Neighbourhood Speed Limits Review – Technical Analysis Report

Contents

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 incicate 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.

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 it 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.

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 fatalaties 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.

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**							
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**							
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.

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

Pedestrian, Cyclist and Motorcyclist Casualty Motor Vehicle Collision Data	**Year**							
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.

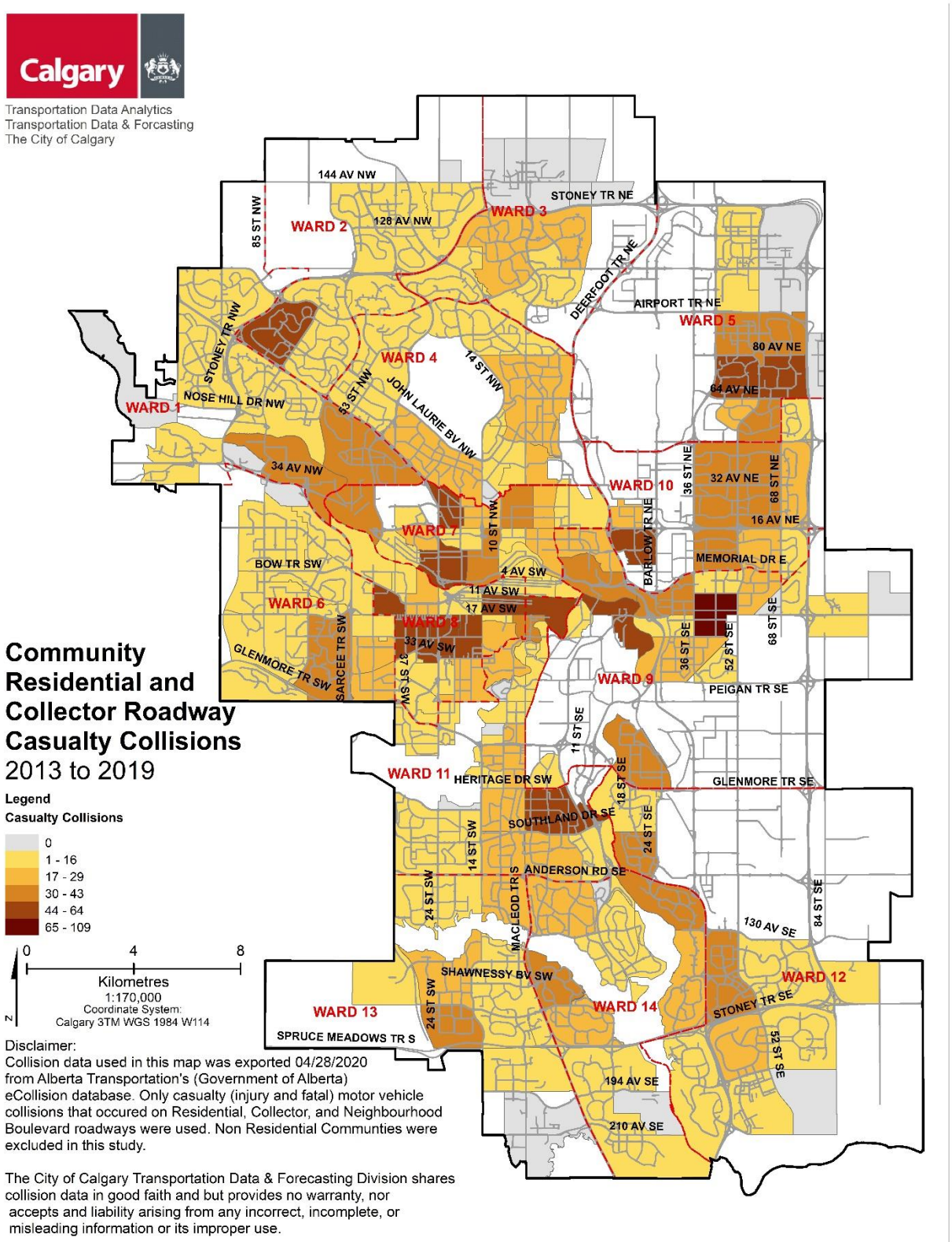
Where are Neighbourhood Collisions Occurring?

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.

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



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.

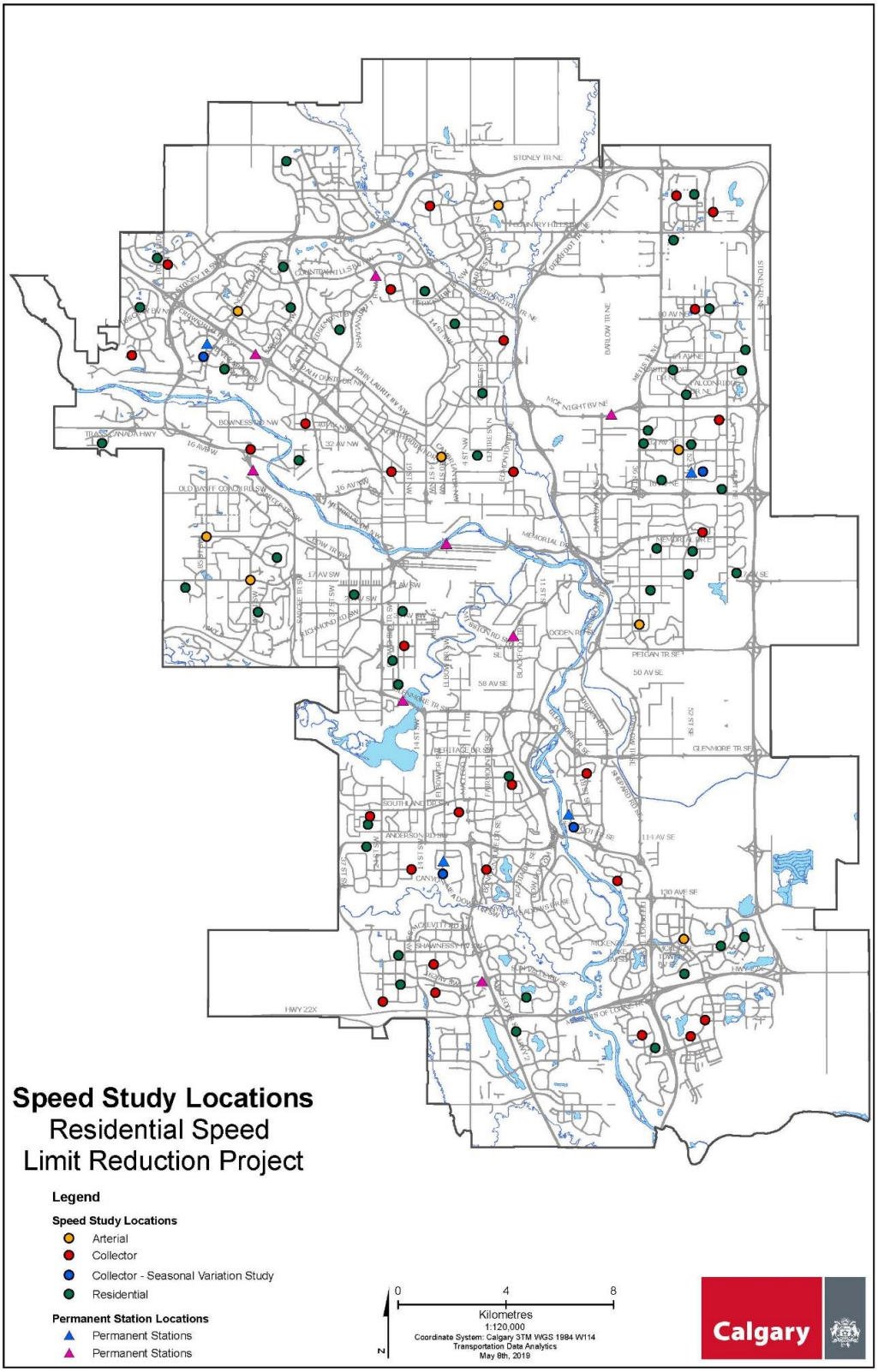
The results of the baseline studies (conducted in both the spring and fall of 2019) are summarized in Table 3.1.

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.

Figure 3.1: Baseline Speed Study Locations



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.

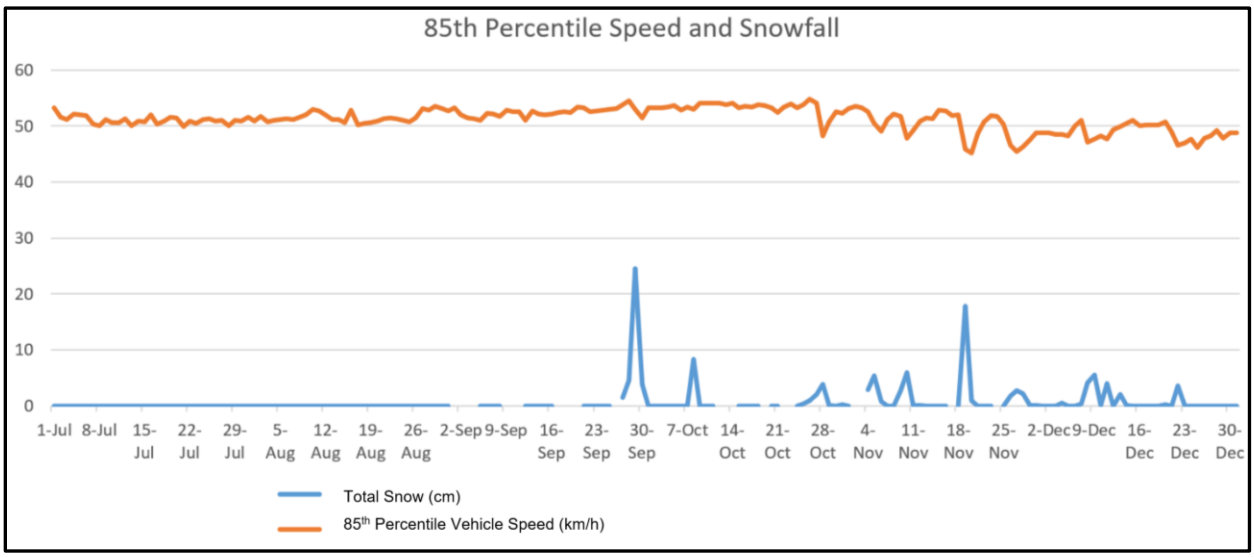
This reinforces that the experiences of residents on their streets do not align with the current speed limits. What may feel quite comfortable and safe for a driver does not appear to feel comfortable and safe for people walking and playing in the vicinity of that road. One unfortunate outcome of our 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.

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

neighbourhood contexts. However, it is important to recongnize 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.)

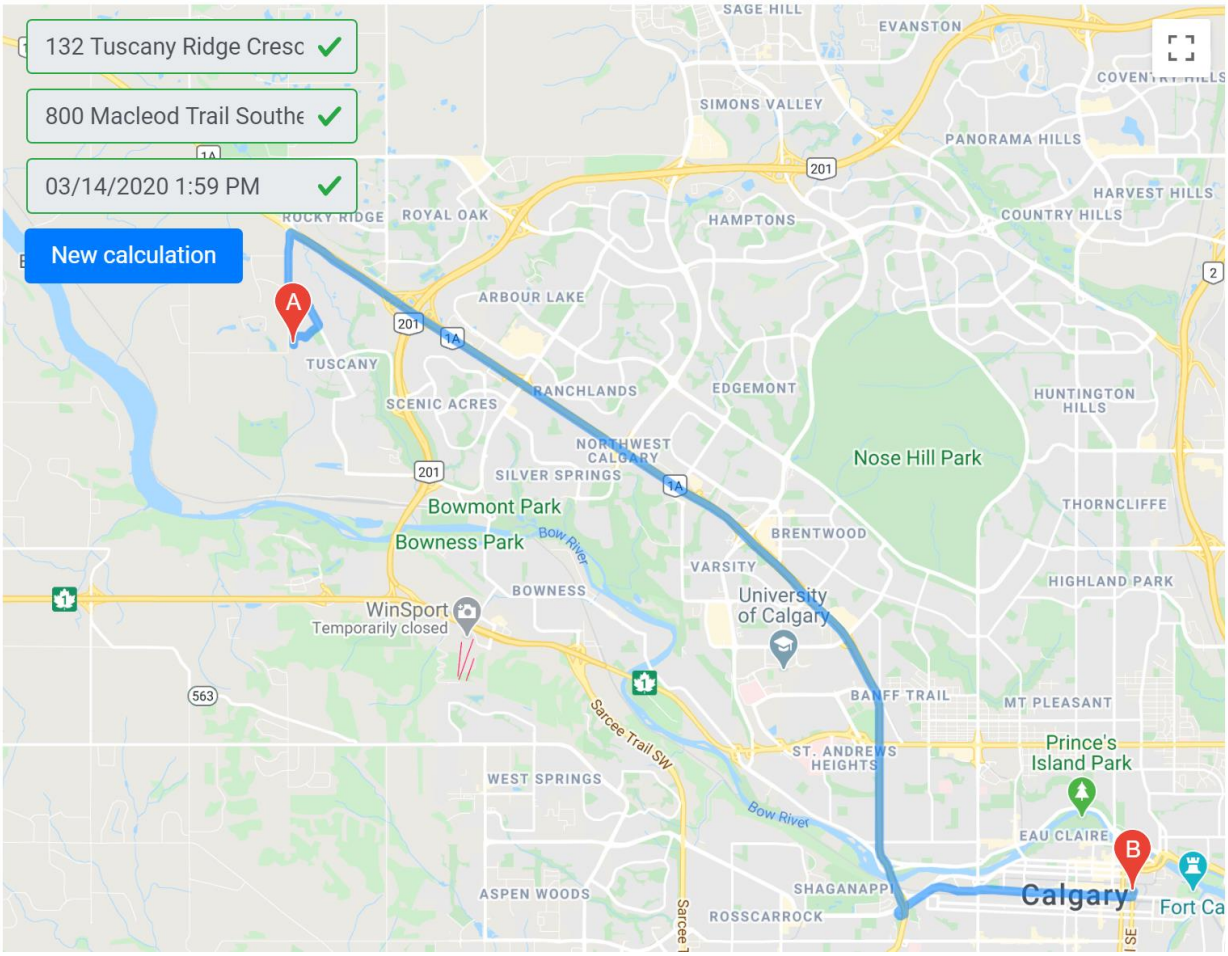
This demonstrates that the changes arising from changing speed limits in neighbourhoods will be less than the day-to-day variation experienced by drivers due to daily variation in traffic volumes, traffic signal phasing, and collisions along the route. In fact, reducing collisions in neighbourhoods would 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.

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.



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%.

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 Scarboro 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.

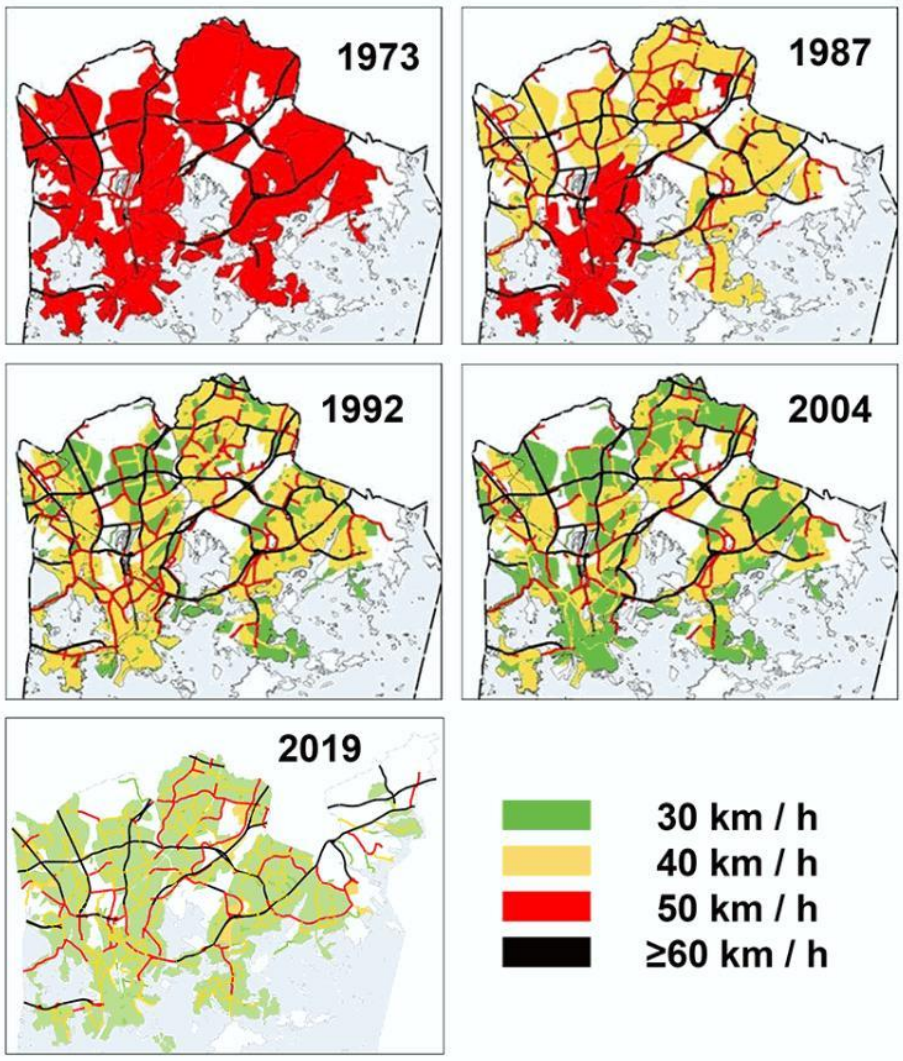
As shown, these approaches are relatively new to Canada, and data on Canadian outcomes is limited. International results demonstrate that changing neighbourhood speed limits is an important tool in an overall program to enhance road safety.

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.

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.

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 dymamics, 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 sensititvity 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 proceeedings	Reference to relatiohship 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.

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 evauate 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 proceeedings	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 repor 421	Evauation 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 effectice 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 consistient with times established in Calgary. Finding that observed reductions in speeds and reductions in collisions were consistent with expected recuctions using Nilsson's Power model (2004).

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 envirionment 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 vehichle 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 envirionment 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.

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.

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 asses, 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 anticiptated for each scenario to obtain the estimated societal benefit in dollars of the

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

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.

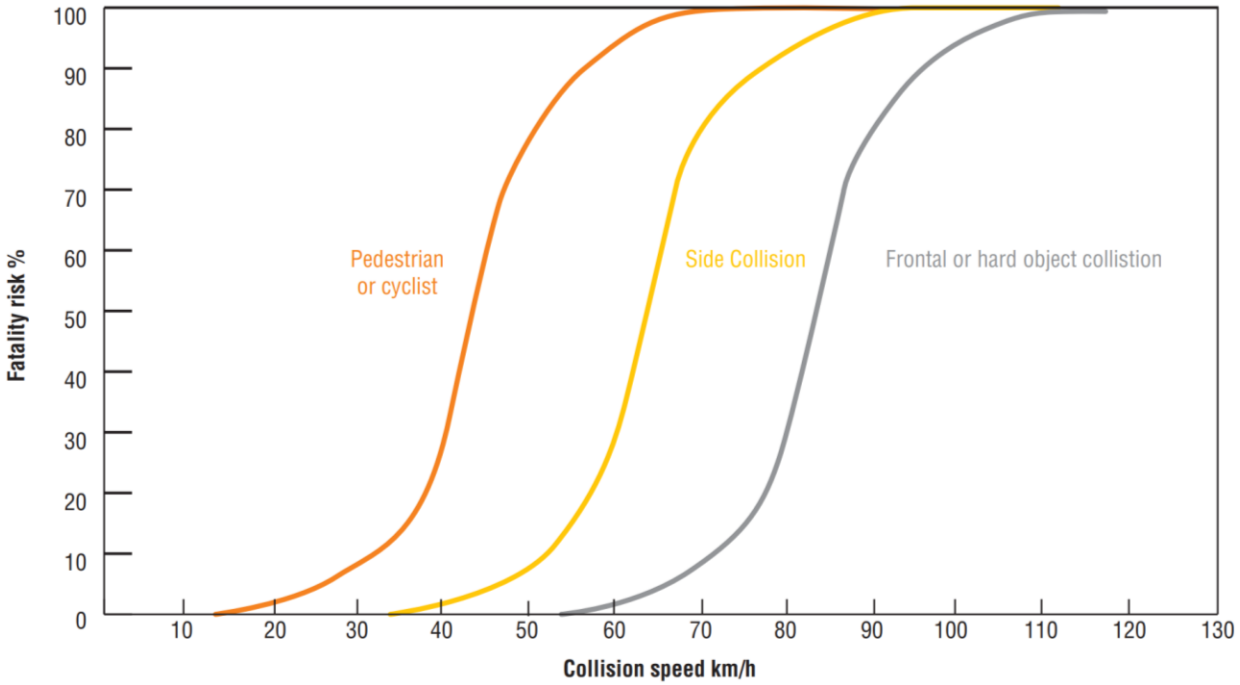
Table 5.2: Anticipated Changes in Average Operating Speed by Scenario

Scenario	**Anticipated Change in Average Operating Speed**	
(Residential / Collector Speed Limit)	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.

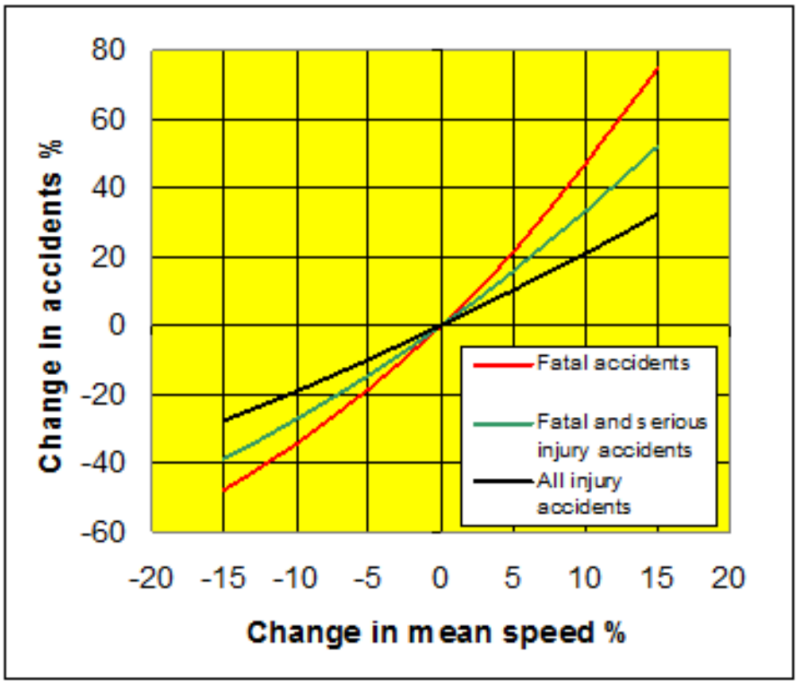
Figure 5.1 illustrates the likelihood of a fatality as a result of a collision at certain speeds. As shown, when speed increases the likelihood of death also increases. The effect is more pronounced if the collision involves a pedestrian or cyclist. For these collisions, the steepest part of the curve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

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)



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**	
(Residential / Collector Speed Limit)	With Traffic Calming	Bylaw and Signage Only
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.

Table 5.4: Estimated Societal Benefit of Collision Reductions in Neighbourhoods

Scenario (Residential/Collector)	**Value of Annual Collision Reduction**	
(Residential / Collector Speed Limit)	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

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	**One Time Implementation Capital Cost per Neighbourhood**		
(Residential / Collector Speed Limit)	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	**One Time Implementation Capital Cost City Wide**		
(Residential / Collector Speed Limit)	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.

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	**Business Unit Impact Estimates**				
Scenario and Implementation item	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.

In this analysis, values greater than one indicate more benefit to society that 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 liveablility 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	**Benefit Cost Ratio**			
(Residential / Collector Speed Limit)	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 targetted 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.

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.

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

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.