

**Transportation Report to
SPC on Transportation and Transit
2020 September 30**

**ISC: UNRESTRICTED
TT2020-1036**

Neighbourhood Speed Limit Review

EXECUTIVE SUMMARY

Calgarians want neighbourhoods and public spaces that are safe, accessible and inclusive for all residents, including children, seniors and people with disabilities. The City of Calgary is actively engaged in maintaining and enhancing the safety and liveability of neighbourhoods through the management of our transportation networks.

Collisions, particularly those involving injuries or fatalities, are a serious concern in Calgary. Recently, there have been an average of 9,100 collisions per year on streets inside Calgary neighbourhoods (with an average of 550 of them resulting in serious injury or death), representing 25 per cent of all collisions in Calgary. Many residents have also expressed feelings of fear or discomfort due to the speed of vehicles travelling along their street.

Based on previous Council direction, the Safer Mobility Plan 2019-2023 (and the embedded Vision Zero approach) aims to improve road safety for Calgarians, bringing us closer towards a transportation network free of fatalities and major injuries. A key step toward a Vision Zero approach is achieving operating speeds that reduce the likelihood of fatality or serious injury for all users by reducing impact energy.

In the long run, Administration recommends that The City move towards a 40 km/h speed limit on Collectors and a 30 km/h speed limit on Residential roadways.

Unfortunately, many of the roads in neighbourhoods do not currently provide an environment where these speed limits would be credible to most drivers. It is not feasible to revise the environment on all City roadways in a short period of time. Without that supporting environment, Administration expects that compliance with these recommended limits would be low. As a result, Administration has prepared a strategy to support incremental change that will lead towards the desired long-term state of safer neighbourhoods while considering the reality of the road network and environments that have been built to date in Calgary.

After careful review (as outlined in this report and its attachments), Administration has concluded that changing the unposted speed limit to 40 km/h while posting (for the time being) most Collector roadways at 50 km/h represents an important first step towards reducing the frequency and severity of collisions and enhancing the liveability of our neighbourhoods. Under the City Charter, Council can make this change through bylaw.

In order to continue to make progress towards the desired long-term state, Administration will work with industry partners to revise road standards to ensure that the construction of future roadways and retrofits of existing roadways (including through our existing traffic calming program) result in environments where the recommended long-term speed limits would be credible to most drivers. Administration will then apply its existing authority to post (or rely on unposted limits, as appropriate) these roadways to speed limits in alignment with their new environment and our long-term vision for safe and comfortable roadways in neighbourhoods.

Approval(s): **Morgan, Doug** concurs with this report. Author: **Chapman, Jonathan; Churchill, Tony**

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ADMINISTRATION RECOMMENDATION:

That the SPC on Transportation and Transit recommends that this report be brought to the November 2, 2020 Combined Meeting of Council, to the Public Hearing portion of the agenda, and that Council:

1. Give three readings to the proposed City of Calgary Standard Speed Limit Bylaw to change the unposted speed limit from 50 km/h to 40 km/h within the city limits.
2. Direct Administration to post 50 km/h speed limit signs on existing Collector roadways unless or until a credible environment for a slower speed limit is provided.
3. Direct Administration to work with industry partners to revise Collector standards to support 40 km/h roadways and to revise Residential standards to support 30 km/h roadways, and to apply those standards in new communities and for retrofit projects on existing city roadways.

PREVIOUS COUNCIL DIRECTION / POLICY

Neighbourhood speed limits and vehicle operating speeds have been explored several times in Calgary. Attachment 1 of this report summarizes these efforts going back to 1980.

At the 2018 September 24 Meeting of Council, Council approved the Notice of Motion on Street Safety and Neighbourhood Speed Limits (C2018-0960) directing Administration to provide a recommendation on whether the reduced speed limit should be 30 km/h and/or 40 km/h, as well as to what extent Collector classification streets should receive reduced speed limits, as part of an interim report as well as an engagement plan through the Standing Policy Committee on Transportation and Transit no later than Q2 2019.

At the 2019 October 23 meeting of SPC on Transportation and Transit, the committee reviewed TT2019-1300 Street Safety and Neighbourhood Speed Limits Update. After review of the report committee forwarded the following amended recommendations:

1. To engage with Calgarians and business stakeholders on the subject of reducing or maintaining neighbourhood speed limits and report the findings and a recommendation to Council through the SPC on Transportation and Transit no later than June 2020.
2. To further develop the Neighbourhood Speed Limits business case to include all costs related to the program, including but not limited to cost of engagement, cost of City operations due to collisions, cost of temporary vs. permanent measures for each scenario.

In the 2019 November 29 Budget adjustment deliberations, Council approved:

RECONSIDER its decision made November 18, 2019 regarding Street Safety and Neighbourhood Speed Limits Update, TT2019-1300, in order for the \$200,000 in one time funds committed to engage Calgarians on the subject of reducing or maintaining neighbourhood speed limits instead be re-allocated as one-time bridge funding for the Downtown Outreach Addictions Partnership (DOAP team) serving to reduce the impact of substance abuse issues and public intoxication.

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Neighbourhood Speed Limit Review

BACKGROUND

Traffic collisions can cause life-altering consequences for everyone involved. Each year an average of 36,600 motor vehicle collisions occur on Calgary streets. About a quarter – an average of 9,100 – of these collisions occur in neighbourhoods, where there are more people walking and wheeling, many of whom are children and seniors.

Of those 9,100 collisions, more than 500 each year result in a serious injury or death. More than half of these serious injuries are experienced by drivers and passengers inside vehicles. Streets in neighbourhoods serve as meeting places, as places to play and exercise, and as connectors to the local amenities that enhance liveability for all Calgarians. Our residents report that the fear of collisions impacts their choices to get out for a bike ride or to allow their children to walk to school.

The City of Calgary has several programs that work to enhance safety on our transportation network. Corridor studies, major intersection rehabilitation, spot improvements and new pathways and interchanges all serve to target high collision locations with capital investments to reduce the risk on our roadways. For collisions occurring in neighbourhoods, these spot treatment approaches are not efficient, as the risks are broadly distributed. At the direction of Council, this report investigates the potential impact of reducing speed limits in neighbourhoods to reduce the harm experienced by our residents.

As shown in the Technical Analysis Report (Attachment 2), a sampling of speed data on objectively selected roadways (not collected on a complaint basis) suggests that most people drive near or below the current speed limits when driving in neighbourhoods.

Unfortunately, the current speed limit leaves little margin for error. A number of studies have demonstrated that driving at 50 km/h in neighbourhoods is risky for everyone on the road. Small reductions in driving speed can reduce the chance of collisions. Travelling at a slower speed gives the driver more time to react, broadens their field of vision, and reduces how severe crashes are when they happen; it also gives others, including cyclist and pedestrians, more time to react to the approaching vehicle. (See Attachment 2 for details.)

Other cities across Canada, North America, and globally, have found that reducing driving speeds in neighbourhoods has reduced the frequency and severity of collisions. (See Attachment 2 for details.)

Collisions have a significant financial cost to Calgary. The impact to society of our current collision patterns is estimated at over one billion dollars per year. This includes costs faced by all Calgarians through provincial taxes (medical treatment and rehabilitation), costs faced by businesses through lost efficiency and benefit programs, and costs to The City for collision response and clean-up. (See Attachment 2 for details.)

The City reviewed the options available under the new City Charter to reduce the unposted speed limit in Calgary through a bylaw.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

There are two primary types of roadways within Neighbourhoods. Residential streets are typical streets that provide access to homes. Collector streets provide access to some homes, but also serve a circulation function within the area, support transit service, provide access for school

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Neighbourhood Speed Limit Review

sites, local shops and parks, and connect to the larger network of roadways that run between communities.

Administration investigated six potential scenarios in response to Council requests and discussion. Each scenario represents a selection of an unposted speed limit which would apply to Residential class roadways, and options for setting the speed limit (either posted or unposted) on Collector class roadways in the neighbourhood setting.

Attachment 2 of this report provides the data, analysis, and outcomes of this investigation, including cost-benefit analysis for each scenario. The recommendations presented in this report arise from the following key considerations:

Credibility

Research has shown that drivers will generally comply with posted speed limits when those limits match with the level of comfort provided by the road environment. In Calgary, the typical environment on Residential class roadways (short segments with narrower travel lanes and on-street parking) means that limits of 40 km/h are generally credible, with 30 km/h appropriate in some places. Compliance with the 30 km/h speed limit in playground zones is relatively high but we know that as zones get longer compliance decreases. So, although Calgarians who are driving respect the space near parks and schools, the credibility of 30 km/h on longer stretches of collector or residential roads as they are currently built is generally low.

Unfortunately, many of the larger roads in neighbourhoods (classified as Collectors by The City) do not currently provide an environment where a 40 km/h speed limit would be credible to most drivers. As a result, physical changes to the roadway would be necessary for most drivers to comply with a slower limit on these roadways.

Cost

The cost of each scenario was investigated. The capital costs for retrofitting the entire Collector network to make 30 km/h or 40 km/h credible are significant. Although the cost-benefit ratios of scenarios that include significant traffic calming are favourable, it is not feasible to deliver such a significant change to all Collectors in a short time-frame. As a result, Administration reviewed options to take an incremental approach where speed limits on specific roadways are reduced to align with these long-term goals as the appropriate environment can be established.

Administration also investigated the impact of each scenario without traffic calming in order to identify a high value approach for short term action that would support achieving the desired long-term state over time.

Costs to residents and city operations were also considered. Travel time analysis confirms findings from other jurisdictions that these changes have little impact on a typical driving trip. Impacts to Calgary Transit and other city operations vary by scenario and are discussed in more detail in Attachment 2. The recommended approach has minimal impact to city operations, citizens and businesses in the short-term while being an important move toward safer mobility.

Alignment with the City of Edmonton

The City of Edmonton is currently moving forward on a similar project to reduce their unposted speed limit. At their Council's direction, Edmonton is preparing a bylaw and implementation plan to deliver a 40 km/h unposted limit. For The City of Calgary, bylaw consistency with Edmonton

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Neighbourhood Speed Limit Review

is expected to improve compliance in both cities due to the number of people who routinely, or occasionally, travel between our two jurisdictions.

Participation in Review by the Calgary Police Service

The Calgary Police Service was engaged as a key stakeholder and contributed information and guidance at the project team and advisory level. Credibility was a significant concern for CPS, as enforcement of speed limits that do not match the environment drivers experience is expected to be challenging.

Results

In the long term, considering the layout of existing communities and other factors, an approach that achieves 30 km/h on Residential roadways and 40 km/h on Collector roadways is expected to provide a high value for residents, assuming roadway environments are credible for those speed limits.

In order to realize this desired state, Administration recommends updating The City's design standards for Residential and Collector roadways in order to ensure that future roadways are constructed to create this environment, and any retrofit projects undertaken on existing roadways bring those roads into alignment with this goal.

For most existing neighbourhood roadways in Calgary, these speed limits would not be credible. The City of Calgary does not currently have the capacity to retrofit all roadways to create a credible environment.

As a result, Administration recommends setting the unposted limit to 40 km/h (aligning with the current environment on most Residential Streets) and posting most Collector roadways (for the time being) at 50 km/h. On its own, this action is expected to reduce the number of collisions in neighbourhoods by about 300 per year. It is low cost (~\$2.3M), is consistent with the legal approach being taken by the City of Edmonton, and is expected to have relatively high compliance.

Over time, and in combination with other safety projects, these changes will move the City closer to our goal of eliminating deaths and serious injuries in our Transportation network.

Stakeholder Engagement, Research and Communication

At Council's direction, Administration did not conduct engagement with the public on the specific recommendation presented in this report. Previous engagement activities supporting the pedestrian strategy, local growth initiatives, ward safety meetings, and Council feedback on their own citizen engagement indicate that driving speeds (even though they are generally in compliance with posted limits) remain a significant concern for many Calgarians.

Administration has maintained a project website with information on project goals and progress for the public, including a link to an external resource that estimates travel time impacts associated with different speed limit scenarios: ETAtool.com

The Calgary Police Service (CPS) was consulted as a key stakeholder in traffic safety in the City of Calgary and provided a written statement summarizing their key concerns, as shown in Attachment 5.

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Neighbourhood Speed Limit Review

The project team has continued to monitor results of similar efforts in other jurisdictions. The latest information is included in Attachment 2 of this report.

Strategic Alignment

Improving the safety of neighbourhood streets in Calgary directly supports the Calgary Transportation Plan (CTP) and its associated policy (TP011). Goal #2 of the CTP is “promote safety for all transportation system users.” Additionally, Council Directive M1 from the One Calgary service plan and budget identifies safety as a primary priority for transportation.

Social, Environmental, Economic (External)

Social: Reduced speed limits in neighbourhoods leads to fewer collisions, injuries and fatalities, contributing significant social benefit to the community. Additional social benefits include reduced traffic noise and a greater sense of safety and comfort for people walking, wheeling and playing outdoors in their neighbourhoods.

Environmental: Reduced speed limits in neighbourhoods are expected to have negligible environmental impact in terms of emissions and energy use. A reduction in noise pollution in neighbourhoods is expected.

Economic: Collisions cost Calgarians over 1 billion dollars annually, including 274 million dollars annually on neighbourhood roadways. They represent a significant efficiency loss to the local economy and reducing collisions will provide considerable economic benefit.

Financial Capacity

Current and Future Operating Budget:

Operating costs for the current budget cycle: Education and awareness efforts to support the implementation of the recommended approach will be conducted through existing communication channels (e.g. City social media accounts, variable message signage, media relations team). Based on the recommended approach, minimal operational impacts are expected for City business units.

Current and Future Capital Budget:

Capital costs for the current budget cycle: \$2.3M (see Attachment 3) for signage. Funding would be sourced from existing capital budgets.

Risk Assessment

Risks associated with pursuing the recommended option:

- If legislative changes are not supported with appropriate education, enforcement, and design, credibility of speed limits can be undermined.
- Results of recommended approach will be gradual. Risk that public or political support for the measure will depend on unrealistic timelines or rate of improvement.
- Recommended option does not align with international best practice on speed limits for Vision Zero results (30km/h preferred). Risk that pace of change may not be sufficient to ensure support from communities and advocates.

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Risks associated with not pursuing the recommended option:

- Current collision rates in Calgary are gradually decreasing due to ongoing efforts to improve safety, but not at a rate that aligns with the targets established in the Safer Mobility Plan for the medium- or long-term. Failure to take action risks continuing that trend.
- Other approaches to reducing the frequency and severity of collisions (e.g. reconstructing major intersections, prohibiting heavy personal vehicles, no right turn on red regulations) have higher capital, operating, or political costs.

REASON(S) FOR RECOMMENDATION(S):

Of the available options, the recommendations represent the most effective means available at this time given budgets and current road designs to achieving the goal of reducing the number and severity of collisions in neighbourhood areas. The proposed bylaw aligns with City of Edmonton and is anticipated to have relatively high compliance.

ATTACHMENT(S)

1. Attachment 1 – Summary of Previous Council Direction, Policy, and Neighbourhood Speed Limit Changes
2. Attachment 2 – Technical Analysis for Neighbourhood Speed Limit Review
3. Attachment 3 – Implementation Plan for Recommended Option
4. Attachment 4 – Draft Bylaw
5. Attachment 5 – Correspondence from The Calgary Police Service

Approval(s): Morgan, Doug concurs with this report. Author: Chapman, Jonathan;Churchill, Tony

Neighbourhood Speed Limits Update Report

Summary of Previous Council Direction, Policy and Neighbourhood Speed Limit Changes

Calgary City Council has considered lower speed limits in neighbourhood settings on various occasions in the past in different contexts and under different legislation. Approaches ranging from city-wide changes to one-off street speed limit changes have been explored or implemented. The following summarizes the history of this issue since 1980.

1982 Feasibility Report:

In 1981 Administration was directed to investigate the feasibility of implementing a 40 km/h speed limit on all residential streets within the city and report back through the SPC on Operations and Development. This motion was made in response to the large number of complaints made about speeding vehicles in residential neighbourhoods. At the 1982 February 22 Meeting of Council a report was presented discussing the feasibility of this (OD82-11).

The feasibility report focused on the legal complications that the then governing Highway Traffic Act of 1975 presented. Specifically, urban areas were permitted to adopt lower maximum speed limits, however the amount of signage needed to complete this was considered quite expensive and work intensive. Furthermore, as most complaints at the time focused on excessive speeding above 50 km/h it was thought that police resources could first focus on these violations. A recommendation that the Province of Alberta be requested to change the unposted speed limit on residential streets in urban areas was made at Committee but lost on a tie at Council.

1992 Riverdale Avenue Report:

After the 1982 feasibility report, there were several cases where communities asked for a speed limit change on individual streets. In 1992 Administration was requested through Council to investigate Riverdale Avenue SW where a recent petition had circulated on reducing the speed limit on that roadway. A large majority of residents were in favour of a reduced speed limit and were concerned with speeding traffic in their neighbourhood. Administration and Calgary Police Service conducted speed and traffic studies, ultimately recommending various signage improvements, but no speed limit change. At the SPC on Transportation Transit and Parking on 1992 May 26 these recommendations were carried, and two further amendments were made to 1) reduce the speed on Riverdale Avenue to 40km/h, and 2) to study reducing speeds on all neighbourhood streets in Calgary, specifically addressing a city-wide speed reduction. At Council, this final recommendation was amended to not address city-wide speed changes but a report addressing speed in general was undertaken.

1992 Speed Reduction Report:

Following the Riverdale Avenue report, Administration prepared a report analyzing speed reduction strategies for all neighbourhoods in the city. This report found that neighbourhood speed issues were being investigated one-by-one as complaints were raised by Council or communities. Addressing each in isolation was becoming inefficient and was causing other downstream effects on other nearby streets. The report explored various means for reducing

Summary of Previous Council Direction, Policy, and Neighbourhood Speed Limit Changes

speeds and the relative compliance of each of these strategies. In general, it concluded that speed changes are better achieved through environmental changes such as traffic calming and narrower roadways than simply changing speed limits on existing roadways. The report introduced various traffic calming features like speed humps, speed buttons and rumble strips, and recommended piloting these to confirm their intended effects. The report introduced a method for determining where and when speed issues would warrant intervention and a procedure for consulting communities, planning and implementing any traffic calming changes. This recommendations in this report were approved at the 1992 November 30 meeting of Council

As in the 1982 report, the Highway Traffic Act at the time was seen as a significant barrier, adding considerable cost to a city-wide speed limit change. A recommendation was made that The City work with the Alberta Urban Municipalities Association (AUMA) to approach the Province to change the Highway Traffic Act to allow for a lower unposted speed in urban areas. Calgary alone approached the Province for this change. Without the broader support of more communities, the Province chose to not incorporate this change into the proposed Traffic Safety Act when that was drafted between 1999 and 2001.

2000 Feasibility Report

In the 1990s following Riverdale Avenue speed limit change to 40km/h many other communities began to advocate for speed limit changes. In parallel with the traffic calming program used at the time, many other streets were changed to 40 km/h per hour. Examples of neighbourhood streets with signed 40km/h speed limits can still be seen in many communities.

In 1999 a Council motion directed Administration to again comprehensively review the feasibility of introducing a 40km/h speed limit for local streets in all neighbourhoods. Communities across the city had continued to request lower speeds on their streets and at the time, other Canadian cities were just beginning the trend of lower neighbourhood speed limits which renewed interest. At the 2000 February 15 meeting of the SPC on Transportation, Transit and Parking a report was presented again concluding that The City should approach the Province through AUMA to amend legislation to lower unposted speed limits in urban areas. This report again concluded that the cost constraints imposed by the Highway Traffic Act were the most significant barrier to introducing a citywide change.

Traffic Calming Policy:

Following the 2000 report, the traffic calming program was formalized into Council Policy TP002 Traffic Calming Policy. This document contains a process and several implementation tactics for making neighbourhoods safer for all travel modes.

Step Forward Pedestrian Strategy:

At the 2016 May 2 Meeting of Council, Council adopted the Step Forward pedestrian strategy (TT2016-0250). This strategy includes 49 actions all aimed at improving the safety and quality of walking in Calgary. One of the actions in this plan was to work with the Province of Alberta, through the development of the City Charter, to enable reduced unposted speed limits for residential areas. After Step Forward was approved, the ability to set our own unposted speed

Summary of Previous Council Direction, Policy,
and Neighbourhood Speed Limit Changes

limit for Calgary entered City Charter negotiations. Progress continued throughout 2016 and 2017 and this item was included in the City Charter when presented to the legislature.

City Charter:

In 2018 the City of Calgary Charter Regulation (City Charter) was enacted by the Province. It includes the ability to set an unposted (default) speed limit for Calgary through The City's Traffic Bylaw. This provision significantly reduces the effort and cost needed to make large-scale changes to speed limits than under previous legislation.

Following this action from Step Forward being completed, at the 2018 September 10 Meeting of Council a Notice of Motion on Street Safety and Neighbourhood Speed Limits (C2018-0960) was presented to implement the new Charter authority. The Notice of Motion directed Administration to endorse and implement a reduced speed limit on neighbourhood streets, following recent international and Canadian best practice and the conclusions of Step Forward, and report through Council with a recommended plan. This work is currently underway.

Neighbourhood Speed Limits Review – Technical Analysis Report

Contents

| | |
|---|----|
| Chapter 1: Key Terms | 2 |
| Neighbourhoods and Road Types..... | 2 |
| Speeds and Statistics | 2 |
| Cost and Benefit Terms | 3 |
| Chapter 2: Collision Data..... | 4 |
| What Causes Collisions? | 4 |
| How Many Collisions Occur in Neighbourhoods in Calgary? | 4 |
| Where are Neighbourhood Collisions Occurring?..... | 6 |
| Chapter 3: Speed Data..... | 8 |
| Results of Baseline Data Collection | 8 |
| If Driving Speeds Are In Line With the Speed Limit, Why Do People Complain About Speeding?..... | 10 |
| How Much Does Driving Speed Vary Seasonally? | 10 |
| Do Lower Speed Limits Result in Reduced Driving Speeds? | 11 |
| What Impact Does Driving Speed Have on Travel Time?..... | 12 |
| Chapter 4: Results from Other Jurisdictions | 14 |
| Does Reducing Speed Limits in Neighbourhoods Work? | 14 |
| How Did Other Cities Get There?..... | 15 |
| What Does the Scientific Literature Say About Speed and Collisions? | 16 |
| Chapter 5: Cost Benefit Analysis for Potential Approaches to Speed Limit Reduction | 21 |
| What scenarios did the project consider?..... | 21 |
| How did the project estimate the benefit of each scenario?..... | 21 |
| How did the project estimate collision reductions for each scenario? | 22 |
| How did the project estimate the cost of each scenario? | 26 |
| Cost-benefit Calculations | 28 |
| Chapter 6: Recommendation..... | 30 |
| Long Term Vision..... | 30 |
| How Do We Get There? | 30 |

Technical Analysis for Neighbourhood Speed Limit Review

Chapter 1: Key Terms

The purpose of this chapter is to define some key terms that will be used throughout the report.

Neighbourhoods and Road Types

Neighbourhood: These are the areas where people live. Although the land use is often referred to as residential we will be reserving the use of residential in this report for references to the road type described below. Neighbourhoods consist primarily of residences for Calgarians but also include parks, schools, community centres, strip malls and in some cases services such as fire or police stations. Neighbourhoods are accessed using Residential Streets and Collector Streets.

Residential Street: Lower volume roads for access to residences. Generally narrower than collector roads and serve a limited function for circulation within the community or access out of the community.

Collector Street: Higher volume roads in residential areas with higher traffic and providing access to schools, parks, community centres but may also have residences along their length. These are generally larger roads and often have bus routes, snow routes, and in many cases have a painted centreline or median.

Activity Centre Street, Neighbourhood Boulevard: These are other street types that sometimes occur in the neighbourhood context. They provide different cross sections to support higher levels of walking, commercial activity, and social activity in community hub areas. For the purposes of this report, collisions occurring on these streets were bundled with Collector Streets.

Streets outside neighbourhoods: There are a number of other street types that are defined by The City of Calgary which do not typically occur in the neighbourhood context. Arterial Roads, Urban Boulevards, Skeletal Roads and Parkways provide connections between neighbourhoods and industrial/employment areas. Industrial Streets and Industrial Arterials are road types designed to serve industrial areas and the larger vehicles that more regularly need to access these land uses.

Speeds and Statistics

Average Speed: The numerical average, or mean, of a sample of vehicle speed measured.

85th Percentile Speed: The speed at which 85% of drivers are travelling at or below. This measure is commonly used in engineering processes to indicate an upper boundary of 'normal' behaviour.

Design Speed: This refers to a vehicle speed that a given roadway has been designed to accommodate, such that a driver travelling down the road at that speed should be able to maintain control of their vehicle, remain in their designated lane, and stop in time to avoid hazards or yield right-of-way as required.

Speeding: Any driver driving in excess of the posted or unposted speed limit is speeding. While speeding is sometimes considered a factor in collisions from a liability perspective, for the purposes of this study, whether or not someone is speeding is less relevant than the physics at play relative to the speed of vehicles and the design environment.

Technical Analysis for Neighbourhood Speed Limit Review

Cost and Benefit Terms

Capital: Funds that are available for constructing assets such as roadways, buildings, LRT lines and bridges. Funds to cover the cost of these assets are normally provided through ongoing programs or one-time grants from the provincial and federal governments.

Operating: Funds approved by council through The City's budget and business plan process, the operating budget provides the funds that are available on an annual basis to cover the costs of operating a program. The operating budget includes funds for staff salaries/wages, maintenance of vehicles, buildings and other infrastructure.

Direct Costs: These are the largely tangible and clearly understood costs that can be directly linked to the collision, including property damage costs, emergency services, medical expenses, legal costs, travel delay costs and the costs associated with lost time from the workplace. Often, the data required to accurately determine the direct costs of collisions are readily available. (CRISP, 2018).

Societal Disbenefit: This is the total negative impact of collisions including direct costs as well as costs that are associated with the future net production that is lost to a society as a result of a collision. This value represents a measure of the 'value' of that person to society. Disbenefit reflects the costs that a society is willing to pay to prevent or reduce the risks associated with the occurrence of collisions, particularly collisions that involve injury and death. This method involves surveying a representative sample in order to understand the tradeoff between collision risk and economic resources available to the population. The values used in this report are based on values presented in the Capital Region Intersection Safety Partnership review that was published in 2018 based on work in the Edmonton Region. Calgary operates in the same economic, regulatory and health system and the study findings are therefore more comparable than other provincial or national values reviewed.

Technical Analysis for Neighbourhood Speed Limit Review

Chapter 2: Collision Data

The purpose of this chapter is to summarize available collision data to establish the scale of the issue of vehicle collisions in neighbourhoods and to provide baseline information for comparing various speed limit scenarios in terms of their potential safety benefits.

Throughout this analysis, “casualties” is used as a term which combines fatal collisions with injury collisions, where injury collisions are those collisions that required one or more individuals to be treated by paramedics at the scene or transported to hospital for medical assessment and treatment.

It is important to note that although pedestrians and cyclists are separated in some tables (since they are at greater risk during collisions due to their relative lack of protection) the majority of transportation-related injuries and fatalities that occur in the neighbourhood context involve motor vehicle occupants (drivers or passengers).

What Causes Collisions?

The data source used for these summaries is police reported collision data. This data is primarily collected to summarize the location and nature of the collision, and to note any special conditions (e.g. intoxication) which may influence the legal outcomes of the event.

Although contributing factors may be noted in the collision reports, it is important to note that no one thing results in a collision. Every collision is the result of decisions and reactions made by multiple parties, and those decisions and reactions are influenced by the environment through which people are moving as well as the information available to them leading up to the event. In this sense, the driving speed of each vehicle involved in a crash is always a factor in the collision and the severity of the outcome.

Speed influences the likelihood of a collision in several ways. The speed of a vehicle determines how much ground it covers during the time while the driver is recognizing a danger and deciding how to react to that danger. Speed also determines how much ground each vehicle covers while braking and how maneuverable the vehicle will be to deviate from a collision path (TAC, 2016).

Also, the speed of a vehicle influences where the driver looks in order to effectively operate the vehicle and anticipate downstream risks. This “cone of vision” effect means that at higher speeds drivers are less likely to be able to see hazards, including people and vehicles that are not already directly in their path. Many reports of people “jumping out” in front of a moving vehicle are the result of people behaving in normal ways which the driver fails to recognize because they are outside the driver’s active field of vision.

Furthermore, it is important to note that regardless of what factors contribute to a collision (of which inappropriate speed may be a contribution), the speed at which the impact takes place determines the severity of the injury. For pedestrians and cyclists, the difference between being struck by a vehicle moving 30 km/h and a vehicle moving 50 km/h represents as much as a five-fold increase in the risk of serious injury or death, while risks to drivers and passengers also increase with an increase in the speed of either vehicle.

How Many Collisions Occur in Neighbourhoods in Calgary?

The project team evaluated all collisions noted in Calgary Police Service data for the years 2013-2019, and categorized collisions by the type of roadway where they occurred. Collisions that occurred at intersections of two roadways were attributed to the higher class roadway.

Technical Analysis for Neighbourhood Speed Limit Review

Table 2.1 summarizes the number of collisions by road type. Table 2.2 summarizes the number of casualty collisions by road type. Table 2.3 summarizes the number of collisions involving one or more pedestrians, bicyclists, or motorcyclists, who are all more vulnerable to serious injury than people inside automobiles if they are involved in a collision.

Table 2.1: Collision Data by Roadway Classification 2013-2019

| Total Motor Vehicle Collision Data | Year | | | | | | | |
|------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Road Classification | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Residential | 4,921 | 5,623 | 4,903 | 3,930 | 3,779 | 4,090 | 4,251 | 4,500 |
| Collector | 4,663 | 5,002 | 4,698 | 4,129 | 4,412 | 4,459 | 4,637 | 4,571 |
| Arterial | 7,348 | 7,564 | 7,273 | 7,894 | 8,339 | 8,291 | 8,214 | 7,846 |
| Urban Boulevards | 2,936 | 3,055 | 3,097 | 3,034 | 3,045 | 2,876 | 2,698 | 2,963 |
| Skeletal | 6,345 | 5,765 | 6,106 | 7,788 | 8,171 | 7,862 | 7,779 | 7,117 |
| Other | 7,085 | 10,257 | 11,140 | 8,861 | 10,353 | 9,912 | 9,993 | 9,657 |
| Total | 33,298 | 37,266 | 37,217 | 35,636 | 38,099 | 37,490 | 37,572 | 36,654 |

Collisions on neighbourhood roadways (Residential, Collector, and Neighbourhood Boulevard, highlighted green) account for 23% of all Motor Vehicle Collision (MVCs) on average.

Table 2.2: Casualty Collision Data by Roadway Classification 2013-2019

| Casualty (Injury and Fatality) Motor Vehicle Collision Data | Year | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Road Classification | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Residential | 192 | 195 | 200 | 190 | 170 | 194 | 206 | 192 |
| Collector | 403 | 381 | 355 | 356 | 339 | 331 | 366 | 362 |
| Arterial | 776 | 801 | 699 | 779 | 779 | 738 | 703 | 754 |
| Urban Boulevards | 286 | 297 | 253 | 236 | 289 | 267 | 195 | 260 |
| Skeletal | 619 | 556 | 550 | 653 | 708 | 619 | 576 | 612 |
| Other | 312 | 512 | 504 | 245 | 378 | 374 | 339 | 381 |
| Total | 2,588 | 2,742 | 2,561 | 2,459 | 2,663 | 2,523 | 2,385 | 2,560 |

Collisions on neighbourhood roadways (Residential, Collector, and Neighbourhood Boulevard highlighted green) account for 22% of all MVCs casualties (injury and fatality) on average.

Technical Analysis for Neighbourhood Speed Limit Review

Table 2.3: Pedestrian, Cyclist, and Motorcyclist Collision Data by Road Class 2013-2019

| Pedestrian, Cyclist and Motorcyclist Casualty Motor Vehicle Collision Data | Year | | | | | | | |
|---|------------|------------|------------|------------|------------|------------|------------|----------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Road Classification | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Annual Average |
| Residential | 84 | 68 | 74 | 76 | 52 | 64 | 63 | 69 |
| Collector | 142 | 126 | 125 | 147 | 128 | 107 | 117 | 127 |
| Remainder of City Network | 421 | 397 | 401 | 454 | 328 | 261 | 251 | 359 |
| Total | 647 | 591 | 600 | 677 | 508 | 432 | 431 | 555 |

Notes:

- Casualty collisions include both fatal and injury traffic collisions.
- Reported collisions used in this study occurred on The City of Calgary road network.
- Collisions on private property and in parking lots are excluded.
- "Collector" includes Collector, Primary Collector, Activity Centre Street, and Neighbourhood Boulevard CTP road classes.
- "Other" includes all Calgary Transportation Plan roadway classifications not otherwise included in this study.

As shown in Tables 1.1 to 1.3, there have been an average of over 9,000 collisions per year on roads within neighbourhoods over the study period. Of these, an average of 550 of these collisions resulted in a serious injury or fatality.

In terms of fatalities, 35 of the 160 traffic fatalities reported from 2013 to 2019 occurred on roadways in neighbourhoods. Of those 35, 18 were people walking or cycling at the time of the collision.

Where are Neighbourhood Collisions Occurring?

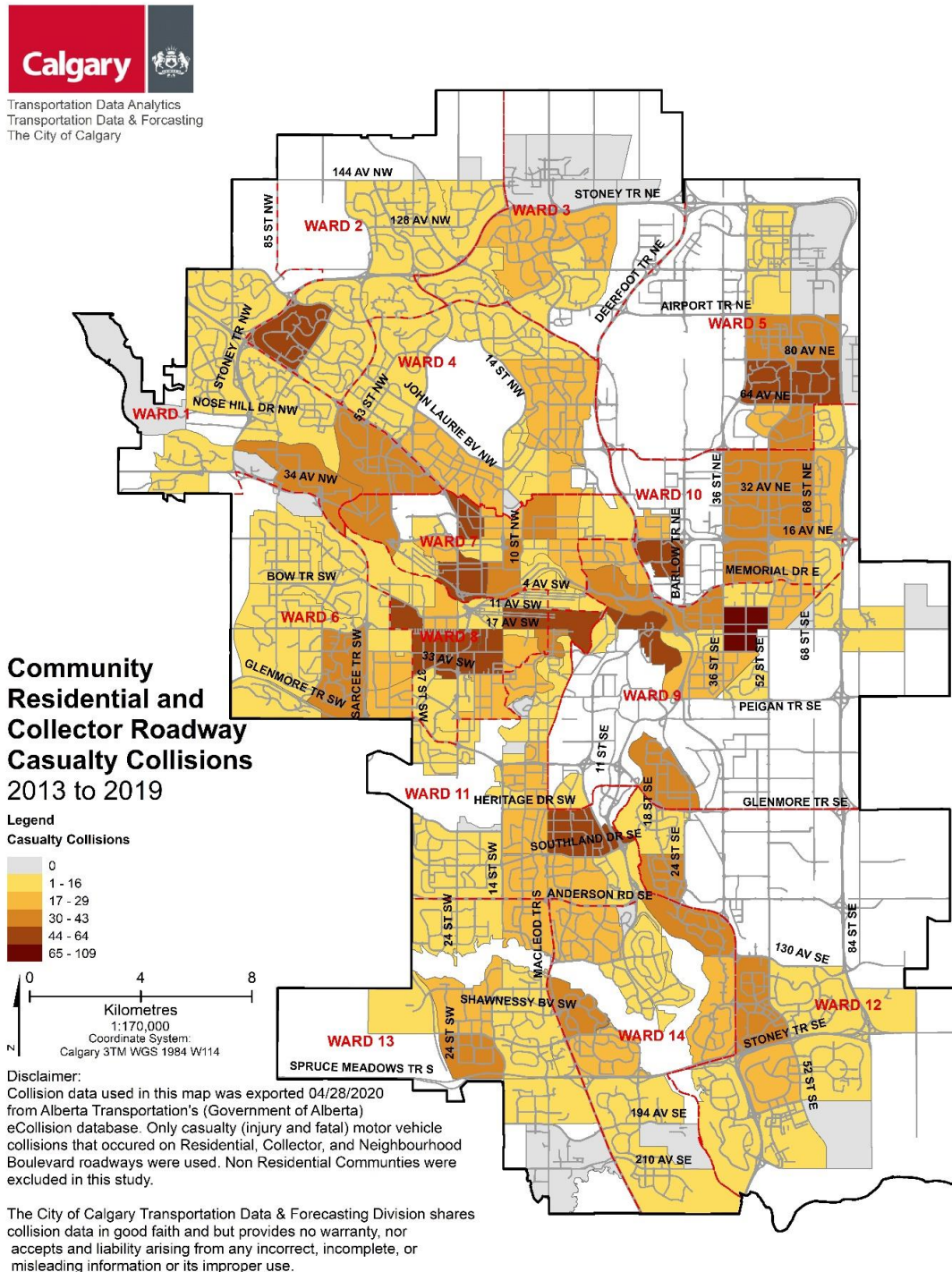
In order to better understand the geographic distribution of the collisions happening in Calgary neighbourhoods, the project team analyzed the data and mapped the number of collisions occurring on Residential and Collector road types in each neighbourhood. Figure 2.1 displays the number of casualty (injury and fatality) collisions sorted geographically.

As shown, people are being harmed as a result of traffic collisions in neighbourhoods across Calgary. There are some neighbourhoods which are significantly over-represented in this data. These areas would be logical places to prioritize if physical measures (traffic calming) were implemented as part of an overall safety program.

The benefit of speed limit reduction is that it is a measure which targets all neighbourhoods and can reduce the frequency of those broadly distributed collisions which are inefficient to target through spot improvements at a street-by-street or intersection-by-intersection level.

Technical Analysis for Neighbourhood Speed Limit Review

Figure 2.1: Spatial Analysis of Neighbourhood Casualty Collisions 2013-2019



Technical Analysis for Neighbourhood Speed Limit Review

Chapter 3: Speed Data

The purpose of this chapter is to summarize the available speed data to better understand what behaviour is correlated with current collision patterns and to establish a baseline to assess the effectiveness of efforts to reduce driving speeds in neighbourhoods.

Results of Baseline Data Collection

While the City of Calgary routinely collects speed profile data (studies which observe the speed of every vehicle passing a specific point over a twenty-four hour period), these resources have traditionally been focused on higher volume roadways. In the neighbourhood context, speed studies have been collected mainly on a complaint basis, to validate reports of localized traffic calming or safety concerns.

For the Neighbourhood Speed Limit review, a new data set was collected in 2019, with locations selected based on objective criteria. A total of 88 sites were selected across the City to obtain a data set of speeds on typical roads with a variety of conditions including age and layout of community, width of road, and traffic volume. This allows for an unbiased look at speed behaviour across the city on roads in Neighbourhoods.

The locations of the baseline speed studies are illustrated in Figure 3.1.

The results of the baseline studies (conducted in both the spring and fall of 2019) are summarized in Table 3.1.

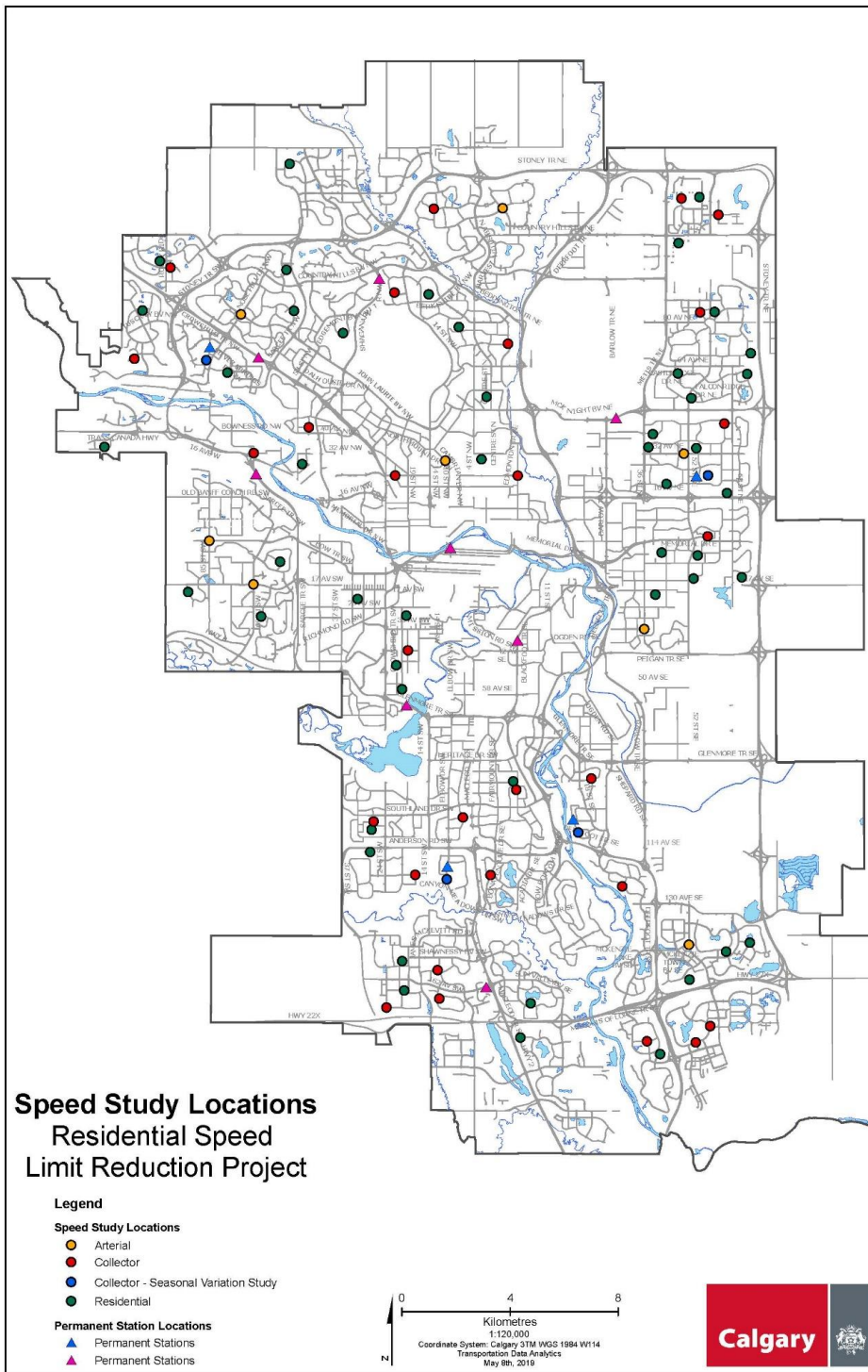
Table 3.1: Results of Baseline Speed Studies

| Spring 2019 Baseline Speed Studies Summary | | | | | | | |
|--|-------------------------|------------------------------|----------------------|---------------------|----------------------|--------------|-------------|
| Road Classification | Total Vehicles Measured | 85th Percentile speed (km/h) | High 85%ile | Low 85%ile | Average Speed (km/h) | High Average | Low Average |
| Arterial Street (60 km/h limit) | 138568 | 67 | 71 | 58 | 58 | 63 | 50 |
| Collector (50 km/h limit) | 155582 | 52 | 59 | 43 | 42 | 50 | 35 |
| Residential Street (50 km/h limit) | 23398 | 45 | 52 | 33 | 35 | 42 | 25 |
| Fall 2019 Baseline Speed Studies Summary | | | | | | | |
| Road Classification | Total Vehicles Measured | 85th Percentile speed (km/h) | High 85th percentile | Low 85th percentile | Average Speed (km/h) | High Average | Low Average |
| Arterial Street (60 km/h limit) | 140099 | 68 | 70 | 58 | 58 | 62 | 52 |
| Collector (50 km/h limit) | 78537 | 53 | 59 | 40 | 43 | 50 | 34 |
| Residential Street (50 km/h limit) | 26640 | 46 | 54 | 34 | 36 | 44 | 26 |

The location by location speed data collected for this analysis is available by request and the location of the speed studies are illustrated in Figure 3.1.

Technical Analysis for Neighbourhood Speed Limit Review

Figure 3.1: Baseline Speed Study Locations



Technical Analysis for Neighbourhood Speed Limit Review

In general, this dataset illustrates that operating speeds on most Collector roads are generally consistent with a speed limit of 50 km/h. That said, there is still a lot of room for improvement on those roads that are higher than average: recording an 85th percentile speed that is slightly higher than the posted speed limit means that more than 15% of motorists are still not compliant with the speed limit. Similarly, observed behaviours on Residential roads demonstrate that the vast majority of drivers complying with the existing speed limit.

As a result, it is important to note that the current collision rates observed in Calgary neighbourhoods are the result of the challenges all drivers face safely operating in these environments at the current speed limits.

It is also worth noting that this is a new glimpse into behavior in Neighbourhoods. Speed information for higher order streets typically shows average speeds at or slightly above the posted limit, with 85th percentile speeds 6-10 km/h above the limit.

If Driving Speeds Are In Line With the Speed Limit, Why Do People Complain About Speeding?

Previous complaint-based speed studies in neighbourhood areas showed average speeds and 85th percentile speeds a few km/h higher than those observed in the 2019 baseline study. While this indicates that residents are sensitive to behaviour on specific streets that reflects higher driving speeds compared to typical, the City of Calgary receives many concerns about “speeding” on streets that are not validated by objective data.

This reinforces that the experiences of residents on their streets do not align with the current speed limits. What may feel quite comfortable and safe for a driver does not appear to feel comfortable and safe for people walking and playing in the vicinity of that road. One unfortunate outcome of our current speed limits is that residents who express concern about driving speeds on their street have limited recourse if speed data collected does not show systematic speeding relative to the legal speed limit. Although a serious collision may not have already occurred on that specific street, the number of collisions observed in neighbourhoods and the random nature of where they occur (see Chapter 2) suggests more can be done to align the City’s safety goals with the liveability requested by residents.

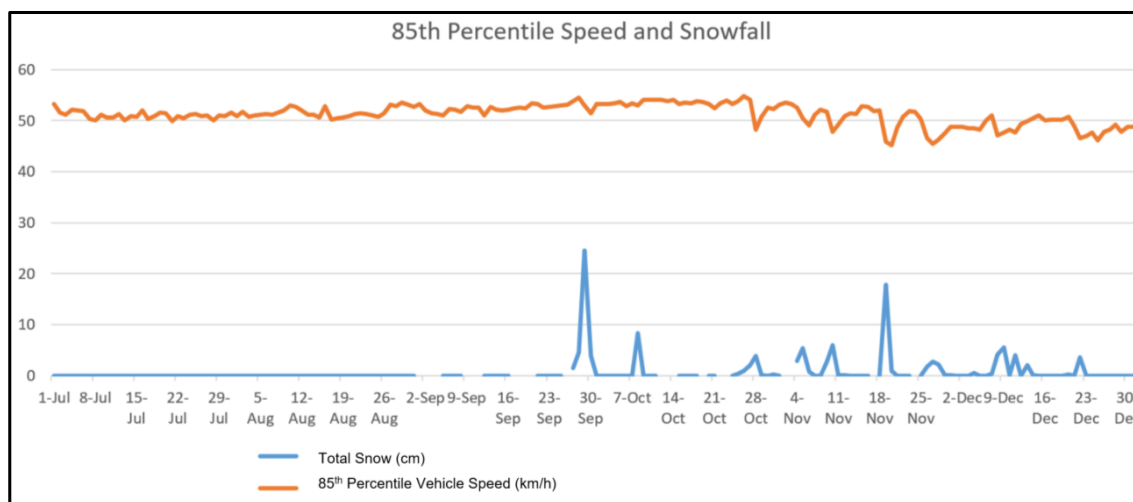
How Much Does Driving Speed Vary Seasonally?

One of the tools used as part of the baseline speed assessment was a small selection of locations observed by permanent count stations. These continuous count locations helped to verify that the one day studies collected in neighbourhoods are accurate representations of typical behaviour experienced on Calgary streets.

One byproduct of this review is a new look at how much seasonal variation there is in driving speeds. Figure 3.2 illustrates the results at one of the permanent count locations.

Technical Analysis for Neighbourhood Speed Limit Review

Figure 3.2: Time variation of speeds at Quarry Way and snow events



As shown, 85th percentile speeds remained fairly consistent from July through October of 2019, before dropping by about 5% through November and December. While individual snow events have an immediate impact on speeds, it is clear that speeds are also depressed in between these events.

Do Lower Speed Limits Result in Reduced Driving Speeds?

A growing number of international studies have demonstrated that lowering speed limits in neighbourhoods does lead to fewer serious collisions, as outlined in Chapter 4 of this report.

As part of preliminary investigation into the potential impact of reducing neighbourhood speed limits, speed observations were collected in August of 2018 in both Calgary and the nearby City of Airdrie.

The City of Airdrie has had neighbourhood speed limits of 30 km/h in place on Residential and Collector roads since the 1980's. Although Airdrie is significantly smaller than Calgary, neighbourhood population densities are similar, and scale of community layout is generally the same in terms of Collector roadway and Arterial roadway spacing. In Airdrie, speed limits on higher class roadways (Arterial and above) align with speed limit setting practices in Calgary. Road design standards are very similar between the two cities, and they share a similar fleet of private vehicles in terms of the number of trucks and SUVs used by residents.

Collector roads in Airdrie and Calgary (NW) with comparable roadway width and traffic volume were selected for a comparative study. Speeds were collected during the week of August 27, 2018 in both Airdrie and Calgary using conventional pneumatic tube counters.

Average speeds on the observed Collector roads in Airdrie vary between 32 km/h and 36.4 km/h and are significantly lower than the observed speeds on Collectors in Calgary which varied from 40.7 km/h to 49.4 km/h. A similar relationship exists for 85th percentile speeds with the highest observed value in Airdrie being 43.4 km/h while the lowest observed value in Calgary was 48.6 km/h. Detailed results from these observations are available on request.

These observations indicate that operating speeds on Collector roads in Airdrie are significantly lower than on Collector roads in Calgary. Given that many other factors are similar, this points to the importance of developing a driving culture that prioritizes low driving speeds in

Technical Analysis for Neighbourhood Speed Limit Review

neighbourhood contexts. However, it is important to recognize that changes in driving culture can be slow and take years or decades.

What Impact Does Driving Speed Have on Travel Time?

One of the questions raised by Calgary residents with respect to potential changes to the speed limits in neighbourhoods was how these changes would affect the amount of time they spend driving on their daily commute, running a typical errand, or other trips they were accustomed to making by personal automobile.

In May 2018, the City of Calgary hosted a Hackathon event, where project teams were provided access to City data and concerns, and invited to prototype solutions over a 24 hour period. One of the project teams developed a prototype of a web application to help residents understand the impact of potential speed limit changes on their travel time.

After further refinement and work with the City, the team released ETAtool.com, a resource that allows residents to select an origin, destination, and time of day, and compare realistic travel times (based on the Google Maps data and engine) for current speed limits with three scenarios that the project team evaluated. See Figure 3.3 for a screen shot sample output.

As shown, due to the relatively short portions of a typical commute spent on Residential and Collector Roads, the travel time impacts of these changes are relatively minor (in the order of 1-2 minutes in most cases).

To better understand the context of this change, The City conducted a study of travel times and travel time reliability on four residential commutes. These typical commutes were found to vary by more than 2 minutes per day, with standard deviation in each trip ranging between 3.1 and 5.5 minutes per trip. (Analysis details from this study are available on request.)

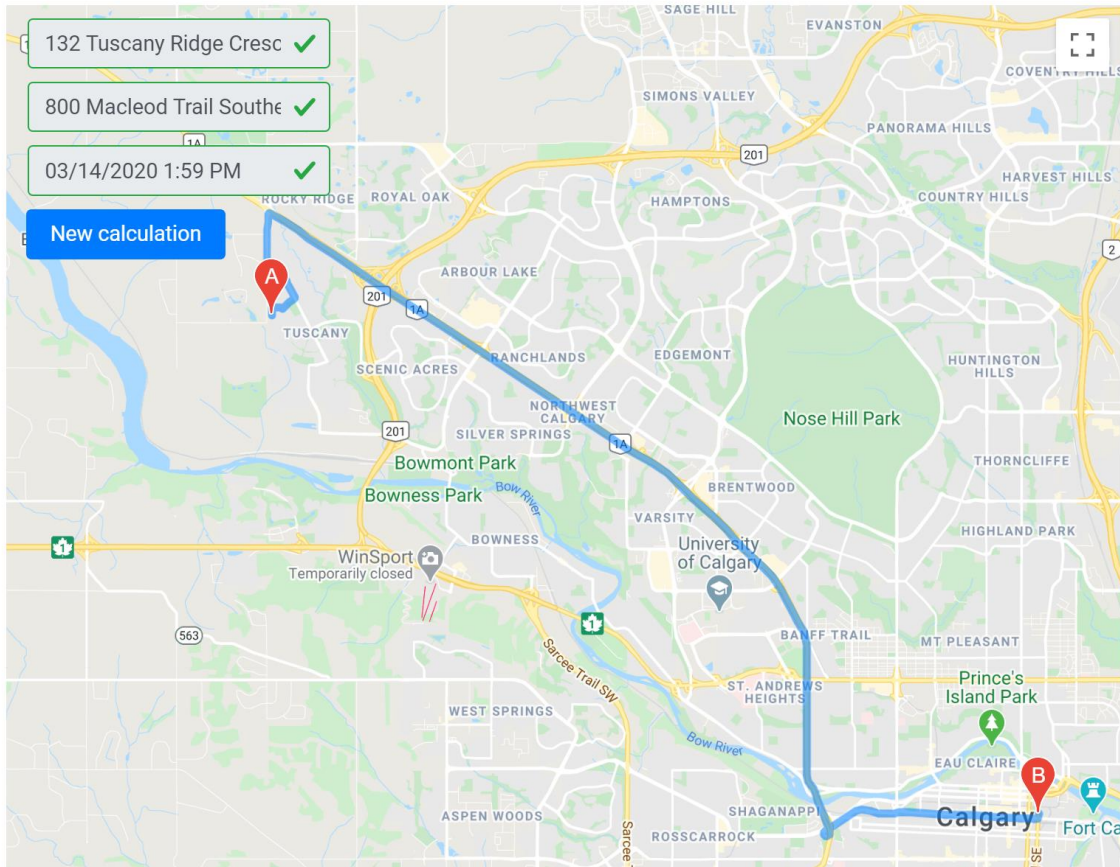
This demonstrates that the changes arising from changing speed limits in neighbourhoods will be less than the day-to-day variation experienced by drivers due to daily variation in traffic volumes, traffic signal phasing, and collisions along the route. In fact, reducing collisions in neighbourhoods would be expected to slightly improve overall travel time reliability, though the effect would be hard for the typical commuter to notice.

There are a limited group of road users who would experience more significant impact due to changes to speed limits in neighbourhoods, depending on the exact approach taken. Calgary Transit, for example, spends a significant percentage of their total operating hours on Collector roadways, so changes to travel speeds on those roadways could impact their performance. For further analysis on the operational impacts of various scenarios, see the cost analysis provided in Chapter 5.

Technical Analysis for Neighbourhood Speed Limit Review

Figure 3.3: Travel Time Estimator Snapshot

Distance: 22.9 km
Duration for current speeds: 25.8 min.
ETA for scenario 1: 26.6 min with 1.6 km impacted.
ETA for scenario 2: 26.1 min with 0.4 km impacted.
ETA for scenario 3: 26.2 min with 1.6 km impacted.



Technical Analysis for Neighbourhood Speed Limit Review

Chapter 4: Results from Other Jurisdictions

The purpose of this chapter is to summarize recent developments and reported results for speed limit reductions enacted in other jurisdictions.

Does Reducing Speed Limits in Neighbourhoods Work?

Speed limit changes have been made in many cities over a long period of time. In 2019 alone Ville de Montréal approved a 30/40 km/h speed limit scenario citywide and the City of Vancouver approved a 30 km/h change for select neighbourhood streets. As recently as May 2019 the City of Edmonton took steps to lower speed limits citywide with a 40 km/h speed limit scenario approved, with an implementation plan to be confirmed in the coming months. A recent review of speed limits of 30 km/h in Toronto showed significant collision reductions.

Across Canada and internationally, different communities have approached the issue with different tactics and they have seen different levels of success. Reviewing these practices will allow Calgary to determine the best means to realize our desired outcomes, and avoid missteps others have made. The following table summarizes the details, decisions and outcomes in other cities:

International Cities:

| City | Approach Taken | Results Achieved |
|---------------|---|--|
| London, UK | More than 400 neighbourhood zones have been established using blanket 20 mph (~30 km/h) limits. Traffic calming infrastructure accompanies each zone. | Serious injuries and fatalities have been reduced by 46% |
| New York, USA | Vision Zero campaign launched including a speed reduction to 25 mph (~40 km/h) for neighbourhood streets. Traffic calming investments and increased enforcement accompanied the change. | Serious injuries and fatalities have been reduced by 44%. In areas where safety infrastructure investments were made, fatalities have fallen by 34%. |
| Boston, USA | Speed limits were lowered from 30 to 25 mph (~50 to 40 km/h) in 2017 without extensive traffic calming. | Speeding over 10 mph above the new limit (over ~55 km/h) was reduced by 29%. Studies on injuries and fatalities have not yet been conducted, though fatalities appear to have dropped by half. Boston is now considering a further reduction to 20 mph (30 km/h) to reduce speeds even further. |
| Seattle, USA | All local neighbourhood streets were lowered to 20 mph (~30 km/h) and collector roadways to 25 mph (~40 km/h) in a 2016 citywide initiative. A spot improvement traffic calming budget accompanied the rollout. | Updated data on the impact of the 25 mph projects on Collector Roadways – implemented with signage only, no additional enforcement or calming. Collisions reduced by 22%, injuries by 18%, and high end speeders (40mph+) reduced by 52%. |

Technical Analysis for Neighbourhood Speed Limit Review

Canadian Cities:

| City | Approach Taken | Results Achieved |
|---------------|---|---|
| Toronto, ON | Toronto reduced speed limits in residential areas to 30km/h in 2015 and 2016. Comparisons with adjacent Scarborough which held speed limits at 40 km/h. | Updated results: 27% reduction in collisions with pedestrians, and a 67% reduction in serious injury and fatal collisions (all types) on roads with the 30 km/h treatment. |
| Ottawa, ON | Ottawa is in the process of designating area speed limits at 40 km/h. This is a blanket speed reduction on a neighbourhood-by-neighbourhood basis that will begin rolling out in late 2019. | In progress |
| Vancouver, BC | Vancouver passed a 30km/h speed limit for all neighbourhood streets in pilot communities earlier in 2019. Administration is currently working towards an implementation plan. | In progress |
| Montréal, QC | In 2019 Montréal approved a 30 km/h speed limit for all local neighbourhood streets and a 40 km/h limit for main streets. Public consultation plans and implementation details are currently underway. | In progress |
| Edmonton, AB | In 2010 some pilot neighbourhoods were changed to 40 km/h to test speed limit changes. In 2019 Council approved a 30 km/h change for inner-city neighbourhoods and 40 km/h for all other neighbourhoods citywide. Administration is preparing an implementation plan for this throughout 2019. | Some of the pilot neighbourhoods remain in place, but others with public opposition were removed. This pilot involved speed limit signs on every block of each street, and aesthetics were one of the factors cited in opposition to the pilots. As the need for safer streets has not diminished, interest in lowering speed citywide has remained and the new city-wide initiative is in progress. |
| Hamilton, ON | Reducing residential streets to 40 km/h and school zones to 30 km/h between Mar 2020 and Mar 2021 | Update: Project installed in ~40 communities, work ongoing. |

As shown, these approaches are relatively new to Canada, and data on Canadian outcomes is limited. International results demonstrate that changing neighbourhood speed limits is an important tool in an overall program to enhance road safety.

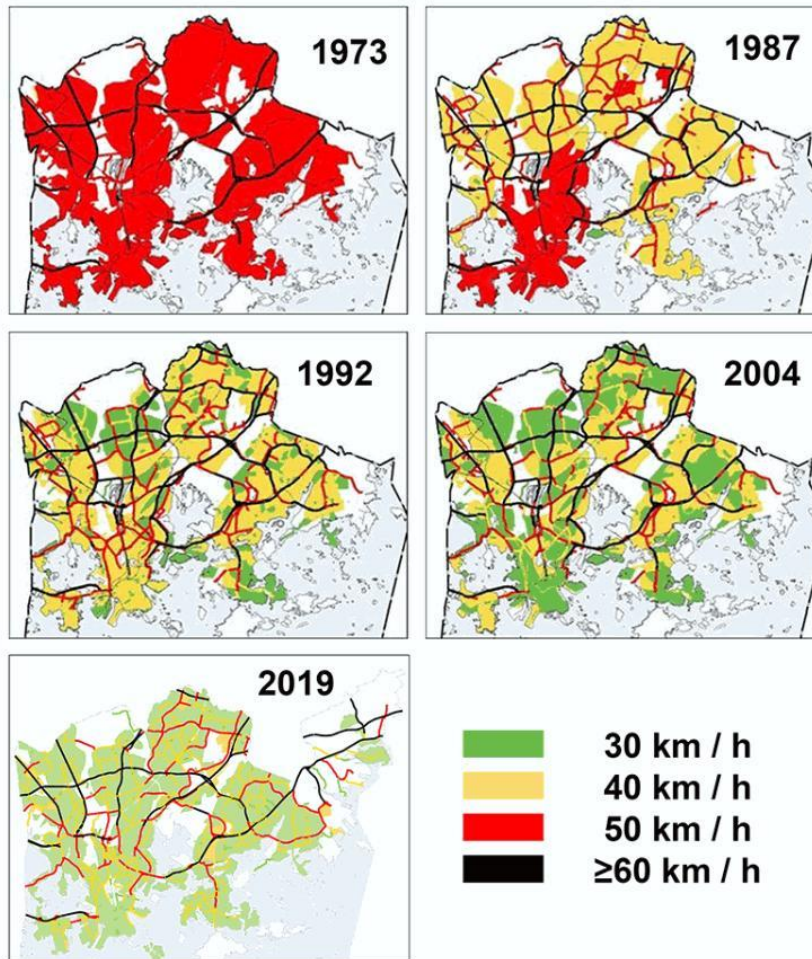
[How Did Other Cities Get There?](#)

Helsinki currently boasts extremely low collision rates and serious injuries/fatality rates, on a network which is designed to support 30 km/h of travel on most residential roads, with select roads/areas still operating at 40 km/h and arterial roadways designed for higher speeds.

Technical Analysis for Neighbourhood Speed Limit Review

As shown in Figure 4.1, this environment did not emerge over night. Speed limits were initially reduced in some areas in the 1980s, and then in more areas and more stringently over a long time period. This evolution of design philosophy was accompanied by changes in driver behaviour and expectations.

Figure 4.1: Speed Limits in Helsinki (1973-2019)



Based on similar incremental success in other high-performing jurisdictions, the project team has identified that maintaining credibility of speed limits and working to change Calgary's driving culture over time is an effective strategy to achieving significant reductions in collisions.

What Does the Scientific Literature Say About Speed and Collisions?

In addition to these direct reports from various jurisdictions about the nature and outcome of their speed reduction programs, the project team reviewed the extensive scientific literature around the relationship between speed limits, speeds, frequency and severity of collisions, and road design. This section lists some of the most significant resources on this issue, with a brief summary of their scope and high level findings.

Technical Analysis for Neighbourhood Speed Limit Review

Scientific Literature:

| Author, Publication | Reference | Findings / Results |
|--|---|--|
| Transportation Association of Canada, 2016 | Speed Management Guide: A Book in the Canadian Road Safety Engineering Handbook (CRaSH) | Human Factors (perception reaction time etc.), credibility of speed limits, vehicle dynamics, risk factors, breaking distance, avoidance manouvers, measurement methods, design speed vs. speed limit vs. operating speed vs. target speed, methods for setting speed limits, road environment and traffic control to influence speeds. |
| International Transportation Forum of OECD, 2018 | Speed and Crash Risk Research Report | Safe Systems approach to setting speed limits; speed and crash risk relationship; impact severity; braking distance; Nilsson's Power Model; case studies of speed limit changes; observed changes in driving speed and change in collisions; clear findings that decreases in mean speed result in decreases in collisions and severity, increases in speed result in increase in collisions and severity. |
| Elvik, Christensen, Amundsen, TOI, 2004 | Speed and Road Accidents: An evaluation of the Power Model. Report 740/2004 | Detailed review of Nilsson's Power Model, theory, validity, meta analysis of applications with sensitivity analysis, speed as a risk factor, need for regulating speed, control of speed, setting speed limits, enforcement of speed limits. Power model holds and a 10% reduction in mean speed found to reduce fatal collisions by 37.8% with additional details in report. |
| Tjandra, Shimko, 2011 | Selecting Communities for Piloting the New Reduced Speed Limit on Residential Roads in the City of Edmonton, Transportation Association of Canada 2011 conference proceedings | Reference to relationship between impact speed and probability of death, study design and selection of communities for speed limit reduction pilot. Part of series evaluating speed limit pilot in Edmonton. |
| El-Bassyouny, El-Bassiouni, 2013 | Modeling and analysing traffic safety Perceptions: An application to the speed limit reduction pilot in Edmonton, Alberta: Accident Analysis and Prevention 51 (2013) 156-167 | Before and after review of public perception of speed limit change and safety. Overall improvement in perceptions of safety in community. Part of series evaluating speed limit pilot in Edmonton. |
| Islam, El-Basyouny, Ibrahim, 2014 | The impact of lowered residential speed limits on vehicle speed behaviour: Safety Science 62 (2014) 483-494 | Statistically significant reduction in mean free-flow speeds and speed variance in all period classifications. Effectiveness of speed limit reduction improved over time. Part of series evaluating speed limit pilot in Edmonton. |

Technical Analysis for Neighbourhood Speed Limit Review

| Author, Publication | Reference | Findings / Results |
|---------------------------------------|---|--|
| Islam, El-Basyouny, 2015 | Full Bayesian evaluation of the safety effects of reducing the posted speed limit in urban residential area; Accident Analysis and Prevention 80 (2015) 18-25 | Various methodologies to evaluate the effectiveness of the posted speed limit reduction to improve safety in terms of crash (collision) reductions. Speed limit reduction found to reduce crashes of all severities and therefore recommended for improving safety on residential and collector roadways. Part of series evaluating speed limit pilot in Edmonton. |
| Badeau, Fafard, 2012 | Implantation du 40 km/h a Montreal (in French); Transportation Association of Canada 2012 conference proceedings | Summary of speed limit change in Montreal. Lowering limit of 50 km/h to 40 km/h largely matched observed behaviour but still resulted in a reduction of 2 km/h on observed roads. Noted to allow for more uniform speeds in neighbourhoods and allowed for traffic calming and new design work to be done for 40 km/h. |
| Taylor, Lynam, Baruya, 2000 | The effects of drivers' speed on the frequency of road accidents; Transport Research Laboratory report 421 | Evaluation of models linking various speed metrics to collision outcomes based on data from UK, Sweden and the Netherlands. Urban and rural roads considered separately; on urban roads increases and speed, Higher average speeds and higher proportions of vehicles speeding were both found to increase collision frequency – severity not examined. Key finding that even in an urban setting speed reductions reduce collision outcomes for pedestrians and motor vehicle occupants. Good to focus engineering efforts where high speeds and high collisions evident. |
| Cameron, Elvik, 2010 | Nilsson's Power Model connecting speed and road trauma: Applicability by road type and alternative models for urban roads; Accident Analysis and Prevention 42 (2010) 1908-1915 | Review of Nilsson's Power Model and specifically the power estimates for collision outcomes in an urban setting. Found that relationship holds in an urban setting based on available data sets but with lower power estimates than for rural data. Noted that the built environment is an important moderator. Evaluation of alternative models to describe relationship. |
| Sun, El-Bassyouny, Ibrahim, Kim, 2018 | Are school zones effective in reducing speeds and improving safety?; Canadian Journal of Civil Engineering 45 (2018) 1084-1092 | Review of effects of change in collisions following posting zones in Edmonton consistent with times established in Calgary. Finding that observed reductions in speeds and reductions in collisions were consistent with expected reductions using Nilsson's Power model (2004). |

Technical Analysis for Neighbourhood Speed Limit Review

| Author, Publication | Reference | Findings / Results |
|--|---|---|
| Insurance Institute for Highway Safety, 2018 | Lowering the speed limit from 30 to 25 mph in Boston: effects on vehicle speed. | 50 road segments were monitored before and after speed limit change in Boston. No significant changes to built environment or enforcement were undertaken. Proportions of vehicles speeding in various categories were found to decrease but changes in mean (average) speeds and 85%ile speeds were zero or negligible. Effect on collisions not included. |
| World Road Association, PIARC (2019) | Setting Credible Speed Limits – Case Studies Report | Theory regarding importance of credibility in setting speed limits, Hierachy of control in setting speed limits, Measures to reduce operating speeds and increase safe speeds: Improving signage, built environment modification, enforcement support, built environment reconstruction. Global case studies shared including selection from Canada and developed nations as well as developing nations globally. |
| Jurewucz, Sobhani, Wolley, Dutschke, Corben (2016) | Exploration of vehicle impact speed – injury severity relationship for application in safer road design; Transportation Research Procedia 14 (2016) 4247-4256 | Review of Safe Systems approach and relationship between impact speed and probability of fatal or serious injury. 10% threshold for serious injurt or death considered. Vehicle occupants involved in side impact collisions have 10% risk of serious injury at 30 km/h and similar risk for pedestrians struck at 20 km/h. Builds on research commonly referenced by Wrambourg (2005). Importance of built environment changes to reduce risk noted. |
| Tefft (2011) | Impact Speed and a Pedestrian's Risk of Severe Injury or Death; AAA Foundation for Traffic Safety report | Report studies US Data from 1994 to 1998 to estimate risk of severe injury or death for pedestrians. Risks were standardized to estimate average risk in 2007-2009. Findings that risk of injury and death increase with speed. 10% threshold for injury at 16 mph and 10% for death at 23 mph. Risks were also stratified by age and older pedestrians found to be at significantly higher risk. Recommendation to limit speeds to reduce risk of injury death where conflicts exist, separate pedestrians where possible and improve vehicle and built environment design. Different form of speed/survivability curve found from previous research but general relationship holds. |

Technical Analysis for Neighbourhood Speed Limit Review

| Author, Publication | Reference | Findings / Results |
|--------------------------------|--|--|
| Aarts, van Schagen (2006) | Driving speed and the risk of road crashes: A review; Accident Analysis and Prevention 38 (2006) 215-224 | Driving speed is an important factor in road safety. Speed not only affects the severity of a crash, but is also related to the risk of being involved in a crash. Studies found evidence that crash rate increases faster with an increase in speed on minor roads than on major roads. |

Technical Analysis for Neighbourhood Speed Limit Review

Chapter 5: Cost Benefit Analysis for Potential Approaches to Speed Limit Reduction

The purpose of this chapter is to summarize the analysis conducted to evaluate different options for how to achieve lower driving speeds in neighbourhoods through reductions in the unposted speed limit.

What scenarios did the project consider?

Given that speed limits in Canada are posted at 10 km/h increments, the project team considered the costs and benefits associated with reducing the unposted speed limit (currently set at 50 km/h by Alberta’s Traffic Safety Act) to either 40 km/h or 30 km/h.

For each of these options, the project team then considered whether the unposted speed limit would apply to Collector class roads, or whether some other speed limit would be established on these roads through signage, as requested by council. Including options to retain current limits, this resulted in six scenarios to assess, as summarized in Table 5.1.

In preliminary reporting, Administration presented outcomes based on the first three scenarios outlined in Table 5.1. These scenarios were selected to provide the public with a simplified set of options for a discussion of values and trade-offs. After discussion with Council, additional scenarios (which were being analyzed as part of the ongoing technical review) were added to the considerations presented in this report.

Table 5.1: Speed Limit Scenarios Reviewed

| Scenario | Speed Limit by Road Type | |
|------------|--------------------------|----------------|
| | Residential Road | Collector Road |
| Scenario 1 | 30 km/h | 30 km/h |
| Scenario 2 | 30 km/h | 50 km/h |
| Scenario 3 | 40 km/h | 40 km/h |
| Scenario 4 | 30 km/h | 40 km/h |
| Scenario 5 | 40 km/h | 50 km/h |
| Scenario 6 | 50 km/h | 50 km/h |

How did the project estimate the benefit of each scenario?

The primary benefit associated with each scenario is the number of collisions avoided as a result of the proposed change. In order to compare this benefit with potential costs of each alternative, the collisions were converted to societal costs.

While this can seem impersonal, it does allow for a direct comparison between different options and the costs to implement those options. The City of Calgary remains committed to reducing harms to individuals from our transportation systems because we recognize that each collision is more than a statistic, and represents physical, financial, and emotional suffering, and a change in the trajectory of a person or families’ life.

Societal costs for collisions, based on the Capital Region Intersection Safety Partnership (CRISP, 2018) study of societal costs of collisions in Alberta, are applied to the collision reductions anticipated for each scenario to obtain the estimated societal benefit in dollars of the

Technical Analysis for Neighbourhood Speed Limit Review

collision change. The Societal cost of collisions used are as follows (adjusted to 2020 values using Consumer Price Index data):

- Fatal Collision: \$7,092,240
- Injury Collision: \$211,755
- Property Damage collision: \$14,388

There are a number of additional benefits of reducing driving speeds in neighbourhoods that are difficult to quantify. Reduced noise levels have been associated with reduced stress for residents. Increased feelings of comfort on neighbourhood streets encourages social interaction which increases community resiliency, and encourages people to walk and play in their neighbourhoods which can have physical health benefits. Children who walk or cycle to school have been shown to perform better academically.

Because there are no readily available studies to quantify these benefits at the level of resolution necessary to compare the scenarios under consideration, these benefits are not reflected in the cost-benefit analysis presented in this report, and benefits are reported exclusively on the basis of collision reduction projections.

How did the project estimate collision reductions for each scenario?

Changes in operating speeds are estimated for each scenario based on a literature review and experience with speed change related projects in Calgary and Edmonton.

Research has shown that drivers will generally comply with posted speed limits when those limits match with the level of comfort provided by the road environment. One of the main influences on the speed that drivers choose to travel is the built environment of the roadway. The majority of the information that drivers use to select a speed that they feel is safe and reasonable are the roadway features (road width, intersection spacing, parking, paintlines, signs, etc.).

If there is a mismatch between the physical features of the roadway and the posted or unposted speed limit then drivers will not perceive the speed limit to be credible and as a result will often drive to the speed that they feel is appropriate based on the roadway characteristics. If the roadway features match with the speed limit, that is to say the speed limits are credible, then compliance will be relatively high.

Threats of enforcement, social norms regarding speeding behaviour, and prevailing weather conditions also influence choice of speed but to a lesser degree than the built environment of the roadway. Results from some jurisdictions (e.g. Seattle) have shown that signage alone can influence behaviour. Projections for collision reductions in these scenarios are more modest than those which provide a credible environment for the proposed speed limit.

In Calgary, the typical environment on Residential class roadways (short segments with narrower travel lanes and on-street parking) means that limits of 40 km/h are generally credible, with 30 km/h appropriate in some places. Unfortunately, many Collector roadways do not provide an environment where a 30 km/h or 40 km/h speed limit would be credible to most drivers. As a result, physical changes to the roadway would be necessary for most drivers to comply with a slower limit.

Based on these considerations, anticipated reductions in average driving speed were estimated for each scenario, both with physical traffic calming to create a more credible environment and by relying on bylaw changes and signage only. In Scenario 6, with existing speed limits, the

Technical Analysis for Neighbourhood Speed Limit Review

impact of broad traffic calming on Collector roadways to make 50 km/h a consistently credible speed limit were considered.

It is worth noting that individual roadways in Calgary have different designs and would benefit differently depending on the physical design and speed profile of that specific roadway. The calculations presented in this report are based on the anticipated overall impact of network-wide changes.

Table 5.2: Anticipated Changes in Average Operating Speed by Scenario

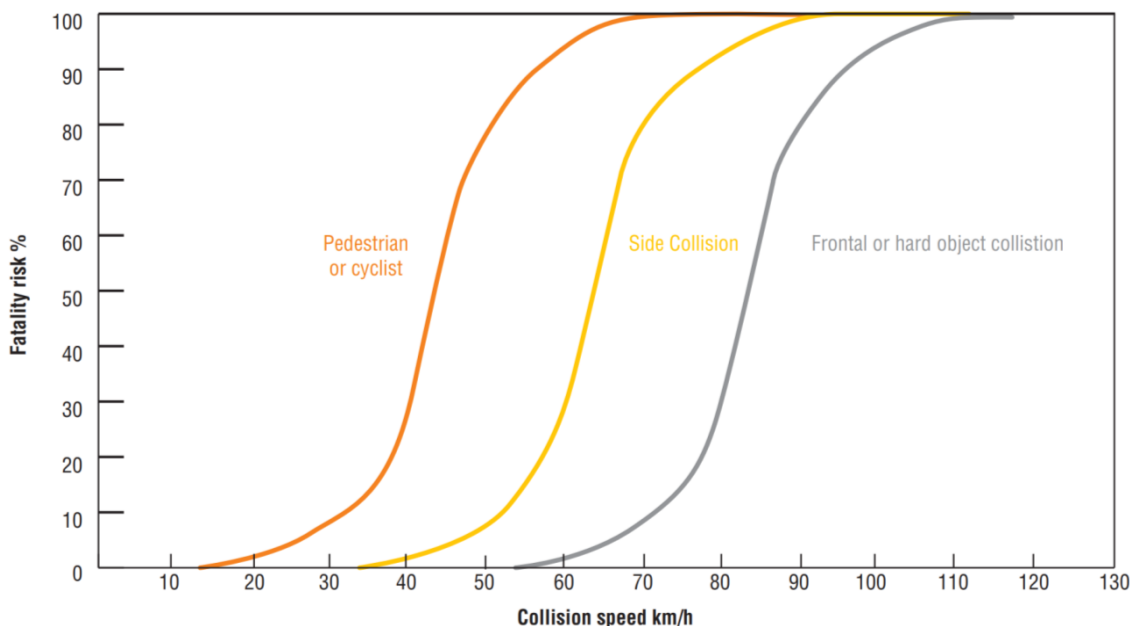
| Scenario (Residential / Collector Speed Limit) | Anticipated Change in Average Operating Speed | |
|--|--|---|
| | With Traffic Calming | Bylaw and Signage Only |
| Scenario 1: 30 / 30 | Residential: 5 – 10 km/h Collector: 8 – 15 km/h | Residential: 5 – 10 km/h Collector: 4 – 8 km/h |
| Scenario 2: 30 / 50 | Residential: 5 – 10 km/h Collector: 2 – 5 km/h | Residential: 5 – 10 km/h Collector: 0 km/h |
| Scenario 3: 40 / 40 | Residential: 1 – 5 km/h Collector: 4 – 8 km/h | Residential: 1 – 5 km/h Collector: 1 – 4 km/h |
| Scenario 4: 30 / 40 | Residential: 5 – 10 km/h Collector: 4 – 8 km/h | Residential: 5 – 10 km/h Collector: 1 – 4 km/h |
| Scenario 5: 40 / 50 | Residential: 1 – 5 km/h Collector: 2 – 5 km/h | Residential: 1 – 5 km/h Collector: 0 km/h |
| Scenario 6: Existing Limits | Residential: 0 km/h Collector: 2 – 5 km/h | Residential: 0 km/h Collector: 0 km/h |

Reductions in driving speeds along roadways has been shown through local and international evidence to reduce the number and severity of collisions that occur.

Figure 5.1 illustrates the likelihood of a fatality as a result of a collision at certain speeds. As shown, when speed increases the likelihood of death also increases. The effect is more pronounced if the collision involves a pedestrian or cyclist. For these collisions, the steepest part of the curve is between 30 km/h and 50 km/h, which means that small changes in collision speed can have significant influence on the outcome.

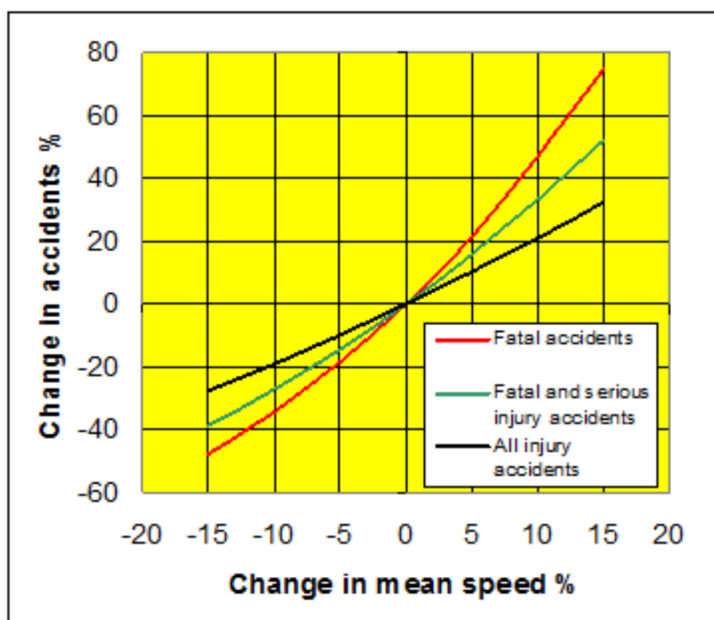
Technical Analysis for Neighbourhood Speed Limit Review

Figure 5.1: Cumulative Probability of Fatality based on impact type and speed



The change in collisions resulting from changes in speeds is best described by the Nilsson's Power Model, graphically represented in Figure 5.2. The Nilsson's Power Model generally describes that a 1% change in average speed will result in a 2% change in all collisions, a 3% change in injury collisions and a 4% change in fatal collisions.

Figure 5.2: Nilsson's Power model graphical representation (Nilsson 2004)



Technical Analysis for Neighbourhood Speed Limit Review

This relationship was verified in Calgary when times for school zones and playground zones were harmonized (07:30 – 21:00) and in effect year-round. Despite some public and political opposition, the evaluation found speed reductions for existing and new hours resulted in measurable injury collision reductions. Edmonton adopted Calgary’s playground zone approach and found significant speed reductions of 12 km/h (previously, Edmonton had ‘areas’ of warning but no regulatory speed reduction) with a resulting injury/fatality collision reduction of 45%, consistent with the Nilsson’s Power Model. In 2018, the effect of neighbourhood traffic calming to change the road environment along 1 Avenue NE in Bridgeland using temporary materials (Traffic Calming Curbs, paint, delineators) demonstrated the ability to improve speed compliance by 14% (3-5km/h reduction) with a higher than expected reduction in injury collisions of 75% and a 36% decrease in all collisions.

Based on this analysis, the reduction in collisions for each scenario was calculated, as summarized in Table 5.3.

Table 5.3: Collision Reduction Per Scenario

| Scenario | Annual Collision Reduction | |
|---------------------------------------|---|--|
| | With Traffic Calming | Bylaw and Signage Only |
| (Residential / Collector Speed Limit) | | |
| Scenario 1: 30 / 30 | All: 1,181 - 2,271 / year Casualty: 116 - 221 / year | All: 816 - 1,631 / year Casualty: 72 - 144 / year |
| Scenario 2: 30 / 50 | All: 633-1,357 / year Casualty: 51-112 / year | All: 450-900 / year Casualty: 29-58 / year |
| Scenario 3: 40 / 40 | All: 456-1,181 / year Casualty: 49-116 / year | All: 181-816 / year Casualty: 17-72 / year |
| Scenario 4: 30 / 40 | All: 816-1631 / year Casualty: 72-144 / year | All: 541-1,266 / year Casualty: 40-101 / year |
| Scenario 5: 40 / 50 | All: 273-907 / year Casualty: 27-83 / year | All: 90-450 / year Casualty: 6-29 / year |
| Scenario 6: Existing Limits | All: 183-457 / year Casualty: 22-54 / year | All: 0 / year Casualty: 0 / year |

The average collision reduction per scenario was then multiplied by the societal costs for collisions, resulting in the estimated benefit for each scenario for cost comparison purposes.

Technical Analysis for Neighbourhood Speed Limit Review

Table 5.4: Estimated Societal Benefit of Collision Reductions in Neighbourhoods

| Scenario (Residential/Collector) | Value of Annual Collision Reduction | |
|----------------------------------|-------------------------------------|------------------------|
| | With Traffic Calming | Bylaw and Signage Only |
| Scenario 1: 30 / 30 | \$52.1M | \$36.9M |
| Scenario 2: 30 / 50 | \$30.0M | \$20.3M |
| Scenario 3: 40 / 40 | \$24.7M | \$15.0M |
| Scenario 4: 30 / 40 | \$36.9M | \$27.2M |
| Scenario 5: 40 / 50 | \$17.8M | \$8.1M |
| Scenario 6: Existing Limits | \$9.6M | \$0 |

How did the project estimate the cost of each scenario?

In order to understand the costs associated with each proposed scenario, the project team reviewed the capital costs and operating costs to The City for each option.

Capital costs are one-time costs associated with physical materials such as signs and traffic calming construction. In order to understand the city-wide costs of these scenarios, the project team developed signage plan concepts (to create the appropriate legal environment) and traffic calming plans (to create credible physical environments to support those speed limits) for a selection of communities for each scenario. By looking at communities of different age and layout, and their prevalence across the City, the overall capital cost estimates for the program can be calculated.

Signage costs vary by scenario. It is a general practice at the City of Calgary that speed changes of 20 km/h or more are denoted by signage, regardless of the unposted limit. For scenarios where the Collector speed limit is different from the unposted limit, a number of new signs will be required on these roadways. All scenarios involving a change in the unposted speed limit include perimeter signage at City entrance points to notify visitors of the unposted limit.

The plans created were high level, and applied typical construction costs per measure to estimate the total cost. As part of an implementation plan for any scenario, detailed plans (locating each specific sign and construction drawings for each traffic calming measure) would need to be developed.

The capital costs to implement each scenario for a typical community are summarized in Table 5.5 and the city-wide costs are summarized in Table 5.6. It is worth noting that city-wide costs were developed by assuming traffic calming would be applied to the full Collector road network. As shown in Chapter 2 of this report, some communities may be a higher priority for broadly applied traffic calming than others. As such, the estimates presented in Table 5.6 represent a conservative high-end cost for complete retrofit of Calgary's collector road network.

Temporary traffic calming approaches have been successfully piloted in Calgary to demonstrate that approaches using low-cost and quick to deploy materials can be effective in reducing driving speeds. Traffic calming curbs (precast, drop in place units), painted lines, delineators, bolt down temporary speed humps, removable planters and other placemaking materials can emulate the effect of permanent curb extensions, speed humps, and physical narrowing of

Technical Analysis for Neighbourhood Speed Limit Review

roadways. Recent projects have demonstrated that traditional permanent construction techniques cost approximately 12 times as much to implement for the same effect.

These materials are not without their challenges, however. Due to their temporary nature, ongoing maintenance is required and some aspects of these tools introduce difficulties for people with accessibility challenges such as visual impairment or wheelchair use. In general, The City prefers to deploy these materials for a limited time to test the effectiveness and resident acceptance of permanent changes to road infrastructure.

Table 5.5: Estimated Implementation costs per Neighbourhood (on average)

| Scenario (Residential / Collector Speed Limit) | One Time Implementation Capital Cost per Neighbourhood | | |
|---|--|---------------------------------------|---------------------------------------|
| | Signage Only | Signage and Temporary Traffic Calming | Signage and Permanent Traffic Calming |
| Scenario 1: 30 / 30 | \$18.4K | \$466K | \$5.6M |
| Scenario 2: 30 / 50 | \$34.5K | \$213K | \$2.3M |
| Scenario 3: 40 / 40 | \$7.5K | \$276K | \$3.4M |
| Scenario 4: 30 / 40 | \$21.7K | \$290K | \$3.4M |
| Scenario 5: 40 / 50 | \$10.9K | \$190K | \$2.2M |
| Scenario 6: Existing Limits | \$0 | \$179K | \$2.2M |

Table 5.6: Estimated Implementation Costs City Wide (Capital)

| Scenario (Residential / Collector Speed Limit) | One Time Implementation Capital Cost City Wide | | |
|---|--|---------------------------------------|---------------------------------------|
| | Signage Only | Signage and Temporary Traffic Calming | Signage and Permanent Traffic Calming |
| Scenario 1: 30 / 30 | \$3.9M | \$98.9M | \$1,193.9M |
| Scenario 2: 30 / 50 | \$7.3M | \$45.3M | \$482.3M |
| Scenario 3: 40 / 40 | \$1.6M | \$58.6M | \$713.6M |
| Scenario 4: 30 / 40 | \$4.6M | \$61.6M | \$716.6M |
| Scenario 5: 40 / 50 | \$2.3M | \$40.3M | \$477.3M |
| Scenario 6: Existing Limits | \$0 | \$38.0M | \$475.0M |

Operating impacts to City business units were also estimated. These costs are based on it taking more person hours to provide the current level service on some core City services that involve staff spending significant amounts of time travelling on neighbourhood roads in the course of delivering that service.

Technical Analysis for Neighbourhood Speed Limit Review

The largest of these expenses comes from impacts to Calgary Transit. Although the impact for an individual transit customer in terms of trip time would be comparable to impacts to drivers (see Chapter 3), calculations indicate that the cumulative effect of small delays on each circuit would mean that either service frequency (how often a bus comes) would be reduced or additional busses would need to be added to each route to maintain current service frequency. Additional busses require additional drivers, fuel, and other ongoing costs. In practice, these two options reflect two ends of a spectrum, where the most likely approach would be to strike a balance between increased cost and reduced service frequency.¹

In order to demonstrate the impact of these strategic choices, cost benefit calculations both with service maintained at current levels and with operating budgets held fixed (with associated service level reductions) are presented in the following section. Table 5.7 outlines the operating costs associated with maintaining current service levels by scenario.

Table 5.7: Estimated Operational Cost Impacts (Maintaining Current Service Levels)

| Scenario and Implementation item | Business Unit Impact Estimates | | | | |
|----------------------------------|---|-------------------------------------|----------------|-------------------|----------------------|
| | Transit One Time Capital (additional Busses) | Transit Operations including Access | Water Services | Roads Maintenance | Other Business Units |
| Scenario 1: 30 / 30 | \$71.7M | \$31.5M / year | \$1.3M / year | \$1.5M / year | <\$0.1M |
| Scenario 2: 30 / 50 | \$5.4M | \$2.3M / year | \$1.1M / year | \$1.3M / year | <\$0.1M |
| Scenario 3: 40 / 40 | \$54.0M | \$22.4M / year | \$0.5M / year | \$0.7M / year | <\$0.1M |
| Scenario 4: 30 / 40 | \$55.8M | \$22.9M / year | \$1.1M / year | \$1.3M / year | <\$0.1M |
| Scenario 5: 40 / 50 | \$3.6M | \$1.4M / year | \$0.5M / year | \$0.7M / year | <\$0.1M |
| Scenario 6: Existing Limits | \$0 | \$0 | \$0 | \$0 | <\$0.1M |

Cost-benefit Calculations

In order to assess the relative merits of each scenario, the project team computed benefit-cost ratios for each scenario. For these calculations, all costs were held in 2020 dollars, and the costs and benefits were evaluated against a twenty year period. The results of this analysis are presented in Table 5.8.

¹ Please note that this report is issued during a local state of emergency associated with the Covid-19 pandemic. All analysis is based on operating costs observed pre-pandemic. It is beyond the scope of this report to anticipate changes to City service levels and their costs as a result of changes arising from this event.

Technical Analysis for Neighbourhood Speed Limit Review

In this analysis, values greater than one indicate more benefit to society than the implementation and ongoing operational costs associated with the work over the initial 20 year period. As noted previously, this analysis is based on societal value of collision reduction only, and does not account for less tangible liveability benefits such as reduced noise and greater comfort for residents. Given that a significant portion of the costs are one-time capital expenditures, cost-benefit ratios below but close to 1.0 would be expected to repay their costs in the years following the evaluation period.

Table 5.8: Benefit to Cost Estimates of Speed Limit Scenarios

| Scenario (Residential / Collector Speed Limit) | Benefit Cost Ratio | | | |
|---|---------------------------------|-------------------------|---------------------------------|-------------------------|
| | Maintain Current Service Levels | | Accept Service Level Reductions | |
| | Bylaw and Signage Only | With Traffic Calming | Bylaw and Signage Only | With Traffic Calming |
| Scenario 1: 30 / 30 | 0.7 | 0.28 | 162.5 | 0.83 |
| Scenario 2: 30 / 50 | 25.0 | 1.05 | 49.2 | 1.15 |
| Scenario 3: 40 / 40 | <0* | 0.02 | 135.8 | 0.66 |
| Scenario 4: 30 / 40 | 0.9 | 0.32 | 104.1 | 0.97 |
| Scenario 5: 40 / 50 | 17.7 | 0.64 | 48.6 | 0.70 |
| Scenario 6: Existing Limits | N/A** | 0.41 | N/A** | 0.41 |

*Costs exceed benefits due to annual operational impacts included in analysis

**No additional costs or benefits associated with this scenario in the absence of traffic calming

As shown, there are some options with favourable cost-benefit ratios based on this high level review.

In terms of operational impacts, the two options presented here represent two extremes of a spectrum of choices with respect to how much investment is made to support service levels. Benefit Cost Ratios were also calculated for the use of temporary traffic calming measures and could represent a middle ground to make some high priority improvements at a lower cost when there is intent to make those measures permanent.

Also, as noted previously, the capital cost estimates for this work are based on complete retrofit of the Collector road network in all neighbourhoods. A targeted application of traffic calming and reduced speed limits to underperforming Collector roadways would have the potential to improve the cost-benefit ratio for any of the scenarios with traffic calming included.

Technical Analysis for Neighbourhood Speed Limit Review

Chapter 6: Recommendation

The purpose of this chapter is to outline the considerations beyond cost and benefit that led the project team to the recommendations presented to Council.

It is not easy to make a recommendation on how best to improve safety when it is balanced against the potential costs of renovating a significant portion of our roadway network, and to do so in a way that the public we serve understand and accept the change.

The project team has developed a long-term vision to guide a sustained effort towards improved safety and liveability, with a strategically selected series of short term recommendations to move The City towards that long-term goal.

Long Term Vision

Given that the goal of this project is to support the City's overall efforts to eliminate deaths and serious injuries on our transportation network, an initial assessment of scenarios was completed to identify the best value scenario for a long-term vision for speed limits in neighbourhood streets.

In general, options which ensured drivers would experience a credible speed limit relative to the design of the roadway are preferred. Although some scenarios achieve high cost-benefit due to the collision reductions associated with partial compliance, it is anticipated that these scenarios will make the work of shifting the overall driving culture towards a greater sensitivity around speed more difficult.

Referring to Table 5.8 above, the project team evaluated each scenario closely. While Scenario 1 most closely aligns with international best practice (as manifested by Vision Zero approaches in other jurisdictions), there are some significant challenges to achieve this state in Calgary, particularly with respect to the Collector road network.

Even with cross sections to create an environment where 30 km/h would be credible along a given block or stretch of a Collector road, the distance drivers would frequently need to travel along these roadways will make it challenging to present that speed limit as credible for the full length of the roadway.

Recognizing that it is not feasible to rewrite the built fabric of communities (that is, because it would be cost-prohibitive to break up communities to introduce more access points and roads through existing neighbourhoods) and also recognizing the very significant impact of 30 km/h on Collectors to transit service in Calgary, the project team identified Scenario 4, (30 km/h on Residential roads and 40 km/h on Collectors) with a targeted approach to service modifications, as a useful vision and direction for a twenty-year horizon.

Looking at the right-most column, Scenario 4 demonstrates a high cost-benefit calculation (where benefits are only measured in terms of collision reduction and not enhanced overall liveability) and makes a positive change to the conditions on Collector roadways, which are a recurring thread in all community conversations about speeding in neighbourhoods.

How Do We Get There?

With a long-term vision of our transportation network that provides a credible environment for Scenario 4, the project team assessed current conditions and the magnitude of the task to modify existing conditions to create the desired credibility.

Technical Analysis for Neighbourhood Speed Limit Review

Currently, Residential roads in Calgary provide environments that are generally aligned with a 40 km/h speed limit (as supported by recent speed observations on Residential roadways) so a short-term scenario that includes changing the legal speed limit on Residential Roadways to 40 km/h is likely to be successful.

Currently, most Collector roads in Calgary provide environments are generally aligned with a 50 km/h speed limit, with some larger roads providing a reasonable level of comfort for driving at 60 km/h or higher, particularly those Collector roadways with multiple lanes in each direction and medians separating the two flows of traffic.

Considering these two factors, a short-term change to speed limits on Residential but not Collector roadways is achievable. This could be achieved in one of two ways:

1. Post all residential streets to 40 km/h and leave the unposted speed limit at 50 km/h.
2. Change the unposted limit to 40 km/h and post Collector Roadways at 50 km/h where the environment is not (yet) appropriate to a lower limit.

Option 2 is preferred for several reasons. First, it requires significantly fewer signs to achieve. Second, it provides a clear signal to residents, businesses, and industry, that The City is serious about broad and systematic change. Finally, this change would be in alignment with the bylaw approach that the City of Edmonton is taking, ensuring some consistency in terms of how speed enforcement is prosecuted in our two jurisdictions.

Therefore, the first recommended action is to revise the unposted speed limit to 40 km/h, in accordance with the requirements outlined in the City Charter, which includes notifying residents of the change, posting gateway signage for all drivers entering the city, and conducting a public hearing on the proposed bylaw amendment. For details, please see the Implementation Plan included as Attachment 3 of Council Report TT2020-1036.

In order for this new unposted limit to retain its credibility, The City will post most Collector roadways in the City to 50 km/h. This is the second recommendation of the report. The choice of “most” is deliberate. Calgary’s Collector network was built over the past century, with varying standards and approaches to safe design. Some roads were declared Collectors long after their construction to meet the needs of network prioritization, transit and emergency access, or snow clearing priorities. Some Collectors, particularly in Calgary’s oldest communities, function credibly at 40 km/h today.

These roads represent only a small fraction of the total network. One task associated with the implementation of the recommendations in this report will be to review in detail and identify those Collector roadways that do not require further treatment to credibly operate with a 40 km/h limit and exclude them from the general effort to post Collectors to 50 km/h. There may also be select Residential Streets that function more like Collectors (often serving as Transit routes despite their designation) which would be reviewed for appropriateness of the unposted limit.

On its own, the effort to change the speed limit on Residential Streets is expected to reduce the number of collisions in neighbourhoods by about 300 per year in the short term. The estimated cost of design and implementation of the signage and supporting education and awareness campaign is \$2.3M dollars.

The third recommended action is to update our design standards so that future Residential roadways are constructed to support a speed limit of 30 km/h and future Collector roadways are constructed to support a speed limit of 40 km/h. For new communities, this will mean posting

Technical Analysis for Neighbourhood Speed Limit Review

Residential roadways with a 30 km/h limit, while new collectors will operate at the unposted limit. These design standards will also inform retrofit projects of roadways in existing communities.

Design standards cannot be changed overnight. The existing standards are the result of extensive engagement and collaboration within The City and with our partners in the development industry who design and construct many of the roadways that will serve future residents. The third recommended action directs Administration to embed the desired operating speed on these roadways into upcoming revisions of design standards.

With these new standards in place, existing programs in traffic calming, road safety, road maintenance/lifecycle, complete streets, and Main Streets will represent numerous opportunities to renovate existing Collector Roadways to create credible environments for a 40 km/h speed limit. Guided by new road standards, retrofit projects will allow the City to incrementally bring more communities into alignment with our long-term goals for safety and liveability in neighbourhoods.

These actions together will begin to move Calgary towards the long-term vision of safe, comfortable neighbourhoods. The effectiveness of this program will be monitored and reported to Council through subsequent reports on the Safer Mobility Plan. In time, once most Collectors are operating credibly at 40 km/h, The City will revisit progress on Residential roadways, and determine when and how to take the next step towards a long-term Vision Zero approach to our streets.

Neighbourhood Speed Limits Review

Implementation Plan for Recommended Option

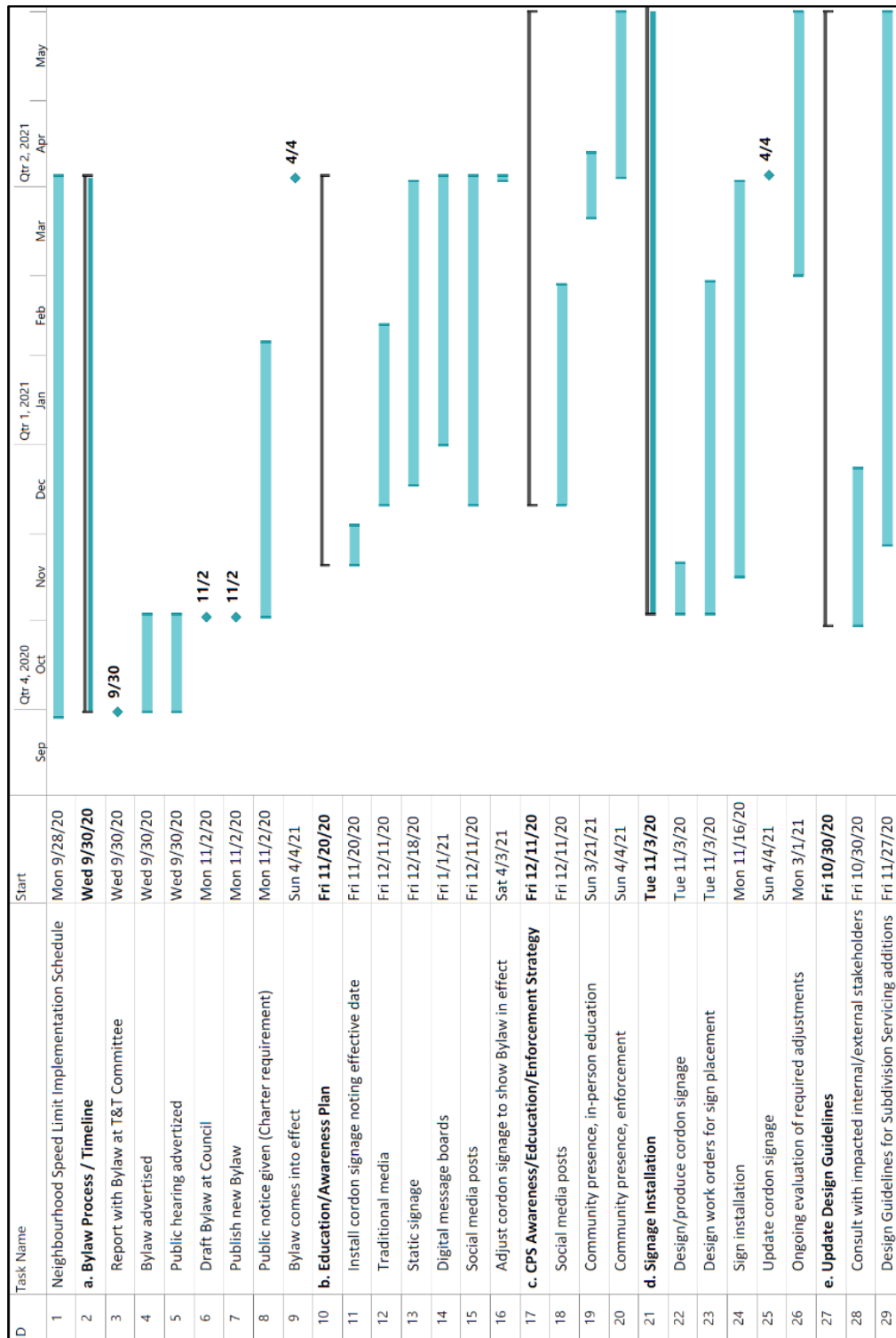
The implementation plan outlined in this attachment summarizes the intended approach to achieve a default speed limit of 40 km/h with posted speed limits of 50 km/h on Collector roads. A selection of collector roads may not be posted at 50 km/h based on functionality of the roadway or other features which create a credible built environment that support 40 km/h; further description of this review of collector roads will be provided in this attachment.

The schedule has been divided into tasks which will be underway at the same time and which will be highly interdependent to coordinate efforts, e.g. education/awareness by the City and the Calgary Police Service. The overall schedule is shown below with additional details provided in the following sections that match the lettered heading tasks in Figure 1.

As shown, the schedule has been prepared for an April 4, 2021 effective date for the change to the unposted speed limit so that it will be in effect by Spring 2021.

Implementation Plan for Recommended Option

Figure 1: Implementation Plan Schedule



Implementation Plan for Recommended Option

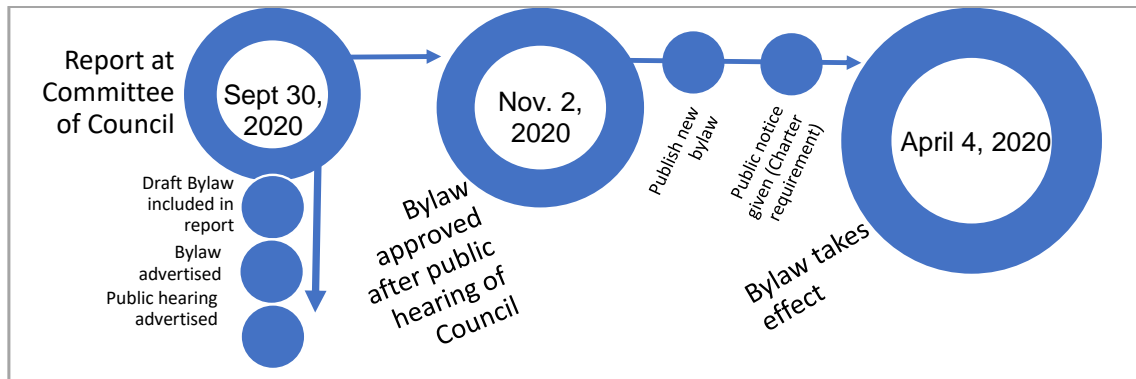
a. Bylaw Process / Timeline

Changing the default speed limit in Calgary will be completed through a City Charter bylaw. A Charter bylaw is passed as a public hearing item at a Council meeting and requires 30 days of advertising the draft bylaw before it reaches the Committee or Council session where it will be discussed. Additional advertising is also made for the public hearing itself. After the bylaw is passed, this Charter power requires giving public notice (specified in the bylaw advertisement regarding timelines and methods for notice) before it is implemented. This public notice would run from projected bylaw approval on November 2, 2020 to April 4, 2021. From consultation with City Law, Calgary Police Service Law and the Alberta Crown Prosecutor’s office, this notice period would satisfy the requirements of the Charter. The general timeline is shown in Figure 2.

Administration has begun this process by preparing a draft bylaw (included with this report as Attachment 4) to advance with the report to return to Council for public hearing on November 2, 2020. After the bylaw is passed by Council, anticipating this occurs immediately after the public hear on November 2, tasks to prepare signage and educational programs to support the change would be initiated as shown in the overall timeline prior to the bylaw coming into effect on April 4, 2021.

Review of the Charter and legal provisions have shown that speeding citations will continue to be Alberta Traffic Safety Act infractions and subject to demerits, rather than a bylaw infraction. This was a key concern from CPS that has been confirmed not to be an issue.

Figure 2: Bylaw Timeline Chart



b. Education / Awareness Plan

Awareness and education about the speed limit change will be a gradual plan including the process through bylaw. Education and awareness will be focused on the 6-8 weeks period in advance of the bylaw coming into effect and will continue for the first month of the bylaw being in effect and then taper off. Traditional media and social media channels will be employed as well as roadside electronic Driver Message Signs and static signage, as identified in bylaw advertising and notice plan. Cordon signage will be posted on all entries to the City and can be placed in advance of the bylaw coming into effect and modified on April 4, 2021 to show that the bylaw is in effect. Further details of the plan will be coordinated closely with the Calgary Police Service and other traffic safety partners to leverage our efforts with consistent messaging.

Implementation Plan for Recommended Option

c. Enforcement Strategy

The awareness/education and enforcement plan for the Calgary Police Service is anticipated to follow a similar approach to the process used for the harmonization of school and playground zone times. This will include social media and traditional media and manned education/enforcement by the Traffic Section. Members of the Residential Traffic Safety Unit and the Traffic Response Units will be deployed, with possible support from Districts as needed. Interactions in the first month after the bylaw comes into effect are anticipated to result in education and warnings and limited citations for larger infractions. Following the initial educational grace period regular enforcement and issuing of speeding citation will resume and be adjusted as appropriate.

d. Signage Installation to Support Speed Limit Change

Maintaining the majority of Collector roads at 50 km/h in the recommended scenario allows for the signage changes to be initiated as soon as the bylaw is approved; posting Collector roads at 50 km/h is consistent with the existing law. Some Collector roads may be suitable to remain unposted (to become 40 km/h when the bylaw takes effect).

The review process is still being finalized. Available data and feedback will be incorporated into the review. Examples of criteria to evaluate Collector roadways are as follows:

- Collector roads that function as a collector (connect multiple residential roads to arterial roads), provide a connection to another collector roadway or loop back to itself, and carry higher traffic volumes (>2000 vehicles/day) are appropriate to sign at 50 km/h. (This is the vast majority of the Collector network.)
- Collector roads with narrow geometry, lower traffic volumes and speed profiles, when available, consistent with 40 km/h operations (e.g. average below 45 km/h or 85%ile below 50 km/h) may be appropriate to remain unposted.
- Stubs of collectors should not be posted unless they are approximately 500m or longer.
- In no case should cul-de-sacs be posted. In Suburban areas, some divided collectors may exist for safety servicing of an over-long cul-de-sac, these should not be signed.

Results of reviews will be documented to assist in prompt responses to future requests for review. Administration recommends that this process be managed at an administrative level rather than through council directive to promote an efficient and repeatable process while providing flexibility to adjust in the future when appropriate, e.g. following traffic calming or observed change in motorist behaviour, without requiring reassessment of previous Council direction of speed limits on specific roadways.

Examples for three communities of how the Collector roads could be signed and draft proposed speed limits within Neighbourhoods are presented in Figure 3 to Figure 5. Existing poles will be used wherever possible to minimize installation costs and maximize installation efficiencies. The total estimated cost of \$2.3 million includes a fixed cost of \$815,066 for signs, brackets and design with the remainder accounting for the installation cost. From recent quotes from industry, City supply and installation of signage is approximately 30% lower than contractor quotes and represents a cost efficiency over contracting and managing the work.

Implementation Plan for Recommended Option

Figure 3: Example signage configuration for Acadia

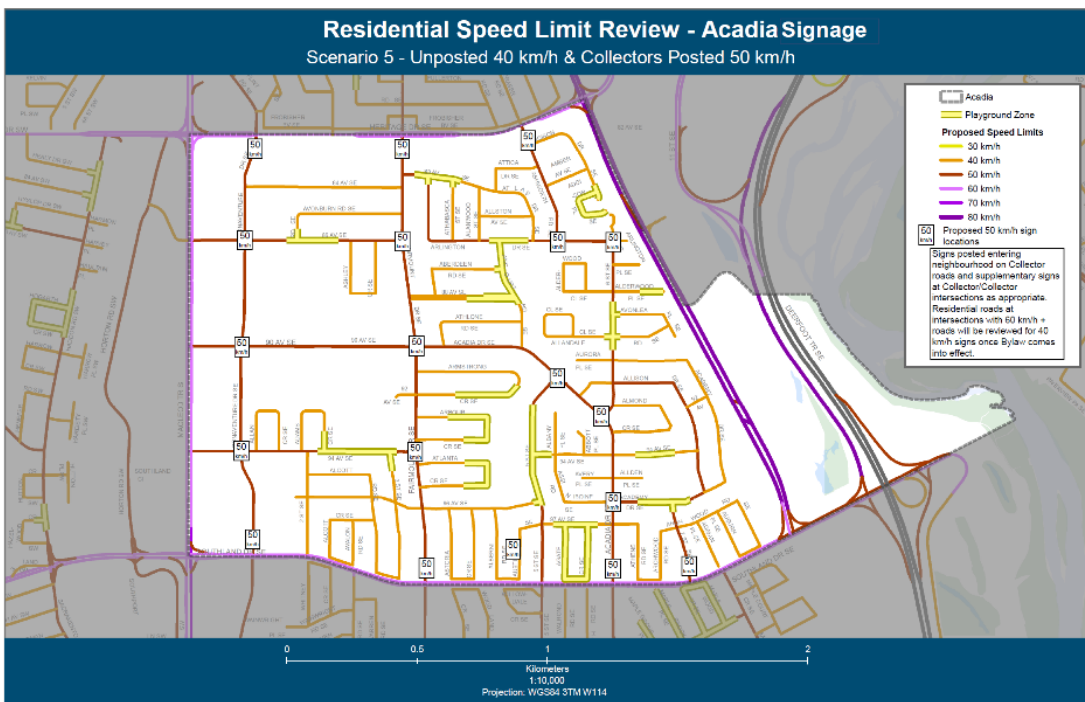
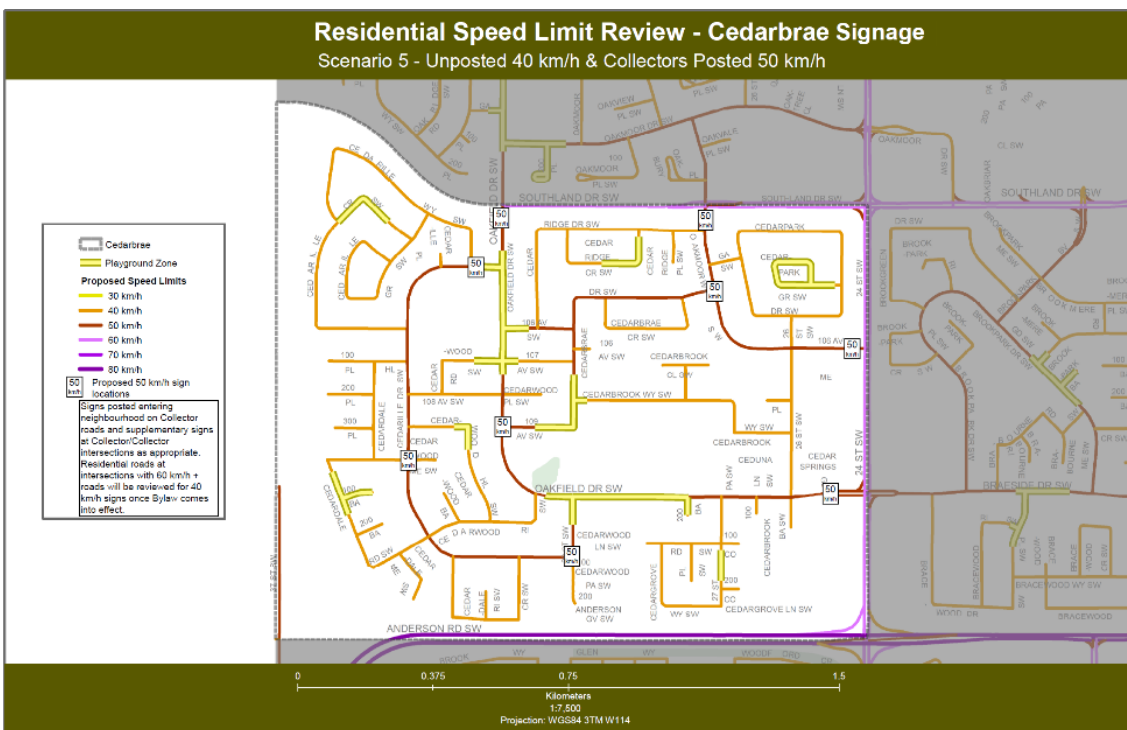
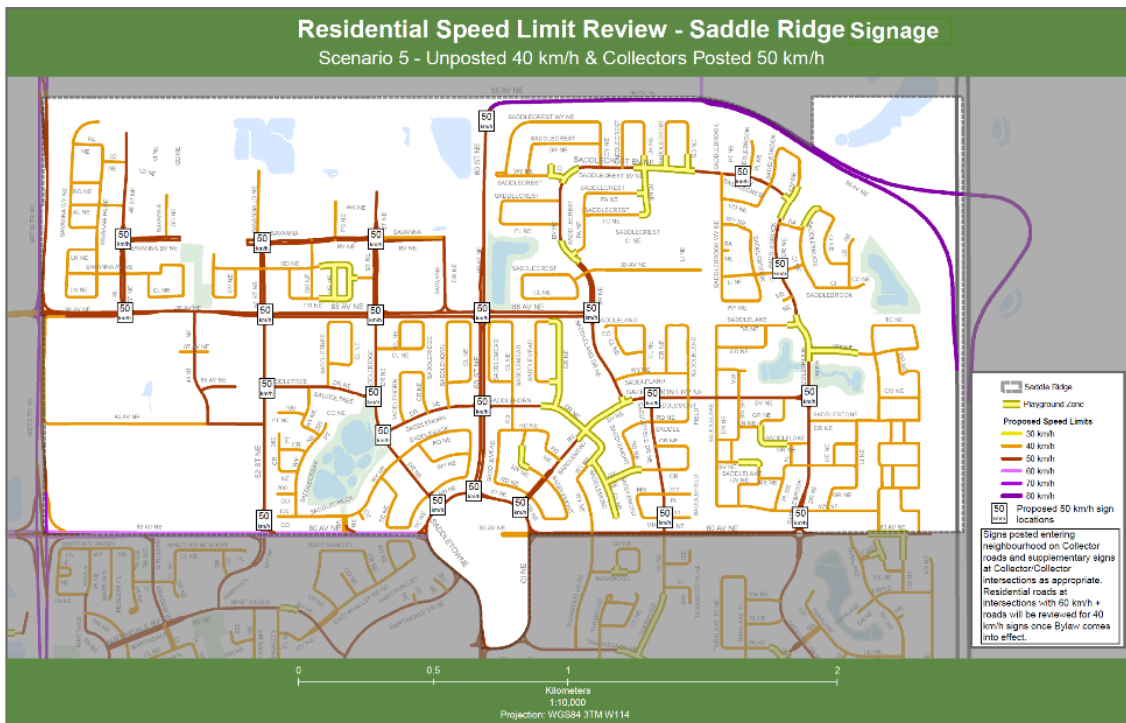


Figure 4: Example signage configuration for Cedarbrae



Implementation Plan for Recommended Option

Figure 5: Example signage configuration for Saddle Ridge



Through a review of sample communities to support cost estimates for the scenarios, it was determined that the design and installation time to complete the required signage changes, taking into consideration that the change would be happening over the winter months, can be completed before the anticipated bylaw effective date of April 4, 2021. Signage changes will be designed to capitalize on existing sign supports and infrastructure, where possible, but may require new sign posts in some cases.

Cordon signage will be posted on all entries to the City to alert entering motorists that the default speed limit will be changing to 40 km/h, and the date when the bylaw will come into effect. The cordon signs will be similar to the existing signs alerting entering motorists to the fact that the Calgary Police Service utilize photo enforcement within the city limits, example shown in Figure 6. The signs will be regulatory style signs, with black text on white background, since they will be alerting motorists to the upcoming legal change in advance of the bylaw coming into effect. These signs will be designed so that they can be easily modified once the bylaw comes into effect to alert motorists to that fact. Supplementary educational signage, of a similar format to the cordon signs, will be placed at key high traffic volume locations to alert Calgarian motorists who may not regularly leave and re-enter the city limits.

Figure 6: Examples of cordon signage for Checkstop and Photo Radar Enforcement



Implementation Plan for Recommended Option

e. Update Design Standards

A review of the Design Guideline for Subdivision Servicing is currently underway with respect to custom cross sections that have been constructed through the application of the Complete Streets Guidelines. At the same time, design standards are being reviewed for alignment with the Alberta Bicycle Design Guidelines. The addition of review for design standards for neighbourhood areas, including 40 km/h for Collector roads and 30 km/h for Residential roads, can be incorporated into this work. Geometric changes are anticipated to largely include the types of treatments used for traffic calming on existing roads and would include narrower lanes to encourage lower comfort speeds and improved voluntary compliance with a speed limit of 40 km/h or 30 km/h as appropriate. These changes will require consultation with internal and external stakeholders, including the development community.

Proposed Text for the City of Calgary Standard Speed Limits Bylaw

Short Title

1. This Bylaw may be cited as the “Speed Limit Charter Bylaw”.

Definitions

2. In this Bylaw:
 - (a) “*Act*” means the *Traffic Safety Act*, R.S.A. 2000, c. T-6;
 - (b) “*The City*” means the municipal corporation of The City of Calgary;
 - (c) the terms “*highway*”, “*street*”, “*traffic control device*” and “*Traffic Engineer*” have the same meaning as defined in the Calgary Traffic Bylaw 26M96.

Speed limit

3.
 - (1) Despite subsection 106(1) of the *Act*, the maximum speed limit for a *highway* or *street* located within the City of Calgary is established as 40 kilometres per hour,
 - (2) The speed limit established in subsection (1) does not apply to a *highway* or *street* where the speed limit is prescribed by a *traffic control device* posted by the *Traffic Engineer* pursuant to section 4(2) of the Calgary Traffic Bylaw 26M96.

Public notice

4.
 - (1) *The City* must post on its website calgary.ca a notice in respect of the speed limit set out in subsection 3(1) no later than March 1, 2021, and must maintain this notice on the website indefinitely.
 - (2) The *Traffic Engineer* must erect signs at the municipal boundary on all *highways* and *streets* entering into the City indicating the speed limit set out in subsection 3(1) no later than March 1, 2021.
 - (3) *The City* must advertise a notice in respect of the speed limit set out in subsection 3(1) on Traffic Advisory Radio, broadcasting at 107.9 MHz FM in the Calgary region, no less than 50 times per day, commencing on March 1, 2021 and continuing until November 30, 2021, or such longer period as the *Traffic Engineer* deems necessary.

Consequential amendment

5. Subsection 4(3) of the Calgary Traffic Bylaw 26M96 is deleted.

Draft Bylaw

Coming into force

6. (1) This Bylaw comes into force upon being published on the *City's* website in accordance with section 10 of the *City of Calgary Charter, 2018 Regulation*, AR 40/2018.
- (2) Despite subsection (1), section 3 comes into force on April 4, 2021.

Text for Discussion

Neighbourhood Speed Limits Update Report

Feedback from the Calgary Police Service

The Calgary Police Service was engaged as a key stakeholder and contributed information and guidance at the project team and advisory level.

After reviewing the draft report, CPS provided the following written statement summarizing their key concerns:

The Calgary Police Service (CPS) was consulted as a key stakeholder in traffic safety in the City of Calgary. The CPS recognizes that speed reduction is an important factor in collision reduction efforts and the related objectives of road safety and injury prevention / mitigation. As an organization, the CPS philosophically supports initiatives that promote traffic safety and reduces fatal and serious injury collisions. An important part of the CPS mandate is to promote traffic safety and to conduct enforcement and education aimed at achieving driver compliance. In order to achieve this, the CPS emphasized the importance of traffic calming measures that would be required in conjunction with the lowered speed limits. The CPS also provided feedback outlining the challenges associated with using a municipal bylaw to set a local speed limit as opposed to directly amending the Traffic Safety Act (TSA) to achieve greater province-wide consistency, road safety, and set notice to drivers. The CPS cannot support the use of a by-law to conduct speed enforcement if it fails to reference the TSA and engage the current legal process. Given the proposed plan regarding signage, the CPS provided feedback that fair notice to Alberta drivers is optimal when speed signs that conflict with the TSA are posted at each enforcement location. Failing to ensure fair notice could lead to challenges with prosecution of offences. The CPS supports in principle efforts aimed at increasing public safety however the CPS recognizes the clarity of role requirement for police agencies to remain neutral in these decisions and to enforce the law rather than make it.

The project team has confirmed that speeding enforcement will continue to be through TSA citation, relying on the current legal process and with no changes to ticket or demerit amounts per Provincial regulation.