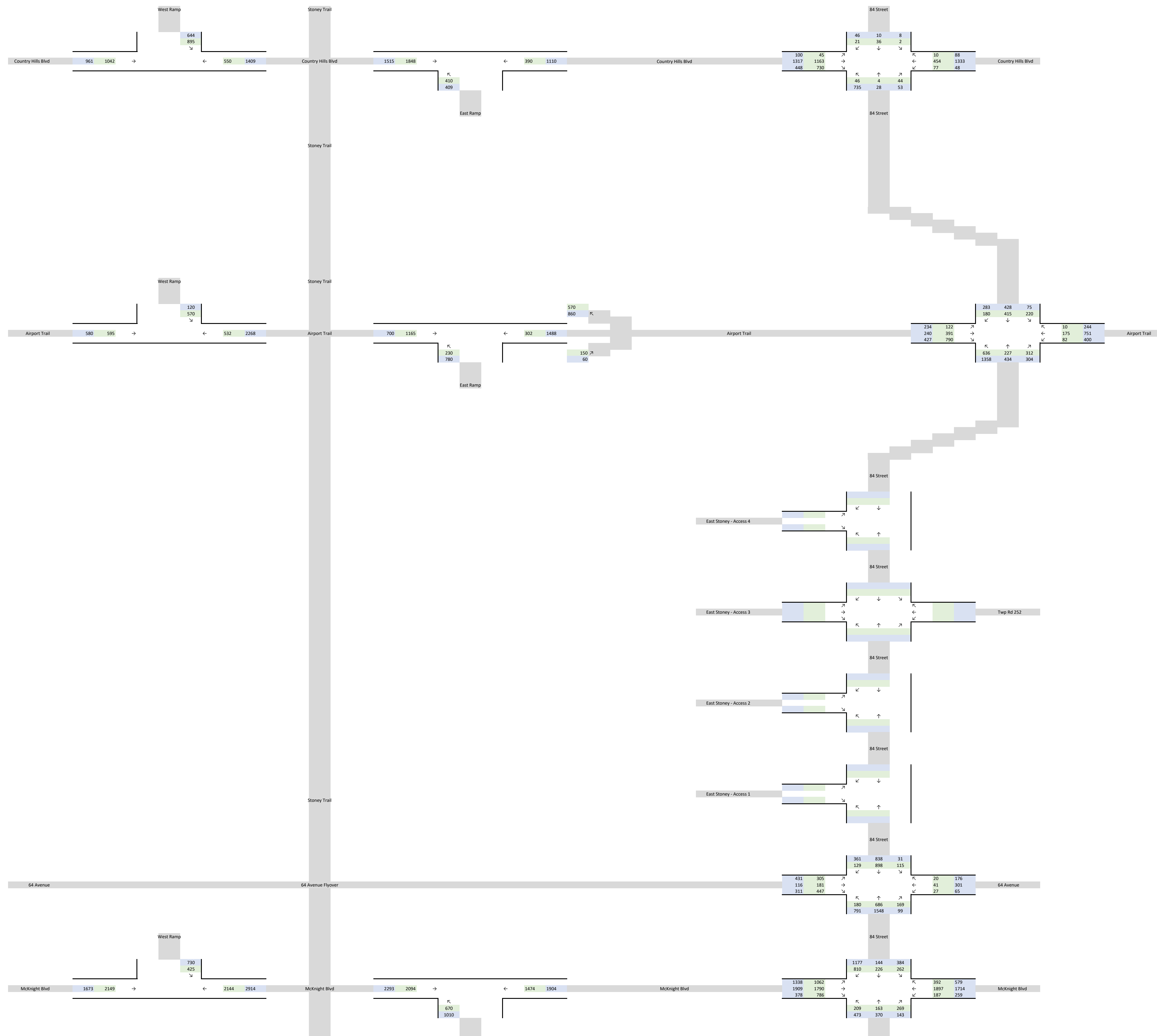
Check:

A.M. Peak			P.M. Peak		
TTL	IB	OB	TTL	IB	OB
1127.7	974.7	153.0	1270.2	253.8	1016.4

Total Trip Assignment (30% Scenario)



Post-Development Traffic Volumes (30% Scenario)



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1673	2914	0	730	0
Future Volume (vph)	0	1673	2914	0	730	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4256	4256	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4256	4256	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		781.0	409.9		174.4	
Travel Time (s)		40.2	21.1		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	20%	20%	5%	5%	5%
Adj. Flow (vph)	0	1818	3167	0	793	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1818	3167	0	793	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		95.0	95.0		35.0	
Total Split (%)		73.1%	73.1%		26.9%	
Maximum Green (s)		89.0	89.0		29.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		89.0	89.0		29.0	
Actuated g/C Ratio		0.68	0.68		0.22	
v/c Ratio		0.62	1.09		1.08	
Control Delay		12.5	60.8		105.3	
Queue Delay		0.0	0.0		0.0	
Total Delay		12.5	60.8		105.3	
LOS		B	E		F	
Approach Delay		12.5	60.8		105.3	
Approach LOS		B	E		F	
Queue Length 50th (m)		85.9	~337.7		~117.1	
Queue Length 95th (m)		99.1	m#341.2		#155.5	
Internal Link Dist (m)		757.0	385.9		150.4	
Turn Bay Length (m)						
Base Capacity (vph)		2913	2913		732	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.62	1.09		1.08	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 51.7 Intersection LOS: D
Intersection Capacity Utilization 89.2% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: McKnight Boulevard & Stoney Trail West Ramp Terminal

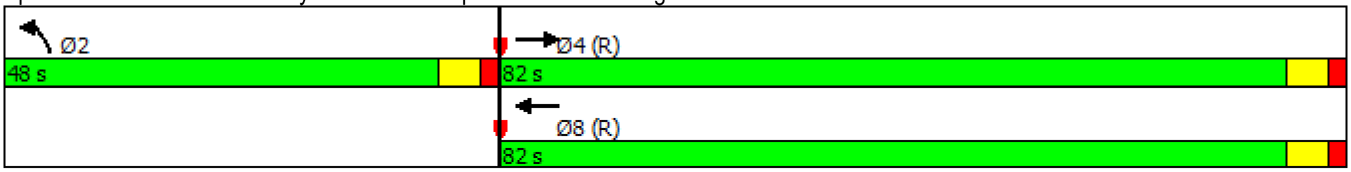
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑	↰↰	
Traffic Volume (vph)	2293	0	0	1904	1010	0
Future Volume (vph)	2293	0	0	1904	1010	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4256	0	0	4256	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4256	0	0	4256	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	409.9			978.3	151.6	
Travel Time (s)	21.1			50.3	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	5%	5%	20%	5%	5%
Adj. Flow (vph)	2492	0	0	2070	1098	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2492	0	0	2070	1098	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	82.0			82.0	48.0	
Total Split (%)	63.1%			63.1%	36.9%	
Maximum Green (s)	76.0			76.0	42.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	76.0			76.0	42.0	
Actuated g/C Ratio	0.58			0.58	0.32	
v/c Ratio	1.00			0.83	1.04	
Control Delay	37.3			25.7	80.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	37.3			25.7	80.3	
LOS	D			C	F	
Approach Delay	37.3			25.7	80.3	
Approach LOS	D			C	F	
Queue Length 50th (m)	~238.3			149.7	~155.7	
Queue Length 95th (m)	m#253.6			172.1	#196.5	
Internal Link Dist (m)	385.9			954.3	127.6	
Turn Bay Length (m)						
Base Capacity (vph)	2488			2488	1060	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	1.00			0.83	1.04	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 41.4 Intersection LOS: D
Intersection Capacity Utilization 89.2% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Stoney Trail East Ramp Terminal & McKnight Boulevard

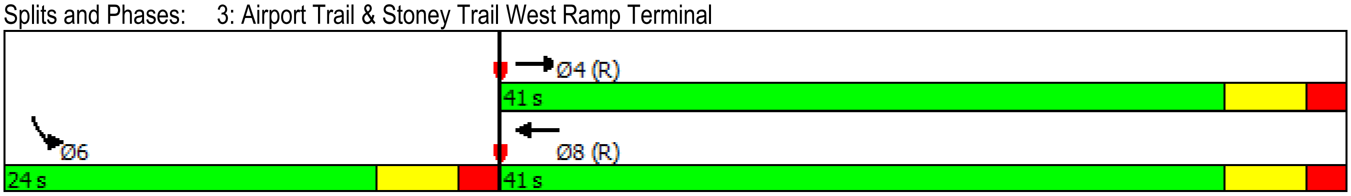


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	580	2268	0	120	0
Future Volume (vph)	0	580	2268	0	120	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4863	4863	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4863	4863	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		80	80		50	
Link Distance (m)		1057.6	470.1		295.9	
Travel Time (s)		47.6	21.2		21.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	630	2465	0	130	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	630	2465	0	130	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		41.0	41.0		24.0	
Total Split (%)		63.1%	63.1%		36.9%	
Maximum Green (s)		35.0	35.0		18.0	
Yellow Time (s)		4.0	4.0		4.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		47.4	47.4		10.0	
Actuated g/C Ratio		0.73	0.73		0.15	
v/c Ratio		0.18	0.70		0.26	
Control Delay		3.9	8.0		25.8	
Queue Delay		0.0	0.0		0.0	
Total Delay		3.9	8.0		25.8	
LOS		A	A		C	
Approach Delay		3.9	8.0		25.8	
Approach LOS		A	A		C	
Queue Length 50th (m)		8.9	62.0		7.2	
Queue Length 95th (m)		12.6	79.4		13.9	
Internal Link Dist (m)		1033.6	446.1		271.9	
Turn Bay Length (m)						
Base Capacity (vph)		3546	3546		909	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.18	0.70		0.14	

Intersection Summary	
Area Type: Other	
Cycle Length: 65	
Actuated Cycle Length: 65	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 63.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Airport Trail & Stoney Trail West Ramp Terminal



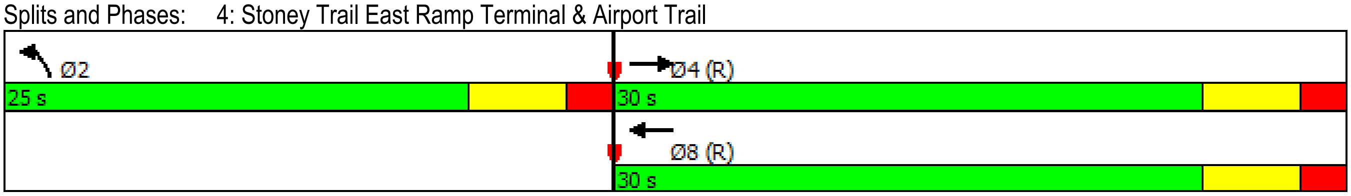
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	700	0	0	1488	780	0
Future Volume (vph)	700	0	0	1488	780	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4863	0	0	4863	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4863	0	0	4863	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	80			80	50	
Link Distance (m)	470.1			907.6	226.7	
Travel Time (s)	21.2			40.8	16.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	761	0	0	1617	848	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	761	0	0	1617	848	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	30.0			30.0	25.0	
Total Split (%)	54.5%			54.5%	45.5%	
Maximum Green (s)	24.0			24.0	19.0	
Yellow Time (s)	4.0			4.0	4.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	25.4			25.4	17.6	
Actuated g/C Ratio	0.46			0.46	0.32	
v/c Ratio	0.34			0.72	0.81	
Control Delay	10.4			14.7	23.8	
Queue Delay	0.0			0.0	0.0	
Total Delay	10.4			14.7	23.8	
LOS	B			B	C	
Approach Delay	10.4			14.7	23.8	
Approach LOS	B			B	C	
Queue Length 50th (m)	17.4			46.8	37.3	
Queue Length 95th (m)	24.7			62.3	55.0	
Internal Link Dist (m)	446.1			883.6	202.7	
Turn Bay Length (m)						
Base Capacity (vph)	2242			2242	1134	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.34			0.72	0.75	

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 16.1 Intersection LOS: B
Intersection Capacity Utilization 63.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Stoney Trail East Ramp Terminal & Airport Trail



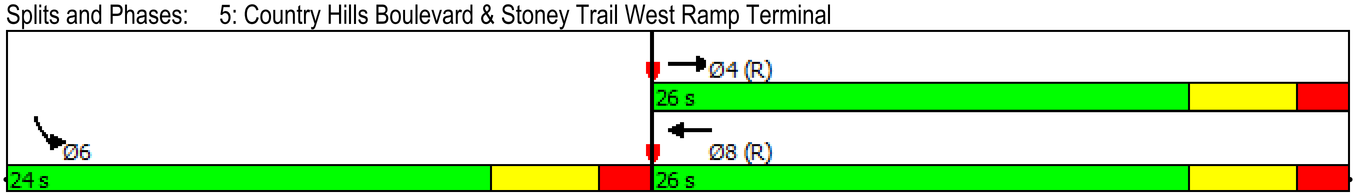
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	961	1409	0	644	0
Future Volume (vph)	0	961	1409	0	644	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	4642	4642	0	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	4642	4642	0	3283	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (k/h)		70	70		50	
Link Distance (m)		854.2	450.4		250.2	
Travel Time (s)		43.9	23.2		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	10%	10%	5%	5%	5%
Adj. Flow (vph)	0	1045	1532	0	700	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1045	1532	0	700	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		7.4	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Number of Detectors		1	1		1	
Detector Template		Thru	Thru		Left	
Leading Detector (m)		4.0	4.0		8.0	
Trailing Detector (m)		2.0	2.0		2.0	
Detector 1 Position(m)		2.0	2.0		2.0	
Detector 1 Size(m)		2.0	2.0		6.0	
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	
Detector 1 Queue (s)		0.0	0.0		0.0	
Detector 1 Delay (s)		0.0	0.0		0.0	
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Detector Phase		4	8		6	
Switch Phase						
Minimum Initial (s)		20.0	20.0		10.0	
Minimum Split (s)		26.0	26.0		24.0	
Total Split (s)		26.0	26.0		24.0	
Total Split (%)		52.0%	52.0%		48.0%	
Maximum Green (s)		20.0	20.0		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Yellow Time (s)		4.0	4.0		4.0	
All-Red Time (s)		2.0	2.0		2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	
Total Lost Time (s)		6.0	6.0		6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	
Recall Mode		C-Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			11.0		11.0	
Pedestrian Calls (#/hr)			0		0	
Act Effct Green (s)		22.7	22.7		15.3	
Actuated g/C Ratio		0.45	0.45		0.31	
v/c Ratio		0.50	0.73		0.70	
Control Delay		11.2	18.6		19.1	
Queue Delay		0.0	0.0		0.0	
Total Delay		11.2	18.6		19.1	
LOS		B	B		B	
Approach Delay		11.2	18.6		19.1	
Approach LOS		B	B		B	
Queue Length 50th (m)		22.4	44.8		27.6	
Queue Length 95th (m)		35.2	#72.8		38.5	
Internal Link Dist (m)		830.2	426.4		226.2	
Turn Bay Length (m)						
Base Capacity (vph)		2109	2109		1181	
Starvation Cap Reductn		0	0		0	
Spillback Cap Reductn		0	0		0	
Storage Cap Reductn		0	0		0	
Reduced v/c Ratio		0.50	0.73		0.59	

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 16.3 Intersection LOS: B
Intersection Capacity Utilization 56.8% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Country Hills Boulevard & Stoney Trail West Ramp Terminal



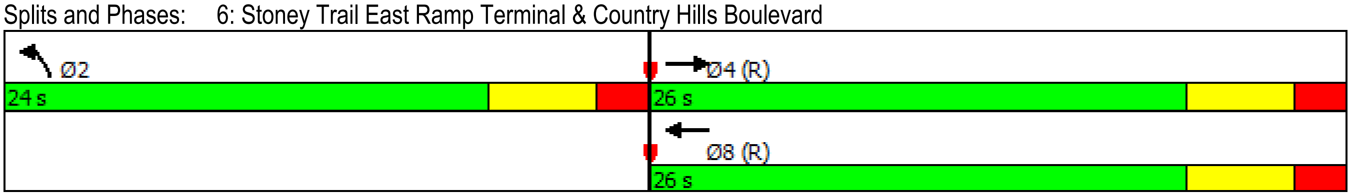
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1515	0	0	1110	409	0
Future Volume (vph)	1515	0	0	1110	409	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	4642	0	0	4642	3283	0
Flt Permitted					0.950	
Satd. Flow (perm)	4642	0	0	4642	3283	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	70			70	50	
Link Distance (m)	450.4			1152.6	205.8	
Travel Time (s)	23.2			59.3	14.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	5%	5%	10%	5%	5%
Adj. Flow (vph)	1647	0	0	1207	445	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1647	0	0	1207	445	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Number of Detectors	1			1	1	
Detector Template	Thru			Thru	Left	
Leading Detector (m)	4.0			4.0	8.0	
Trailing Detector (m)	2.0			2.0	2.0	
Detector 1 Position(m)	2.0			2.0	2.0	
Detector 1 Size(m)	2.0			2.0	6.0	
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	
Detector 1 Queue (s)	0.0			0.0	0.0	
Detector 1 Delay (s)	0.0			0.0	0.0	
Turn Type	NA			NA	Prot	
Protected Phases	4			8	2	
Permitted Phases						
Detector Phase	4			8	2	
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	
Minimum Split (s)	26.0			26.0	24.0	
Total Split (s)	26.0			26.0	24.0	
Total Split (%)	52.0%			52.0%	48.0%	
Maximum Green (s)	20.0			20.0	18.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Yellow Time (s)	4.0			4.0	4.0	
All-Red Time (s)	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	6.0			6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	
Recall Mode	C-Min			C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	11.0				11.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	25.9			25.9	12.1	
Actuated g/C Ratio	0.52			0.52	0.24	
v/c Ratio	0.68			0.50	0.56	
Control Delay	14.3			9.2	19.2	
Queue Delay	0.0			0.0	0.0	
Total Delay	14.3			9.2	19.2	
LOS	B			A	B	
Approach Delay	14.3			9.2	19.2	
Approach LOS	B			A	B	
Queue Length 50th (m)	38.1			22.4	18.0	
Queue Length 95th (m)	69.3			37.0	26.2	
Internal Link Dist (m)	426.4			1128.6	181.8	
Turn Bay Length (m)						
Base Capacity (vph)	2406			2406	1181	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.68			0.50	0.38	

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.1 Intersection LOS: B
Intersection Capacity Utilization 56.8% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 6: Stoney Trail East Ramp Terminal & Country Hills Boulevard



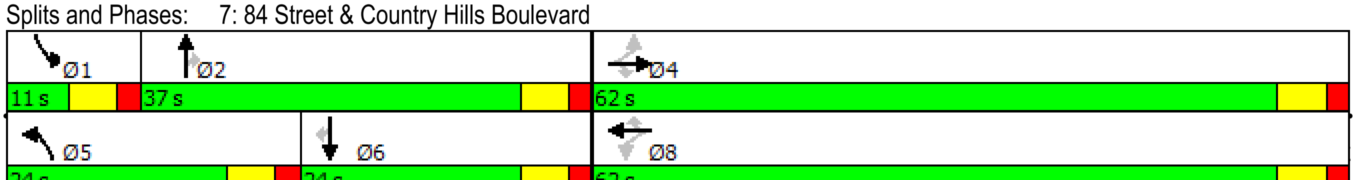
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1317	448	48	1333	88	735	28	53	8	10	46
Future Volume (vph)	100	1317	448	48	1333	88	735	28	53	8	10	46
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	1		2	1		1	3		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.91	0.88	1.00	0.91	1.00	0.94	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1615	4642	2544	1615	4642	1445	4773	3385	1514	1692	3385	1514
Flt Permitted	0.129			0.133			0.950			0.950		
Satd. Flow (perm)	219	4642	2544	226	4642	1445	4773	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			469			149			89			149
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		1152.6			933.1			736.9			712.6	
Travel Time (s)		59.3			48.0			44.2			42.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	109	1432	487	52	1449	96	799	30	58	9	11	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	109	1432	487	52	1449	96	799	30	58	9	11	50
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	62.0	62.0	62.0	62.0	62.0	62.0	24.0	37.0	37.0	11.0	24.0	24.0
Total Split (%)	56.4%	56.4%	56.4%	56.4%	56.4%	56.4%	21.8%	33.6%	33.6%	10.0%	21.8%	21.8%
Maximum Green (s)	56.0	56.0	56.0	56.0	56.0	56.0	18.0	31.0	31.0	5.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)	56.3	56.3	56.3	56.3	56.3	56.3	18.1	28.4	28.4	5.0	10.0	10.0
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57	0.57	0.18	0.29	0.29	0.05	0.10	0.10
v/c Ratio	0.88	0.54	0.30	0.40	0.55	0.11	0.92	0.03	0.12	0.11	0.03	0.17
Control Delay	79.7	14.9	1.8	25.6	15.0	0.7	56.7	26.7	3.4	49.2	41.9	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.7	14.9	1.8	25.6	15.0	0.7	56.7	26.7	3.4	49.2	41.9	1.3
LOS	E	B	A	C	B	A	E	C	A	D	D	A
Approach Delay		15.2			14.5			52.2			13.9	
Approach LOS		B			B			D			B	
Queue Length 50th (m)	18.3	64.1	0.8	5.7	65.1	0.0	56.0	2.1	0.0	1.7	1.0	0.0
Queue Length 95th (m)	#53.8	77.2	8.4	18.1	78.5	2.1	#80.2	6.3	4.7	6.7	3.7	0.0
Internal Link Dist (m)		1128.6			909.1			712.9			688.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	124	2643	1650	129	2643	886	873	1126	563	85	619	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.54	0.30	0.40	0.55	0.11	0.92	0.03	0.10	0.11	0.02	0.13

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 98.8
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 22.1 | Intersection LOS: C
Intersection Capacity Utilization 79.1% | ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: 84 Street & Country Hills Boulevard



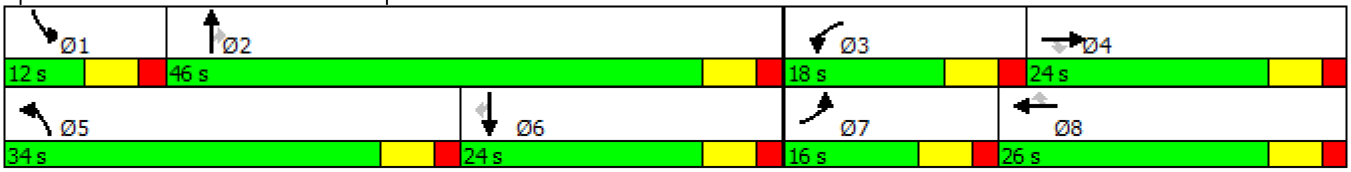
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	234	240	427	400	751	244	1358	434	304	75	428	283
Future Volume (vph)	234	240	427	400	751	244	1358	434	304	75	428	283
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		2	2		2	3		2	2		2
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	0.88	0.97	0.91	0.88	0.94	0.95	0.88	0.97	0.95	0.88
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	4863	2665	3283	4863	2665	4773	3385	2665	3283	3385	2665
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			464			265			330			308
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		907.6			1213.9			932.6			893.6	
Travel Time (s)		40.8			54.6			56.0			53.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	254	261	464	435	816	265	1476	472	330	82	465	308
Shared Lane Traffic (%)												
Lane Group Flow (vph)	254	261	464	435	816	265	1476	472	330	82	465	308
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			11.1			11.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	16.0	24.0	24.0	18.0	26.0	26.0	34.0	46.0	46.0	12.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	16.0%	24.0%	24.0%	18.0%	26.0%	26.0%	34.0%	46.0%	46.0%	12.0%	24.0%	24.0%
Maximum Green (s)	10.0	18.0	18.0	12.0	20.0	20.0	28.0	40.0	40.0	6.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	9.9	17.1	17.1	12.0	19.3	19.3	28.0	41.4	41.4	5.9	16.8	16.8
Actuated g/C Ratio	0.10	0.17	0.17	0.12	0.20	0.20	0.29	0.42	0.42	0.06	0.17	0.17
v/c Ratio	0.77	0.31	0.55	1.08	0.85	0.36	1.08	0.33	0.25	0.41	0.80	0.43
Control Delay	60.0	36.5	6.2	111.1	48.1	5.8	84.3	20.8	2.7	51.8	50.7	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.0	36.5	6.2	111.1	48.1	5.8	84.3	20.8	2.7	51.8	50.7	6.3
LOS	E	D	A	F	D	A	F	C	A	D	D	A
Approach Delay		28.2			58.8			59.3			34.8	
Approach LOS		C			E			E			C	
Queue Length 50th (m)	25.1	16.2	0.0	~49.7	56.1	0.0	~116.1	32.8	0.0	8.0	45.5	0.0
Queue Length 95th (m)	#43.0	24.1	13.9	#79.4	#72.4	10.9	#144.0	45.2	8.6	15.4	#62.9	11.9
Internal Link Dist (m)		883.6			1189.9			908.6			869.6	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	335	894	868	402	993	755	1365	1438	1322	200	622	741
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.29	0.53	1.08	0.82	0.35	1.08	0.33	0.25	0.41	0.75	0.42

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 98
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 50.0 Intersection LOS: D
Intersection Capacity Utilization 80.4% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 84 Street & Airport Trail



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	431	116	311	65	301	176	791	1548	99	31	838	361
Future Volume (vph)	431	116	311	65	301	176	791	1548	99	31	838	361
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3385	1514	1692	3385	1514	3283	3385	1514	1692	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			338			191			136			235
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		3331.9			1417.4			673.7			487.6	
Travel Time (s)		171.4			72.9			40.4			29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	468	126	338	71	327	191	860	1683	108	34	911	392
Shared Lane Traffic (%)												
Lane Group Flow (vph)	468	126	338	71	327	191	860	1683	108	34	911	392
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1	6.1	4.0	6.1
Trailing Detector (m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Position(m)	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector 1 Size(m)	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1	6.1	2.0	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0
Total Split (s)	22.0	30.0	30.0	16.0	24.0	24.0	36.0	63.0	63.0	11.0	38.0	38.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	18.3%	25.0%	25.0%	13.3%	20.0%	20.0%	30.0%	52.5%	52.5%	9.2%	31.7%	31.7%
Maximum Green (s)	16.0	24.0	24.0	10.0	18.0	18.0	30.0	57.0	57.0	5.0	32.0	32.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	16.0	25.4	25.4	8.9	15.8	15.8	30.0	61.5	61.5	5.0	32.0	32.0
Actuated g/C Ratio	0.14	0.22	0.22	0.08	0.13	0.13	0.25	0.52	0.52	0.04	0.27	0.27
v/c Ratio	1.05	0.17	0.57	0.55	0.72	0.52	1.03	0.95	0.13	0.48	0.99	0.67
Control Delay	105.9	40.0	8.5	69.4	58.5	11.8	82.4	41.3	1.8	77.7	70.9	21.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	105.9	40.0	8.5	69.4	58.5	11.8	82.4	41.3	1.8	77.7	70.9	21.5
LOS	F	D	A	E	E	B	F	D	A	E	E	C
Approach Delay		61.7			44.7			53.0			56.6	
Approach LOS		E			D			D			E	
Queue Length 50th (m)	~61.5	13.1	0.0	16.1	38.6	0.0	~110.9	~221.5	0.0	7.9	111.5	32.1
Queue Length 95th (m)	#95.5	21.6	25.5	31.4	54.0	20.2	#151.9	#269.2	5.7	#21.0	#158.2	68.4
Internal Link Dist (m)		3307.9			1393.4			649.7			463.6	
Turn Bay Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Base Capacity (vph)	445	749	598	143	517	393	835	1766	855	71	919	582
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.17	0.57	0.50	0.63	0.49	1.03	0.95	0.13	0.48	0.99	0.67

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 117.9
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 54.5 Intersection LOS: D
Intersection Capacity Utilization 89.3% ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 84 Street & 64 Avenue

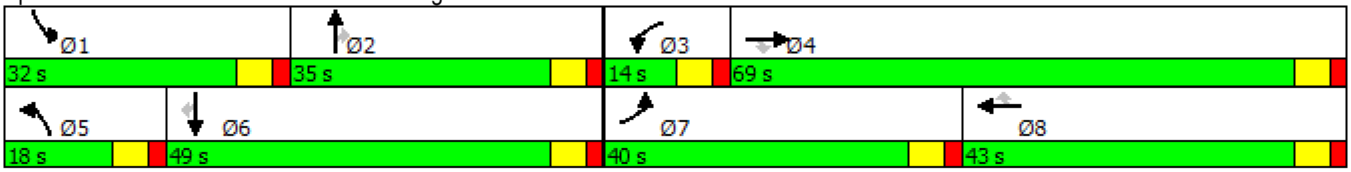
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1338	1909	378	259	1714	579	473	370	143	384	144	1177
Future Volume (vph)	1338	1909	378	259	1714	579	473	370	143	384	144	1177
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	2873	4256	1325	2873	4256	1325	3283	3385	1514	3283	3385	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			170			223			196			397
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		978.3			924.1			716.9			299.4	
Travel Time (s)		50.3			47.5			43.0			18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	20%	20%	20%	20%	20%	20%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	1454	2075	411	282	1863	629	514	402	155	417	157	1279
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1454	2075	411	282	1863	629	514	402	155	417	157	1279
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0	8.0	4.0	4.0
Trailing Detector (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Position(m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Detector 1 Size(m)	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0	6.0	2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0	11.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	69.0	69.0	14.0	43.0	43.0	18.0	35.0	35.0	32.0	49.0	49.0
Total Split (%)	26.7%	46.0%	46.0%	9.3%	28.7%	28.7%	12.0%	23.3%	23.3%	21.3%	32.7%	32.7%
Maximum Green (s)	34.0	63.0	63.0	8.0	37.0	37.0	12.0	29.0	29.0	26.0	43.0	43.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	34.0	63.0	63.0	8.0	37.0	37.0	12.0	31.8	31.8	23.2	43.0	43.0
Actuated g/C Ratio	0.23	0.42	0.42	0.05	0.25	0.25	0.08	0.21	0.21	0.15	0.29	0.29
v/c Ratio	2.23	1.16	0.63	1.84	1.78	1.27	1.96	0.56	0.33	0.82	0.16	1.78
Control Delay	586.5	118.6	24.0	439.4	385.7	167.2	479.3	57.0	4.2	75.0	40.6	380.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	586.5	118.6	24.0	439.4	385.7	167.2	479.3	57.0	4.2	75.0	40.6	380.6
LOS	F	F	C	F	F	F	F	E	A	E	D	F
Approach Delay		281.4			341.6			252.1			283.0	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~358.6	~266.8	56.6	~65.3	~302.2	~183.2	~121.6	57.3	0.0	62.3	18.4	~482.6
Queue Length 95th (m)	#400.3	#294.6	93.8	#94.8	#330.9	#257.6	#157.5	76.4	8.5	80.1	27.9	#564.5
Internal Link Dist (m)		954.3			900.1			692.9			275.4	
Turn Bay Length (m)	100.0		50.0	100.0		50.0	100.0		50.0	100.0		50.0
Base Capacity (vph)	651	1787	655	153	1049	494	262	716	474	569	970	717
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	2.23	1.16	0.63	1.84	1.78	1.27	1.96	0.56	0.33	0.73	0.16	1.78

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.23
Intersection Signal Delay: 295.8 Intersection LOS: F
Intersection Capacity Utilization 137.7% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: 84 Street & McKnight Boulevard



Appendix G

Analysis of MVC’s in Proximity to Shopping Centres

27 February 2018

Geospatial Analytics & Mapping
Strategic Services

Contact
Megan Wallis
Geospatial Analyst
Mail Code: #49

Office: (403) 268-8797
Fax: (403) 287-4249
megan.wallis@calgary.ca

ISC: Protected

RE: Analysis of MVCs in Proximity to Shopping Centres

Defining Shopping Centres

For the purpose of this analysis, shopping centres have been defined as commercial landuse groupings with a size greater than 11 ha whose predominant commercial focus is retail. See Appendix A for more detail of how this was determined.

There are four general categories of areas which meet this definition:

- *Large shopping malls* (i.e. Market Mall, Northland Village Mall)
- *Large "Big Box" commercial centres* (i.e. Signal Hill / West Springs, Crowfoot Commercial Centre)
- *Linear groupings of smaller stripmalls or shops* (i.e. Kensington, 17th Ave in Forest Lawn)
- *Combination type* such as shopping mall and linear grouping or shopping mall and big box centre. (i.e. Chinook Mall and MacLeod Tr or Sunridge Mall and Spectrum Shopping Centre)

See Appendix B for a list of all shopping centres considered in this analysis.

City-Wide Motor Vehicle Collision Density

Incidents with the following types were analyzed for the years 2015 - 2017:

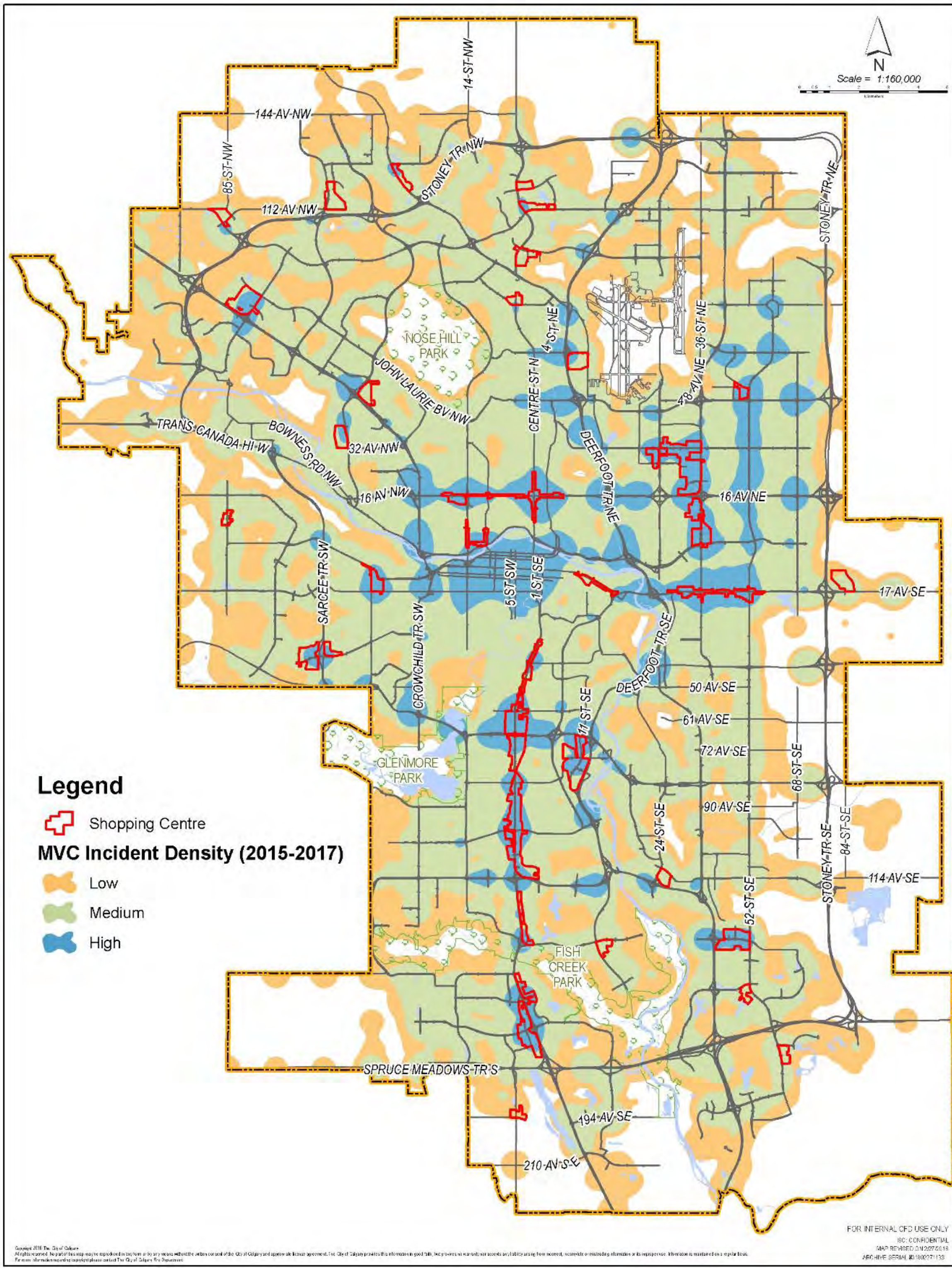
- 322 - Motor Vehicle Accident with Injuries (MVC/Medical)
- 324 - Motor Vehicle Accident with No Injuries, No Fluids (MVC)
- 323 - Motor Vehicle/Pedestrian Accident (MV PED) (MVC/Medical)
- 3210 – Medical Assist - MVA
- 463 - Vehicle Accident, General Cleanup, or Fluids (MVC)
- 4001 – MVA – Fluid Spill or General Cleanup Only

Of those incident types, 23,174 were mappable; that is, their assigned address was able to be associated with an actual location. The density of these locations were then calculated across the entire city. Map 1 shows the results of this analysis.

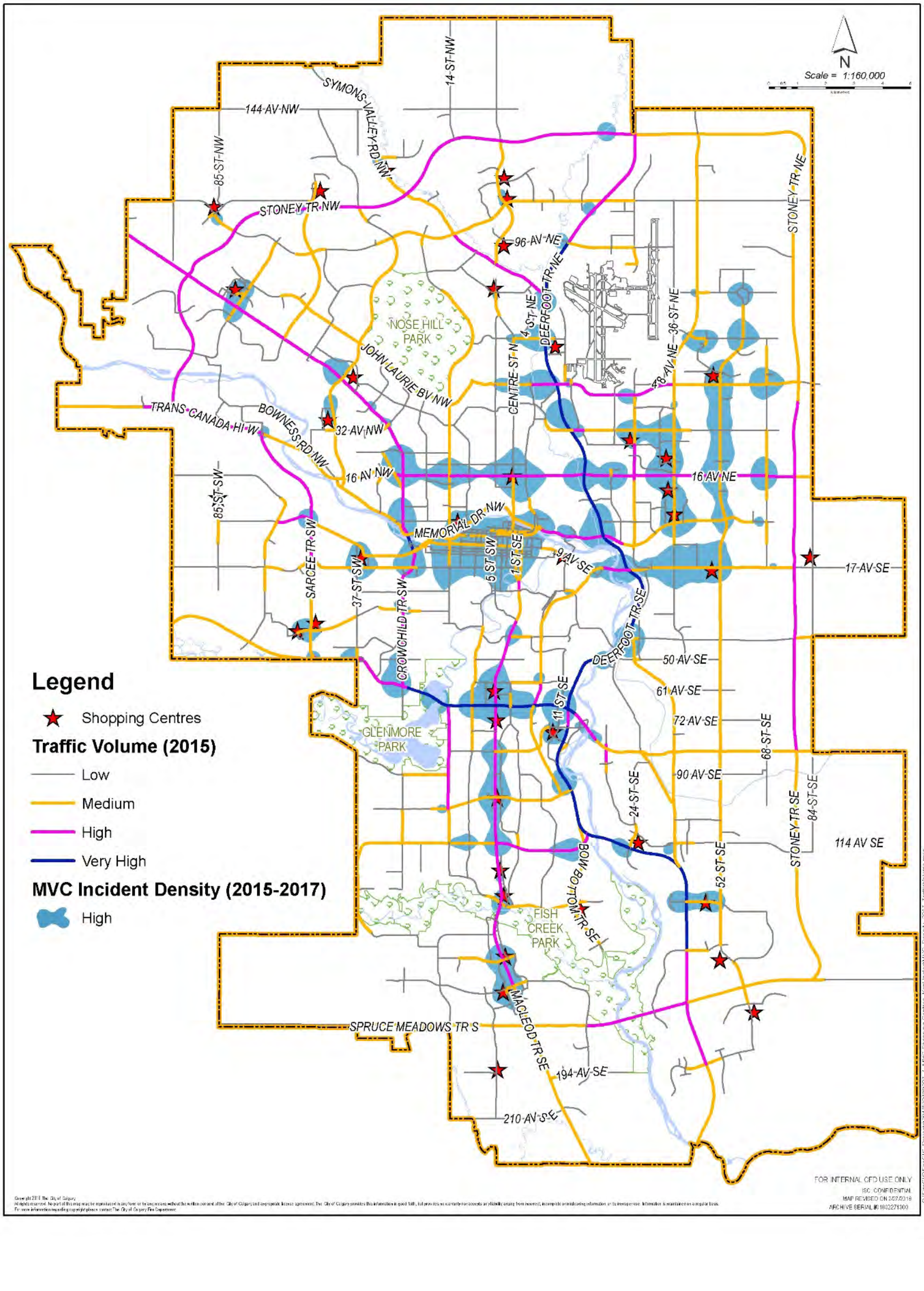
The map shows a clear correlation between shopping centre boundaries and high density locations for MVC. The map also shows high density MVC locations at the intersections of major roads as well as within the downtown core as well as along 52^{nd} Ave in the East Corridor. Since many large shopping centres are located at or near the intersections of major roads it is a reasonable assumption that the high number of MVCs in these areas is due partly to the intersection and partly to the influence of the shopping centres themselves.

Traffic volume was also considered with respect to shopping centres and MVC incident density. Map 2 shows traffic volume from 2015 in relation to the highest density of MVCs. While this map does indicate that traffic volume can be correlated to MVC density in some cases, not all high volume roads also have high density of MVCs.

Map 1: Motor Vehicle Collision Incident Density (2015-2017)



Map 2: 2015 Traffic Volume and Highest Density of MVCs (2015-2017)



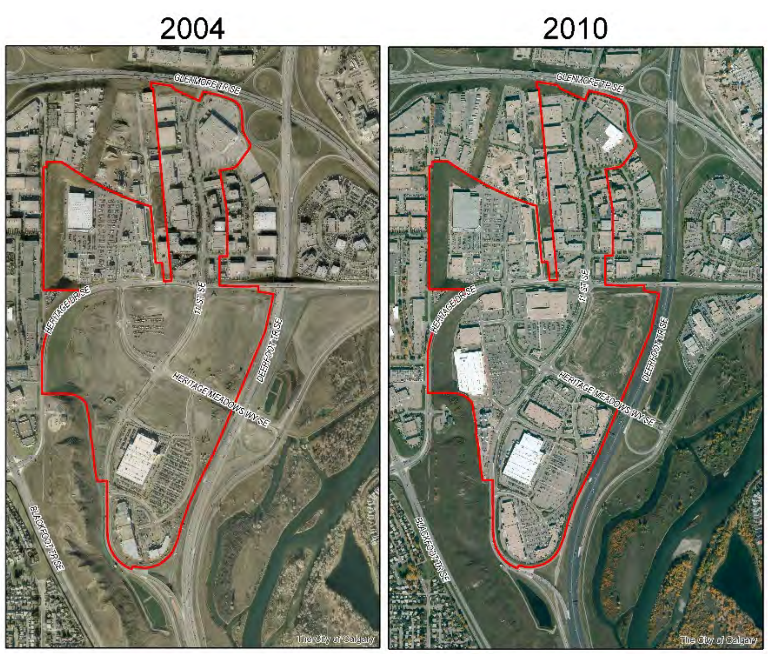
Incident Counts within Shopping Centre Proximity

In an effort to quantify the number of MVCs which occur near to shopping centres service areas were created from access points around the perimeter of each identified area. The service areas identify major roads within 500m, 1000m, 1500m and 2000m of each access point. From these service areas we can determine how many of the MVCs from 2015 to 2017 were within these proximities to a shopping centre. See the table below:

Number of MVC Incidents on Major Roads within Proximity of Shopping Centres				
Distance from Shopping Centre	**Number of Incidents**	**Percentage of Total**	**Range of Incidents Counts for All Shopping Centres**	**Median Incident Count**
500m	5,536	24%	3 - 635	92
1,000m	8,216	35%	4 - 859	126
1,500m	10,206	44%	9 - 1,041	181
2,000m	13,142	57%	14 - 1,549	228

Before and After Example

In 2004, when CFD's earliest records in FireRMS begin, Deerfoot Meadows was mostly unfinished. Only Ikea and the stores to the south had been built. Six years later, by 2010, the shopping centre was built out to the extent it is today.



The table below shows incident counts within the 1,000 m service area and along Deerfoot Tr between Glenmore Tr and Southland Dr in 2004, 2010 and 2017.

Year	Incident Count In 1,000m Service Area	Incident Count on Deerfoot Tr (Glenmore – Southland)
2004	24	2
2010	59	10
2016	51	7

The analysis shows that after build-out of Deerfoot Meadows there is an increase in MVCs in the 1,000m service area of 146% and also a major increase in the MVCs along Deerfoot Tr in the area of the shopping centre. Further, we can see that there is not a similar increase six years after the build-out date (there is actually a slight decrease) which indicates that increased population in the intervening years does not play a major part in the increase of MVC incidents.

Appendix A

Shopping Centre Definition

For this analysis a shopping centre is defined by two aspects: retail area and parking area.

Retail Area

The International Council of Shopping Centers defines a large shopping centre as a "Regional Mall" which ranges in size from 300,000 – 800,000 sq ft. (https://www.icsc.org/uploads/t07-subpage/Canada_Shopping_Center_Definition_Standard_v2.pdf) In addition, Wikipedia lists the largest shopping malls in Canada as any greater than 60,000 sq m. (https://en.wikipedia.org/wiki/List_of_largest_enclosed_shopping_malls_in_Canada)

While this analysis is not constrained to shopping malls only, the retail size of 60,000 sq m was chosen as the minimum for the retail aspect of the two part definition.

Parking area

The City of Calgary requires 4 stalls for every 100 sqm of retail space and defines the maximum size of a parking stall as 14sq m. (http://lub.calgary.ca/Part3/Division_6_Requirements_for_Motor_Vehicle_Parking_Stalls_Bicycle_Parking_Stalls.htm)
A 60,000 sq m shopping centre therefore requires 33,600 sq m of parking stalls. This number was increased to 50,000 to account for driving aisles etc.

60,000 sq m of retail space and 50,000 sq m of parking space gives us 110,000 sq m or 11 ha as our defined size.

Appendix B

Shopping Centres Used in Analysis

Big Box Commercial Centres
130th Commercial Centre
96th Ave & Harvest Hills Blvd
Airways Mall & 32nd Ave at Barlow
Avenida Bonavista Shopping Centre
Beacon Hill Centre
Beddington Towne Centre & Co-Op
Country Hills Town Centre
Coventry Hills Centre
Creekside Shopping Centre
Crowfoot Commercial Centre
Deer Valley Commercial Centre
Deerfoot Mall
Douglas Square Shopping Centre
East Hills Shopping Centre
Heritage Town Centre / Deerfoot Meadows
MacLeod & Canyon Meadows Shopping Centre
Mahogany Shopping Centre
McKenzie Towne Shopping Centre
Midnapore Commercial Centre
Richmond Shopping Centre
Royal Oak Centre
Shawnessy Commercial Centre
Signal Hill / West Hills
Silverado Shopping Centre
West Springs Commercial Centre
Westwinds Shopping Centre

Large Shopping Malls
Market Mall
Northland Village Mall

Linear Groupings of Shops
17th Ave in Forest Lawn
9th Ave in Inglewood
Kensington
MacLeod - Glenmore to 78th Ave
MacLeod - Southland to Heritage

Combination Type
16th Ave & Centre St and North Hill Mall
Chinook & MacLeod to 34th Ave
Marlborough & Northgate
Pacific Place & Marlborough West
Sunridge Mall & Spectrum Shopping Centre
Westbrook Mall & Bow Trail