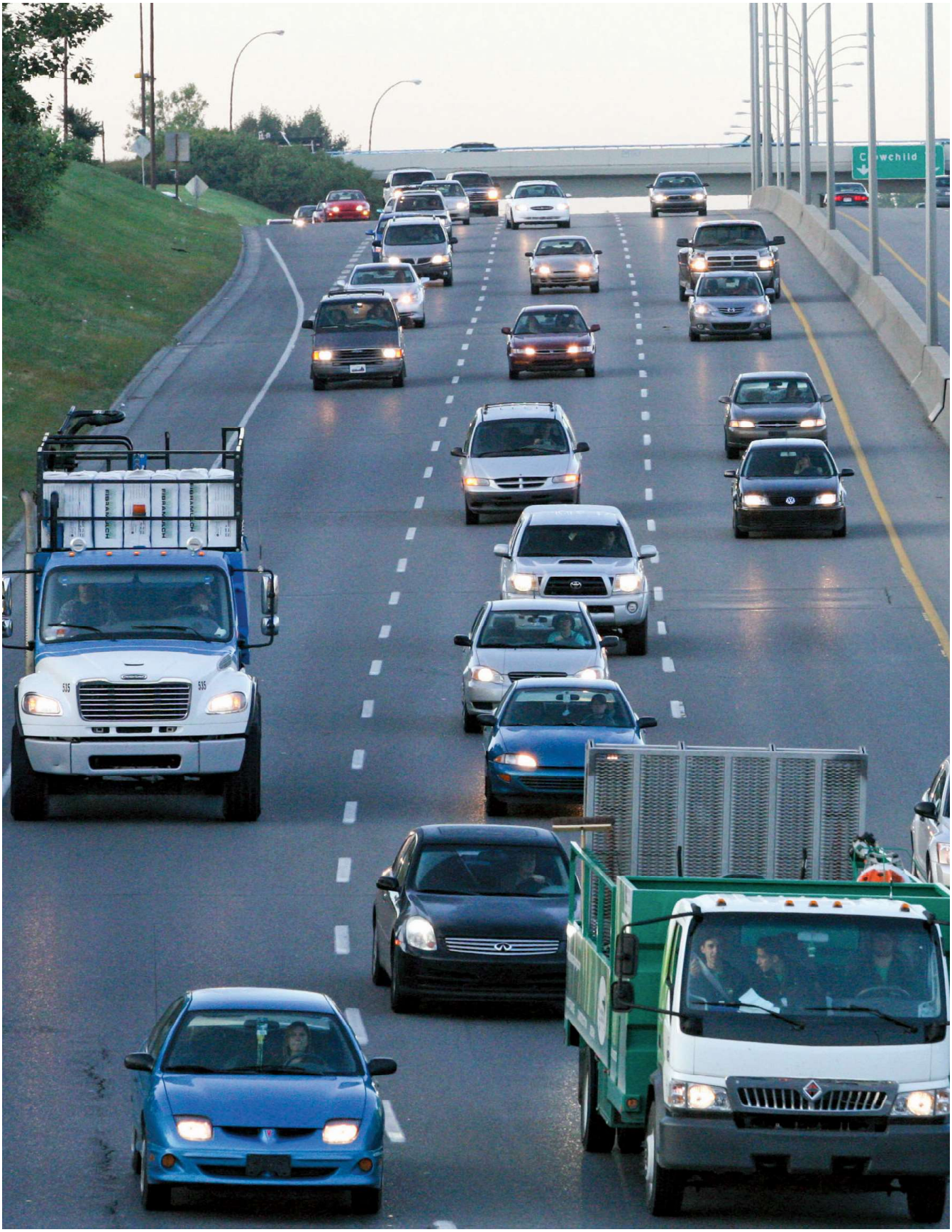
The Calgary Goods Movement Strategy

Moving together to help our economy



Message from Michael Thompson

General Manager of Transportation

Calgary's origins began where the Bow and Elbow rivers come together, a significant meeting place for the Siksika, and later the North West Mounted Police who eventually laid the foundation for our city. The City of Calgary has since established itself as an important destination in western Canada, a gathering place for minds to connect, goods and services to be exchanged and lives to prosper. Today, the Calgary Region connects local, national and international markets by rail, highway, pipeline and an international airport. As an inland port, Calgary enables the movement and distribution of goods between businesses from local markets to a large international scale.

Calgary's Transportation Plan and Municipal Development Plan recognize that the movement of goods is essential to Calgary's wellbeing, growth and quality of life. Calgary's goods movement industry supports approximately 134,000 jobs in the Calgary Region. It contributes up to $14.5 billion in our region's Gross Domestic Product. To continue to support Calgary's prosperity, and diversify, strengthen and attract new investments in our economy, I'm pleased to share the Goods Movement Strategy with you today.

Our Goods Movement Strategy outlines how to support the movement of goods throughout Calgary, by making improvements to our local transportation network. These improvements support the economy by effectively and efficiently moving goods to markets in the Calgary Region and beyond. The Goods Movement Strategy aligns with Council's decisions regarding new capital investments, priorities and funding, along with The City's Growth Strategy.

The team has done a tremendous job collaborating with the public and private sector, considering innovations and technological advancements. Their efforts to take a regional approach to develop this plan included examining common challenges and growing trends in transportation. Effective and efficient transportation networks will improve the reliability and availability of goods for all Calgarians, helping our city thrive for the next 30 years. I'm excited that the Goods Movement Strategy identifies actions and investments that will support the economic development of Calgary in the short and long-term.

Through the Goods Movement Strategy, we will make improvements to our local transportation network, making Calgary an even more attractive destination to live and make a living.

Sincerely,

Michael Thompson
General Manager, Transportation

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What is goods movement?

What is goods movement?

Goods movement is about how the products that we consume and businesses produce reach their destinations. This includes their journeys to, from and within Calgary.

Goods are also referred to as freight or cargo. They include all the items that people use in their every day life.

Goods movement includes the industries of transportation, logistics and warehousing. These industries are involved in the movement of goods between producers and consumers. With respect to goods movement, logistics involves the planning and coordination of the movement of goods between producers, businesses and consumers.

Goods can be moved by foot, bicycle, truck, train, airplane, ship or pipeline. Due to this, the Calgary Goods Movement Strategy is multi-modal. It considers all the vehicle-types and supporting infrastructure that enable goods to be delivered to Calgary residents and businesses.

While all modes of transportation are important to ensuring an effective goods movement system, the Calgary Goods Movement Strategy focuses on road based transportation generally. This is because nearly all goods need to be transported by truck eventually. However, all modes of transportation are important to ensuring an effective goods movement system.

Calgary is connected to local, national and international markets in several ways. Major railways, interprovincial and cross-border highways and a large international airport distribute products to and from businesses in Calgary and all over the world.

Why is goods movement so important?

The popularity of online shopping has increased the number of packages delivered to homes and businesses in Calgary. As a result, it has increased the number of delivery vehicles on Calgary's roads. It also means that more deliveries happen outside of traditional work hours.

Businesses in Calgary depend on the transportation network to bring them the products they need to help Calgarians live their daily lives. Some businesses buy raw materials such as wheat and barley to make into goods like flour and beer. Other companies buy goods for manufacturing and construction, like metal and lumber. Retailers ship pre-made items such as clothing, electronics and snack foods to Calgary for us to buy in malls and corner stores. The last kilometre of travel for many products happens on Calgary's roads and highways by truck or van.

Economic importance of goods movement in Calgary

Goods movement is a key contributor to and enabler of Calgary's economy. In recent years, Calgary has evolved into one of western Canada's leading multi-modal goods movement hubs. The Transportation, and Warehousing and Wholesale Trade sectors directly accounted for nearly 8 per cent or $9 billion of the Calgary region's gross domestic product (GDP) in 2015. These sectors in turn support other economic activity, yielding a combined GDP impact of more than $14.5 billion in 2015. They also directly and indirectly supported up to 134,000 jobs in the Calgary region.

Statistics Canada estimated that **$10 billion** in goods moved **from** the Calgary region to other regions of Canada by truck and rail in 2012, and **$13 billion** in goods moved **to** the Calgary region by truck and rail. The recent additions of large-scale distribution centres add to the growing footprint of warehousing and logistics in the Calgary region. These businesses can only thrive when they are complemented with a sustainable multi-modal transportation network to carry goods to, from and within Calgary and people between their jobs and homes.

Goods movement employment

The location of jobs in goods movement (transportation and logistics) industries provides some indication of where goods movement activity within Calgary is likely to start and end. These locations also indicate the key destinations to which workers in these industries must commute. Most of Calgary's employment in goods movement-related industries is clustered in the northeast, south of Calgary International Airport, and in the city's southeast between the CP and CN rail networks.

Around the airport, there is primarily air sector and support sector employment, which includes activities that relate to passenger transportation. There are also several warehousing, storage and trucking sector employers, which likely support the transit of freight through the airport.

In southeast Calgary, warehousing, storage, trucking and rail sector employment is clustered around areas with rail spur access. This also corresponds to the locations of many transload facilities and CP's intermodal terminal. A smaller cluster of employment is also located between CP's line south to Lethbridge and its line east to Regina.

Developing the strategy

Objectives

The Municipal Development Plan (MDP) and the Calgary Transportation Plan (CTP) set out the future direction for Calgary's urban form and transportation system. Both plans recognize that efficient goods movement is essential to Calgary's wellbeing and quality of life, as well as to the achievement of transportation, land use, economic and environmental aspirations and goals.

In support of this recognition, The City commissioned a Goods Movement Strategy. The Strategy will help determine what transportation infrastructure improvements need to be made to help Calgary thrive as a distribution hub over the next 30 years. The Strategy also will help The City support businesses and residents alike through continued improvements to Calgary's transportation network. These improvements will continue to help move goods efficiently to markets in Calgary and beyond.

The objectives of the Calgary Goods Movement Strategy (the "Strategy") are to:

- Identify and prioritize short-, medium- and long-term actions, policies and investments in transportation infrastructure to enhance the goods movement network in Calgary.
- Support the MDP's urban growth policies and the CTP's sustainable transportation initiatives, as well as identifying proposed changes to the CTP's Primary Goods Movement Network.
- Complement City and regional economic development initiatives by articulating the strong linkage between efficient goods movement and the economy.
- Review and, where appropriate, consolidate The City's bylaws related to goods movement. This includes the truck route map and Bylaw 60M90.

The Strategy has two sets of outcomes:

- **Policies** specific to goods movement that can be incorporated into future CTP, MDP and other City plans. The consolidated truck route bylaws also inform City policies.
- **Actions and investments.** The Strategy identifies potential investment areas in infrastructure and operations that warrant further investigation, for facilities that are under the jurisdiction of The City and other levels of government. The Strategy also identifies actions and investments in technology, operations and practices, based on best practices in Calgary and elsewhere that could be led by The City in conjunction with other private- and public-sector stakeholders.

The Calgary Goods Movement Strategy complements other City transportation plans that detail the development of the transit network (Route Ahead), the pedestrian network (Step Forward) and the bicycle network (Cycling Strategy).

Vision

The vision for the Calgary Goods Movement Strategy is:

The Goods Movement Strategy supports a multi-modal system that is safe, economical, reliable, efficient and environmentally sustainable.

Within Calgary, goods movement is widely recognized as an essential contributor to the economic, social and environmental wellbeing of residents and businesses.

The vision serves three purposes:

1. It links the Strategy directly to The City's Triple Bottom Line policy, which is based in economic, social and environmental concepts.
2. It establishes the importance of goods movement in planning. It suggests that decision-makers must consider the extent to which goods movement investments and priorities will be balanced with those of passenger movement.
3. It provides a framework within which goods movement initiatives can be prioritized and evaluated using qualitative and quantitative tools, such as benefit-cost and multi-criteria analysis, with other initiatives.

Policies connected to goods movement

The Strategy is informed by municipal, provincial and federal government policies. These policies define the regulatory oversight for the use of the multi-modal goods movement network.

Among City policies, the MDP and CTP provide a context to support goods movement. They link goods movement to The City's land use, economic and sustainability policies and aspirations. The MDP notes the economic importance of Calgary International Airport, intermodal rail terminals and the transportation and logistics industry. It points out the need to ensure that these and other industrial sites are well connected to a road and highway network that can support the efficient movement of trucks, goods and services.

Other City policies that support or are relevant to goods movement are Investing in Mobility, the Complete Streets Policy, the Environmental Policy, the 2020 Sustainability Direction, the Triple Bottom Line Policy Framework, the Economic Development Strategy and the Industrial Lands Strategy.

Three City bylaws regulate the movement of trucks in Calgary:

- Bylaw 26M96 (Calgary Traffice Bylaw) regulates the movement of all types of traffic on Calgary's streets, including trucks and commercial vehicles.
- Bylaw 60M90 (Calgary Truck Route Bylaw) regulates the movement of trucks in Calgary and defines a truck route network.
- Bylaw 13M2004 (Calgary Dangerous Goods Bylaw) regulates the movement of dangerous goods in Calgary, and defines a dangerous truck route network, as amended by Bylaw 23M2005.

These bylaws are supported by the Truck Route Network Development Policy (policy TP005), the Dangerous Goods Route Network Development Policy (policy TP001) and the High Load Corridor Development Policy (policy TP006). The City is also part of TRAVIS, which is a provincially led multi-jurisdictional permitting system for over-sized and overweight loads.

At the regional level, the 2014 Calgary Metropolitan Plan notes the importance of an integrated efficient infrastructure system for the movement of people and goods. This plan was a voluntary collaborative initiative of the Calgary Regional Partnership (CRP), whose members included The City of Calgary and several surrounding municipalities. The CRP has since been dissolved. The newly-established Calgary Metropolitan Region Board (CMRB) is charged with creating land use and servicing plans that, among other outcomes, promote coordinated development and infrastructure to serve Calgary and nine surrounding municipalities. Goods movement is not specifically mentioned yet, although this Strategy is expected to inform future CMRB initiatives.

The province regulates goods movement within Alberta, notably the funding and operation of provincial highways. Relevant provincial policies, legislation and regulations include the 2018-2021 Transportation Business Plan, Alberta *Traffic Safety Act* and Commercial Vehicle Safety Regulations.

An intermodal rail terminal is where containers carrying goods can be loaded to and from trucks and trains, without having to move the goods from one container to another. Goods are not handled directly by staff working at intermodal rail terminals. The container stays sealed as it moves from truck to train or vice versa.

The federal government is charged with regulating and enabling goods movement across Canada and internationally, including regulating modes such as rail, air and pipelines that cross borders. Relevant federal legislation and regulations includes the *Canada Transportation Act*, the *Transportation of Dangerous Goods Act,* the *Railway Safety Act* and the Commercial Vehicle Drivers Hours of Service Regulations. The federal government is also seeking to enhance goods movement through its Trade and Transportation Corridors Initiative.

Development of the strategy

Data collection and identification of current conditions and trends for goods movement in Calgary. Identified the policies that impact goods movement in Calgary.

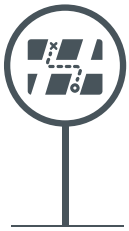
STAGE 1

Foundation

Q1 2017 – Q2 2017

Engagement Phase 1
- Advisory group meetings
- One-on-one stakeholder interviews
- Small business survey

Technical
- Origin-destination survey
- Reviewed data collected
- Best practices review



Identified issues and challenges related to goods movement in and around Calgary.

STAGE 2

Issues and challenges

Q3 2017

Engagement Phase 2
- Advisory group meetings
- Focus group sessions

Technical
- Technical review of issues and challenges
- Best practices review (continued)
- Jurisdictional review

Solutions were explored.

STAGE 3

Opportunities

Q4 2017 – Q 2 2018

Engagement Phase 3 and 4
- Advisory group meetings
- Public engagement sessions and online survey
- Symposium

Technical
- Solutions developed
- Reviewed stakeholder feedback of potential solutions

A policy framework was developed, including the recommended actions, investments and priorities. The implementation and monitoring plans were created.

STAGE 4

Strategy and actions

Q2 2018 – Q4 2018

Engagement Phase 5
- Information sessions for key stakeholders

Technical
- Finalized potential solutions
- Develop Goods Movement Strategy

How stakeholders were involved

Engagement strategy

The Strategy was driven by stakeholder-defined challenges and inputs, aided by supporting research and analysis. Due to this, the engagement approach was multi-faceted, involving both online and face-to-face components. It was important to work directly with industry stakeholders to understand their needs specifically. Calgarians were consulted at a key milestone in the project rather than throughout the project, as it is anticipated that any improvements made would benefit them as well. This engagement was in the form of face-to-face events and an online survey.

Key industry stakeholders provided valuable input that helped the project team understand operational and strategic issues and challenges, and how to address them in the long- and short-term. This was done through face-to-face consultation with stakeholders, and where appropriate augmented with online surveys.

Engagement activities were taken in five phases, which took place at different stages in the project.

Engagement activities

Key stakeholders were invited to participate in several engagement activities. These included advisory groups, one-on-one interviews and focus groups.

The advisory groups focused on providing the project team with detailed input from a range of perspectives throughout the development of the Strategy. The advisory groups met between April 2017 and September 2018. The advisory groups were organized as follows:

- Operational Advisory Group, which addressed short-term needs and opportunities.
- Strategic Advisory Group, which took a long view on challenges and opportunities.
- Regional Advisory Group, which comprised the neighbouring municipalities.
- Internal Advisory Group, which comprised City staff and emergency services.

The engagement activities for Calgarians consisted of three face-to-face sessions and an online survey. This took place in Q1 2018. As goods movement is a complex topic, a combined education and engagement campaign led into the public engagement opportunities. The education campaign provided Calgarians with basic information about goods movement in Calgary, so that they would have a better understanding of goods movement prior to participating in engagement activities. The engagement campaign encouraged Calgarians to participate in the engagement opportunities.

Focus group sessions held in Q4 2017 helped capture additional feedback from the broader goods movement industry and academia on potential long-term solutions.

What we heard from stakeholders

What we heard in Phase One

During the first phase of engagement three main themes came out of the advisory groups: planning and coordination with other regions/partners, maintaining accessibility, and being prepared for emerging trends. More in-depth analysis of the verbatim revealed many sub-themes which were dominated by issues surrounding current infrastructure, flexibility, updating policies and bylaws, and land uses.

What we heard in Phase Two

The operational advisory group discussions focused on how goods flow through Calgary, how infrastructure changes can alleviate bottlenecks and that improvement of data sharing between industry and The City is necessary.

The strategic advisory group discussions focused on future planning, land use, zoning and policies that are flexible enough to manage today's needs but also look to the future needs for goods movement.

Our discussions with regional partners focused on consistent routes for goods, appropriate infrastructure for moving goods and collaboration around future developments. The aggregate industry emphasized the importance of minimizing the impacts to goods movement through appropriate planning, development and designation of truck routes.

What we heard in Phase Three

Our public engagement indicated that many respondents still want their goods delivered directly to their homes. They also preferred daytime deliveries, although there was some flexibility on picking parcels up from a dedicated location or having the deliveries either early morning or evening.

- At commercial, retail or condominium developments, respondents indicated that they would prefer that the appropriate infrastructure be in place for deliveries.
- We also heard that respondents preferred some form of time or location specific restrictions on deliveries to locations without a back alley or loading zone (e.g. strip malls).
- Respondents are open to adjusting signal timing to help goods move around more efficiently on truck routes, rather than creating specific infrastructure for trucks.
- Of respondents who work in the industrial parks, the majority currently drive themselves to work, but a significant portion of respondents said they would prefer other options for commuting.

Our Operational and Regional advisory group members used maps to show us what they felt were critical areas for transportation infrastructure improvements. Our Strategic advisory group spent time discussing how to protect transportation right-of-way for future changes in technology.

Focus groups discussed improving the flexibility in City policies related to transportation as changes take place within the goods movement industry. There were also discussions about industrial land servicing needs and the timing of future of technological advancements that are currently underway.

What we heard in Phase Four

In this phase, advisory group participants were asked to rate how well they thought that proposed solutions to challenges that were raised in previous phases of the project would work in Calgary. This was done through a dot-mocracy exercise. For the most part, participants indicated that all the solutions will work in Calgary.

What we heard in Phase Five

During this phase, stakeholders were shown a draft version of the Strategy recommendations, which included proposed infrastructure and operational improvements. This gave them the opportunity to see the results of the strategy and how their feedback on challenges and potential solutions had been addressed.

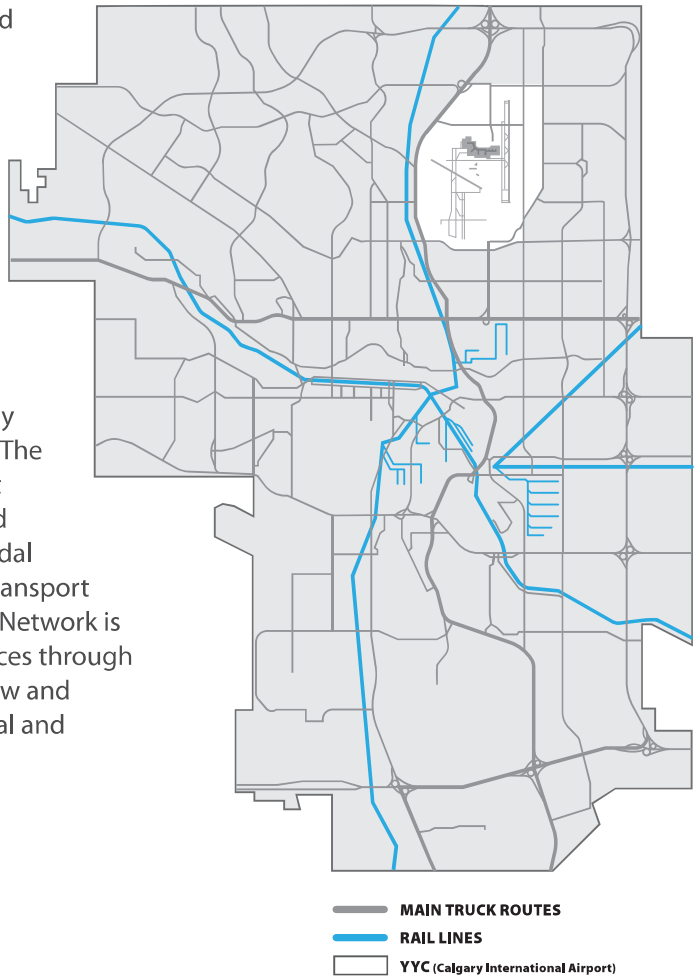
Goods movement in Calgary

How and where do goods move?

Calgary is served by a comprehensive multi-modal goods movement network, including provincially owned highways and City-owned roads, CN and CP rail lines and pipelines (Figure 1). There are also numerous facilities for transferring goods between transportation modes, including Calgary International Airport and rail intermodal and transload facilities. These facilities allow goods to be transported over long- distances quickly (in the case of air) and cost-effectively (in the case of rail), before being transferred to a truck for shipment to their destination.

Although the CTP emphasizes passenger movement, it recognizes commercial vehicles as a critical element of Calgary's economy. It does so by designating the Primary Goods Movement Network on key roads and highways. The Network defines high-priority routes that are used most often to transport goods. It emphasizes accessibility and connectivity to the airport, industrial areas and intermodal rail terminals and along roads that are heavily used to transport goods. By designating these routes as high priority, the Network is intended to facilitate the movement of goods and services through the implementation of measures that improve traffic flow and control access. It also promotes the situation of industrial and goods-generating land uses close to the network.

Figure 1:
Calgary's multi-modal goods movement network



Trucks and goods movement

Rail transload facilities are where goods are handled directly as they are moved between rail cars and trucks. Bulk, break-bulk (bulk goods being transported within containers like barrels) and oversized project specific cargo are handled at transload facilities.

Research was conducted to create a better understanding of goods movement in Calgary. This included an analysis of truck travel patterns within Calgary. The most important mode for the movement of goods within, to and from Calgary are trucks. In 2014, about 70 per cent of all goods by weight entered and exited Calgary by truck.[1] In 2015, approximately 120,000 truck trips were made within Calgary daily, according to City estimates.

Areas of high goods movement industry employment tend to be key generators of truck trips. In addition to the key northeast and southeast locations within Calgary, industrial areas to the north and east of the city, such as Balzac, are important truck trip generation clusters, as shown in Figure 2.

In the summer of 2017, an origin-destination survey of more than 3,600 truck drivers on the roads and highways around Calgary was conducted. The results profiled the characteristics of trucks travelling to, from and through the city.

The 2017 origin-destination survey of trucks travelling at the perimeter of Calgary found that there is a significant amount of truck trips within and between truck trip generation clusters daily. Daily truck trip volumes to and from the southeast and northeast industrial areas are especially high, as shown in Figure 3. This activity underscores the importance of goods movement activity both within Calgary and between Calgary and the surrounding region, and the corresponding need for a regional perspective in planning for goods movement needs.

Truck volumes across the city have been growing, generally in line with growth in Calgary's population and employment. The volumes crossing the city's boundaries are increasing fastest as new industrial and commercial development takes place in the surrounding region. Since 2001, the average annual truck growth rate across the boundaries of Calgary has slightly outpaced population growth, with truck trips on the highway around Calgary having grown by more than half over the last 15 years.

Truck trips within the Calgary Region are expected to continue to grow approximately in line with population and employment, although many emerging trends might affect where and how goods move in the future.[2]

TRUCK MOVEMENT ON HIGHWAYS AROUND CALGARY HAS INCREASED BY OVER 55% IN THE LAST 15 YEARS

The 2017 truck origin-destination survey also captured long-distance trucking activity. About one-third of long-distance trips to/from is between British Columbia and Calgary (Figure 5). By compass heading, the next highest percentage of long-distance truck trips is to and from Central and Northern Alberta (27 per cent), including Edmonton (21 per cent). Trucks also come from and are destined to all other compass headings. They highlight Calgary's role as an important hub for goods between the US and eastern Canada, and Calgary.

1 Consultant analysis of Statistics Canada Canadian Freight Analysis Framework, 2014, https://www150.statcan.gc.ca/n1/en/catalogue/50-503-X2018001.

2 These forecasts do not factor in the results of the 2017 truck origin-destination survey.

Figure 2:
Top freight clusters by trip ends

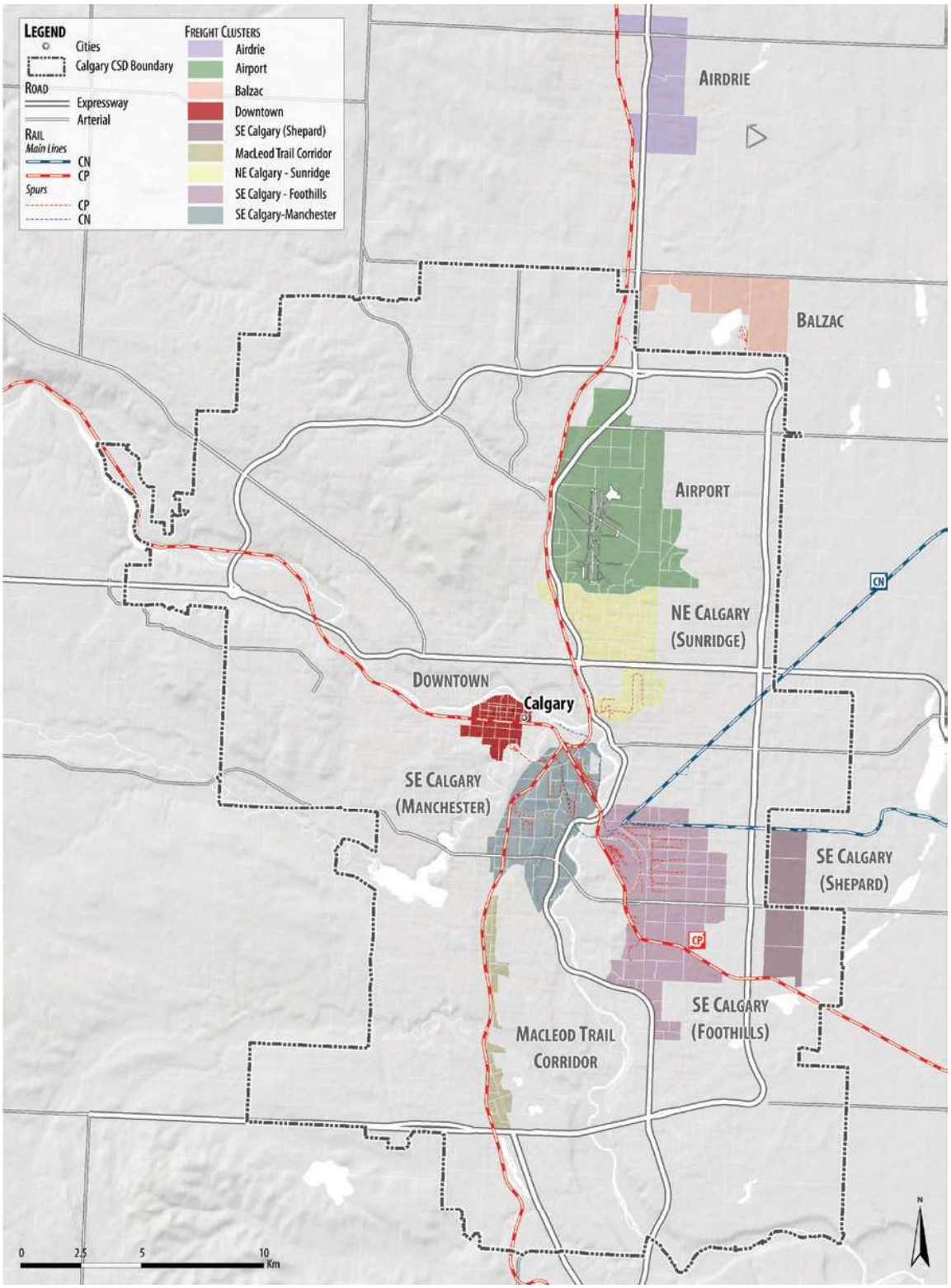
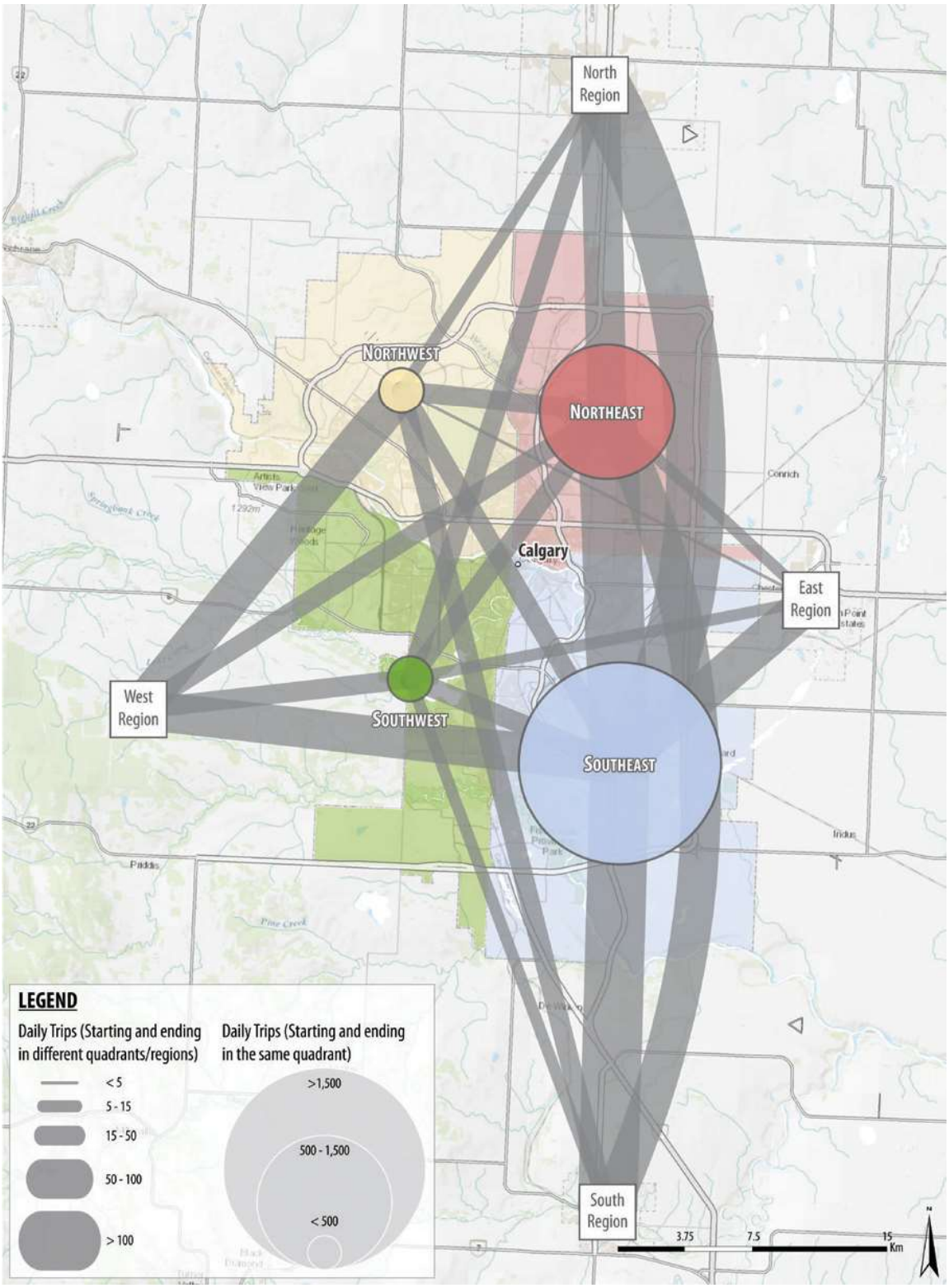
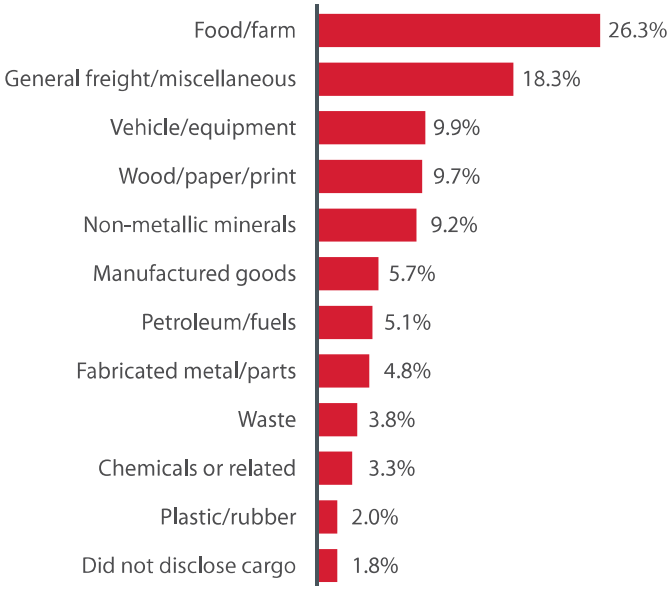


Figure 3:
Daily truck trip patterns within the Calgary region



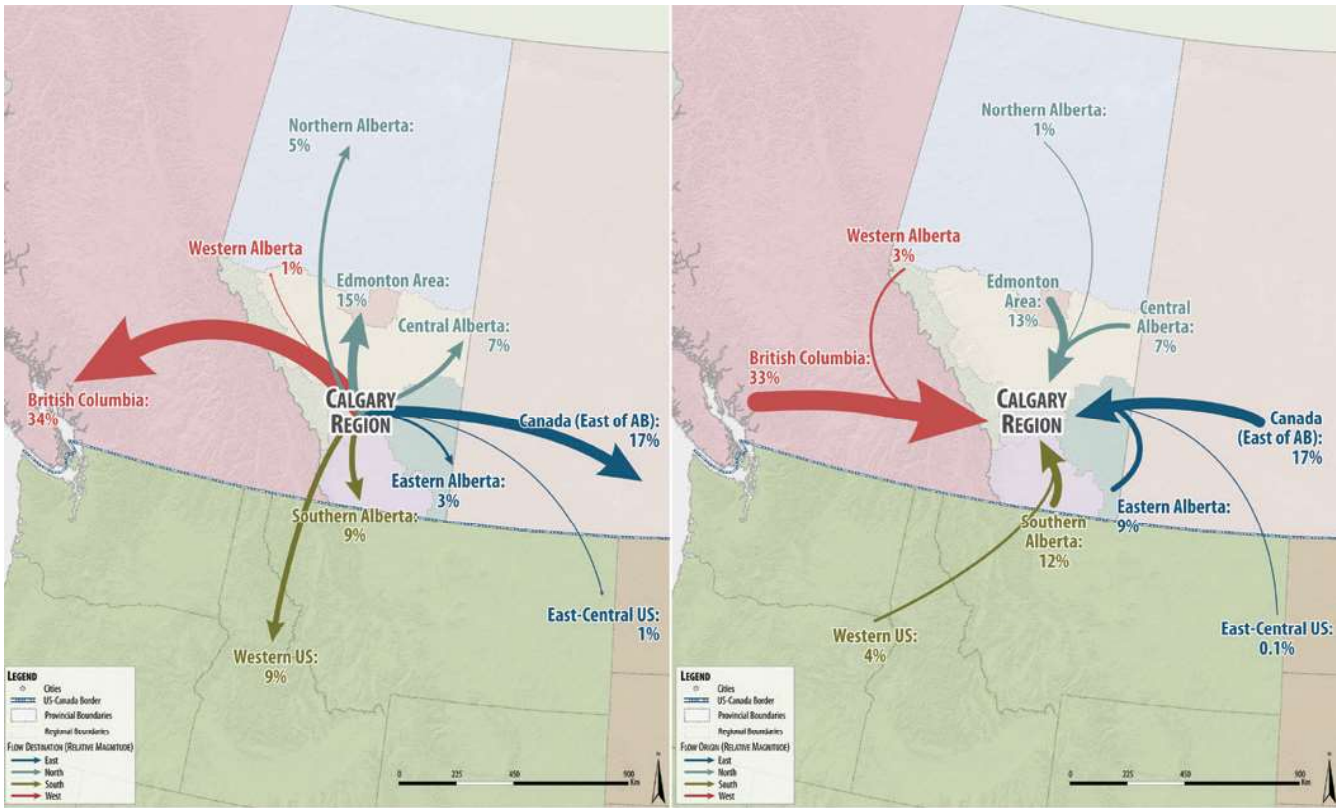
Trucks carry all types of goods. Based on the 2017 truck origin-destination survey results, construction-related materials, such as gravel and cement, were the most frequently cited specific goods carried by trucks on the roads and highways leading to and from Calgary. Based on more general classification by category of goods, food and farm products and general freight (like consumer products destined to retail stores) were the most frequently cited products entering and leaving Calgary.

Figure 4:
General category of goods carried to and from Calgary



The 2017 survey and other data demonstrate the importance of Calgary's highway system. The northeast quadrant of Stoney Trail experiences some of the highest truck volumes. This is consistent with its role in connecting major industrial areas and the inter-city highway network, as well as serving as a by-pass for trucks around Calgary. Highway 2, also known as Deerfoot Trail, from the north and the south are also some of the busiest truck entry points to Calgary. Calgary also benefits from multiple highways to the east and west that allow goods to enter and exit the city. There are also several important highway and non-highway corridors for goods within Calgary, such as Glenmore Trail.

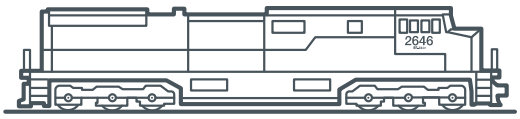
Figure 5:
Long-distance truck trips outbound from Calgary (left) and inbound to Calgary (right)



Trains and goods movement

Containerized goods are goods that are shipped in sealed intermodal/ shipping containers.

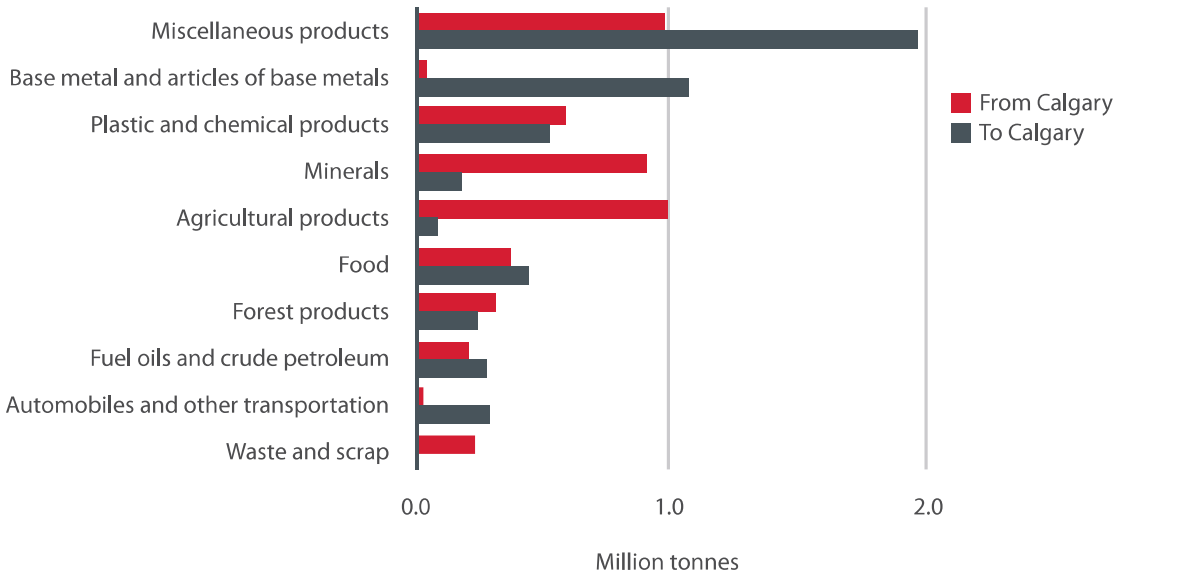
Calgary is served by two Class 1 railways, Canadian National Railway (CN) and Canadian Pacific Railway (CP). CP's transcontinental mainline from Vancouver to Montreal passes directly through Calgary. CN's east-west mainline runs through Edmonton between the Canadian West Coast (Prince Rupert and Vancouver) and Eastern Canada, the United States Midwest and the United States Gulf Coast. As a result, CN serves Calgary from a line that connects to the mainline through Edmonton. The busiest rail line in Calgary, CP's east-west mainline, can carry upwards of 25 trains per day.



NEARLY 3 MILLION TONNES OF GOODS WERE TRANSPORTED TO THE CALGARY AREA BY RAIL IN 2016

Relative to truck and other transportation modes, rail is most efficient at carrying high volumes of containerized and non-containerized goods. In 2014, rail carried nearly 30 per cent of goods by weight into and out of the Calgary region. This includes miscellaneous products such as consumer goods destined to retail stores, metals (e.g. steel for construction), plastics and chemical products (Figure 6).[3] In 2016, 220,000 containers transporting 2.8 million tonnes of cargo were transported to Calgary by rail, and 140,000 containers containing 1.7 million tonnes were transported from Calgary.[4]

Figure 6:
Top ten category of goods transported by rail to and from Calgary in 2014



3 Consultant analysis of Statistics Canada Canadian Freight Analysis Framework, 2014, https://www150.statcan.gc.ca/n1/en/catalogue/50-503-X2018001.

4 Consultant analysis of data provided by Transport Canada.

Planes and goods movement

Calgary International Airport (YYC) is Canada's fourth busiest airport. It is served by major air cargo and courier services. A recent $2 billion expansion added a new 14,000-foot runway and more industrial warehousing space, which has increased YYC's ability to handle anticipated growth in air freight. The YYC Global Logistics Park, which occupies over 330 acres of land, is accessible by shippers and receivers in the area from the major road and highway network. YYC operates 24/7 and cargo can be transported from YYC to anywhere in the world within 48 hours.[5] Most cargo moves in the belly of passenger aircraft, although YYC is also served by cargo-only flights.

The airport handles approximately 135,000 tonnes of air cargo each year. Although these quantities are small relative to other modes, air cargo carries sensitive high-value cargo needed by Calgary businesses and residents, such as food products and pharmaceutical products. As a result, although air cargo only carried 0.3 per cent of goods by weight into and out of Calgary in 2014, it carried over 10 per cent of goods by value.

YYC is also a key international gateway for western Canada. Approximately $2.1 billion worth of products was exported internationally by air in 2016. Approximately $2.9 billion worth of imported products delivered by air was cleared through customs at the airport.

$1.7 MILLION IN HOCKEY STICKS WAS IMPORTED THROUGH YYC IN 2016

Pipelines and goods movement

Liquid product and natural gas pipelines operate in and through Calgary. For example, ATCO Pipelines owns and operates natural gas transmission pipelines that deliver natural gas from producers to customers in Calgary. These pipelines largely follow the major highway corridors in Calgary.

Trans-Northern owns and operates the Alberta Products Pipe Line, the main source of delivery for refined petroleum products in southern Alberta. This pipeline carries refined fuel products from refineries in the Edmonton area to distribution terminals in Calgary, including terminals at YYC. This pipeline carries approximately 48,000 barrels of refined fuel products per day.[6]

5 Calgary Airport Authority, *YYC Global Logistics Park*.

6 Trans-Northern, *Our Pipelines*.

Challenges with goods movement in Calgary

Through engagement with stakeholders and technical analysis of Calgary's road and highway network, challenges with goods movement in and through Calgary were identified. This work focused on the roadway infrastructure as air and rail transportation are regulated through various Provincial and Federal regulations and policies. The road and highway network challenges that were identified and reviewed were grouped into transportation infrastructure and non-infrastructure challenges.

Transportation infrastructure challenges refer primarily to bottlenecks and other traffic concerns at specific areas within Calgary that negatively impact the movement of motor vehicles that transport goods. These are outlined in more detail found below in Challenge 1.

Non-infrastructure related transportation challenges refer to broader policy challenges that can be addressed. They include things like emerging industry trends, protection of infrastructure, last kilometre deliveries, maintaining flexibility into the future, and regional needs. These are outlined further in Challenges 2-6 listed below.

Challenge 1: Congestion and other inefficiencies on roads

Throughout the project Calgary's road and highway network was reviewed and analyzed to identify potential challenges that can be addressed through infrastructure and technology improvements. Stakeholders helped identify specific locations where bottlenecks, congestion, operational concerns, capacity constraints, and conflicts with other traffic impact their work. They also expressed a desire for new or expanded connections.

As part of the review and analysis of the information provided by stakeholders, indicators such as the Peak Travel Time Index (TTI) were developed using truck GPS data to identify possible challenge areas. This helped confirm that several sections of Deerfoot Trail, within the southeast and northeast industrial areas and downtown Calgary, are subjected to higher TTI values and lower performance. By comparison, Stoney Trail generally operates under free-flow conditions during the peak.

The Peak TTI is the ratio of the free-flow truck speed to actual peak truck speed. The free-flow truck speed is defined as the average overnight speed. The peak speed is defined as the average speed in the most congested hour among the six peak hours as defined.

Source: National Performance Management Measures, US Federal Register, 2017.

Based on stakeholder input and technical analysis four challenges were identified:

1. Stoney Trail has been successful in getting trucks around Calgary, but some additional needs remain, including additional connections.
2. Operational and capacity constraints cause bottlenecks at several locations, notably along Deerfoot Trail.
3. Some additional connections and corridors are desired, notably to improve east-west flow.
4. Traffic disruptions due to construction can be problematic and should be minimized.

Recommended improvements are detailed in Strategic Direction 1 and in Appendix B.

Challenge 2: Emerging and ongoing needs and trends

Several emerging trends have started to impact the goods movement industry. These include rapid growth in online purchasing and in the related customer demand for express delivery, tests of deliveries made by drones and robots, disruptive technologies such as Transportation Network Companies that allow anyone to be a courier, and the emergence of electric delivery vans and self-driving (autonomous) trucks. The pace and extent of these trends are still evolving, especially for new technologies. Challenges concerning the reliability, regulations, liability, safety and public acceptance and supporting infrastructure for new trends and technologies need to be resolved. However, it is evident that these trends and technologies will be factors in moving goods in and around Calgary in the future. In the meantime, the demands for moving goods will continue to grow.

The challenges listed below regarding new trends and technologies need to be resolved.

1. Changing demands and economic conditions will impact where and how goods are moved, such as the increasing growth of e-commerce changing how deliveries are made. For example, more delivery vehicles are seen in residential areas because of home deliveries due to the increase in online shopping.

Left: Example parcel delivery locker.
Right: Example truck carrying dangerous goods.

CPCS

2. Economic downturns can result in heightened competitiveness and cost cutting among truckers. This can impact safety compliance among small or independent truck owners who do not always have the resources to devote to the regular maintenance of their vehicles. Economic downturns can also impact small or independent truck owners' ability to implement fuel efficiency measures.
3. Potential environmental impacts, such as from a spill or accident involving vehicles carrying dangerous goods, should be better anticipated in plans or designs that minimize mixing traffic from industrial/commercial and residential developments, rather than mitigated after an incident occurs.

Challenge 3: Protection of strategic goods movement infrastructure

Goods movement activities impact the surrounding community, and cannot always be given priority over other transportation system users. However, strategic goods movement infrastructure must be protected from encroaching land uses to ensure that it can continue to serve the function intended. For example, a noise curfew would limit air cargo operations and an airport's ability to attract and retain cargo airlines. Ensuring appropriate separation between goods movement infrastructure and other sensitive land uses can also minimize encroachments and promote safety.

1. Strategic goods movement infrastructure, especially airports, rail lines and rail terminals, need to be protected from conflicting land uses, to enable them to continue to effectively serve the region.
2. Complementary land use around strategic goods movement infrastructure needs to be protected. Access for goods movement needs to be protected even as lands are redeveloped.
3. Truck routes need to be protected to serve goods movement even when roads are reconfigured.
4. Conflicts between rail and truck traffic need to be minimized.

CP mainline through Calgary showing residential developments in the background.

CPCS

CPCS

Aggregates truck turning left from 112 Ave. N.W. to Country Hills Blvd. N.W.

5. Efficient access to aggregates-producing lands need to be maintained as the surrounding areas develop. Conflicts between aggregates haulers and other traffic need to be minimized.
6. Roads into new development sites are not adequate to support heavy construction vehicles, so these vehicles often use adjacent neighbourhood roads to access the sites.

Challenge 4: Last kilometre deliveries and accessibility

Goods will continue to be delivered to Calgary businesses and residents, even as e-commerce and other factors change how deliveries are made. Six challenges were identified that impact the last kilometre of a delivery, whether it is to a home or business:

1. Changing demands for deliveries generate impacts in residential areas.
2. Delivering goods without impacting residents can be challenging.
3. Parking and operational layouts in recent suburban developments are not necessarily designed for the efficient use by couriers and express deliveries. This can impede deliveries, especially when snow is present.
4. Building and site design can constrain the delivery of goods.
5. The planning, supply and location of loading zones can constrain the delivery of goods.

CPCS

CPCS

Left: Food distribution company attempting evening delivery in Toronto.

Right: Curbs and parking in McKenzie Towne.

CPCS

CPCS

Top left: Goods movement vehicle delivering to business in Toronto blocking parking.

Top right: Goods movement vehicle receiving parking ticket in Toronto.

6. Planning decisions impact goods movement. Goods movement cannot always be prioritized in planning decisions with respect to parking and circulation, but this comes at a cost for goods movement activities.

Challenge 5: Maintaining flexibility in future plans

It is anticipated that the emergence of many technologies, such as autonomous vehicles and drones, will have a profound impact on where and how goods and people move. Some technologies, such as truck platooning, could be more readily adopted to today's road and intersection configurations and geometries. Other technologies, such as fully autonomous vehicles, might require dedicated lanes of their own.

Aside from the physical road and intersection configurations and geometries, investments in telematics and vehicle-to-vehicle, vehicle-to-infrastructure and infrastructure-to-infrastructure communications are also required for truck platooning and autonomous vehicles.

However, stakeholders told us that the pace and breadth of the uptake of new technologies depends on resolving the regulatory and other related challenges described under Challenge 2. Anticipating the full impacts of these new technologies on infrastructure plans is difficult – for example, the need for a dedicated lane for autonomous vehicles or recharging stations for electric trucks. As a result, infrastructure plans need to continue to meet the needs already identified today, while building in flexibility as conditions change.

It is important to incorporate flexibility in planning for technological changes. We should prepare for the future, even if it is unclear when or even if a technology will be deployed. Examples of things that we can do include:

- Protecting right-of-way for new transportation infrastructure.
- Adding the ability to repurpose transportation infrastructure in the future – for example, reserving a lane on an existing highway for autonomous vehicles.
- Drafting less prescriptive regulations and ensuring they are kept up-to-date as new technologies are deployed.
- Identifying the conditions or thresholds that might determine when planning for a new technology might become more critical.

However, building in flexibility today comes at a cost, which includes increased construction costs, sprawl and reduced regulatory enforceability.

New warehouse under construction in Calgary.

Challenge 6: Implications of regional needs

Goods movement vehicles need to move seamlessly across the Calgary Region and western Canada. For Calgary to continue to develop as a western Canadian distribution hub, the following challenges should be reviewed and addressed where possible:

1. The Calgary Region will continue to be attractive as western Canada's hub, but not all new development will occur in Calgary, so connections across the region are important.
2. To be a meaningful guide and tool for attracting businesses, industry requires ongoing communications and predictability in infrastructure commitments from The City. Sharing information with industry stakeholders regarding the plans to construct new transportation infrastructure, even if it is not scheduled until well into the future, helps them with their business planning. To be able to do this, predictable and stable funding for transportation infrastructure and the establishment of plans beyond the short-term is required.
3. Increasingly, distribution centres and warehouses are in suburban, low density sites that are not always well served by transit. It is challenging to get employees who work in these industries to their jobs at these locations, especially overnight shift workers at these 24/7 operations.
4. Congestion at the Port of Vancouver – at the landside accesses – and the relatively low supply of room to expand around the individual ports, are of concern as they could result in delays and unreliable delivery times for goods destined to Calgary. Although alternative west coast ports exist, such as Prince Rupert, their lack of direct rail connectivity to southern Alberta presents further limitations.

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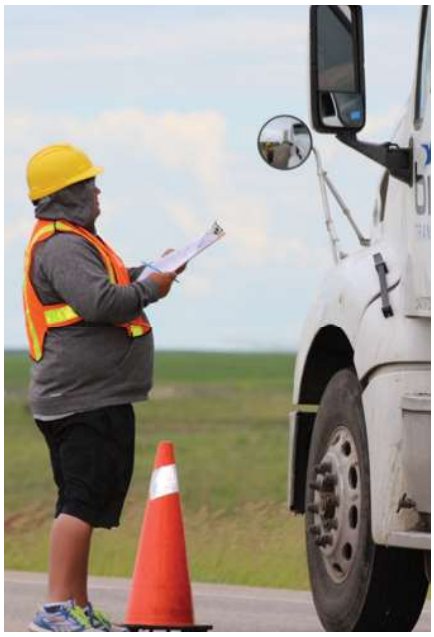
Port of Vancouver Centerm in downtown Vancouver.

Research into other goods movement strategies

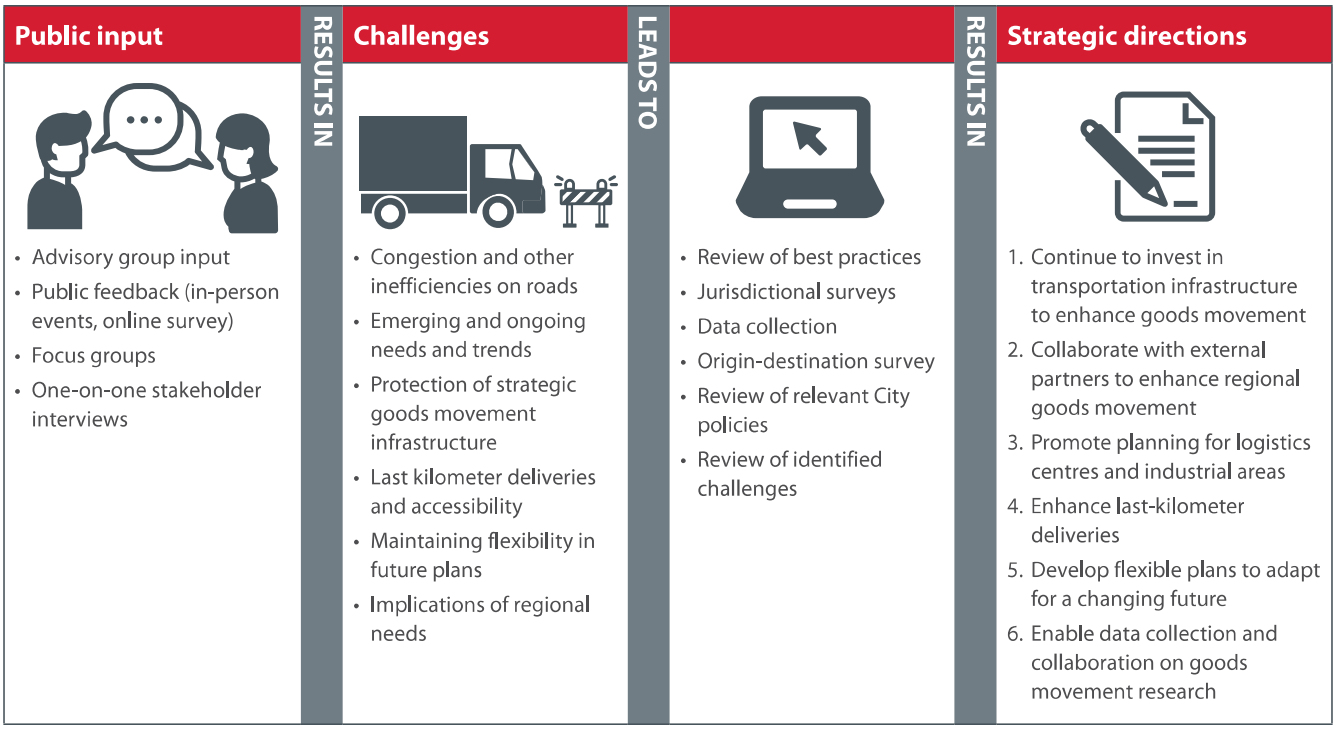
Interviews were conducted with other jurisdictions on how they address goods movement challenges. In addition, a review of best practices in other cities across North America and elsewhere was done.

The research and surveys were used to generate and assess potential solutions to the identified challenges. Together with solutions offered by stakeholders, these were then assessed for feasibility in Calgary. The recommended solutions were then vetted by stakeholders before finalization as the Strategy's directions and actions.



2017 origin-destination survey being conducted.

Figure 7:
How strategic directions were developed



Strategic solutions

Through addressing the challenges outlined above, the transportation network can be improved for all users, not just the goods movement industry. Strategic directions have been created to help address these challenges, and recommend actions to guide us in making improvements and efficiencies. The table below outlines which challenges each strategic direction addresses. In most cases, further analysis will be required to further define and evaluate the actions proposed in the Strategy.

	Challenge 1: Congestion and other inefficiencies on roads	**Challenge 2:** Emerging and ongoing needs and trends	**Challenge 3:** Protection of strategic goods movement infrastructure	**Challenge 4:** Last kilometre deliveries and accessibility	**Challenge 5:** Maintaining flexibility in future plans	**Challenge 6:** Implications of regional needs
Strategic direction 1: Continue to invest in transportation infrastructure to enhance goods movement	✓					✓
Strategic direction 2: Collaborate with external partners to enhance regional goods movement	✓	✓	✓	✓	✓	✓
Strategic direction 3: Promote planning for logistics centers and industrial areas			✓			
Strategic direction 4: Enhance last-kilometre deliveries				✓		
Strategic direction 5: Develop flexible plans to adapt for a changing future		✓	✓		✓	
Strategic direction 6: Enable data collection and collaboration on goods movement research	✓	✓	✓	✓	✓	✓

Value of time for goods movement and reliability considerations

The actual value of time for a given vehicle can vary depending on its contents. For example, according to one source, a truck in traffic typically has a cost of $75 per hour, which accounts for the direct operating cost of the vehicle. However, a vehicle carrying auto parts to a production plant might have a value of time of $13,000 per minute, if unexpected delays in arrival will cause the shutdown of the assembly line. (InterVISTAS Consulting cited in Anderson, B, The Border and the Ontario Economy).

InterVISTAS Consulting (2009) Cross-Border Flow Analysis Report 5: Case Study for Company 5 (Automotive Parts Manufacturer) prepared for Industry Canada.

Strategic direction 1: Continue to invest in transportation infrastructure to enhance goods movement

It is critical for the success of the Calgary Goods Movement Strategy that the potential impacts to goods movement be considered in any evaluation of new transportation infrastructure or policies. While there are typically more passenger vehicles on the road, improving the efficiency of goods movement can have disproportionate benefits. For example, saving one minute of travel time for a passenger vehicle can result in a savings of the order of $20, whereas for a goods movement vehicle this value can be of the order of $100 or more (see box). As a result, whether qualitatively or quantitatively, it is important that a goods movement lens be taken with any transportation evaluation.

The four actions recommended below are potential infrastructure solutions to address network challenges. The infrastructure deficiencies and challenges identified should be reviewed prior to implementing changes. Where appropriate, the benefits to goods movement should be considered in the identification, planning, evaluation and prioritization of these and other infrastructure improvements. Appendix B identifies transportation corridors that can be improved and areas that can be reviewed for better access and connectivity.

Challenge to be addressed: Investigate potential operational and capacity improvements that can improve the movement of goods in and around Calgary.

Action 1.1: Review signal timings to enhance the flow of goods along key corridors while maintaining a safe environment for all corridor users

The review of signal timings, coordination and progressions along key truck corridors provides an opportunity for operational improvements that can improve the fluidity of the goods movement network, while maintaining a safe environment for all users.

Impact of reducing delays

Reducing delays for goods movement vehicles does not only result in direct cost savings, in the form of fewer trucks and drivers are on the road. Reducing delays also helps improve the competitiveness of the Calgary region to businesses, by making it easier and less costly to move its goods to and from Calgary. If travel times can be reduced by one minute on a corridor with 4,500 trucks per day through the optimization of signal timing, with a savings to goods movement vehicles of approximately $2 million per year.[8]

8 Source: Consultant's estimates based on City of Calgary Average Annual Weekday Traffic (2016) and estimated truck percentage. Because these estimates combine truck percentages and estimated truck volumes from differing years, they should be considered indicative only of the order of magnitude of truck volumes. The value of time used for commercial vehicles was assumed to be the unweighted average of the value of times for light, medium and heavy-duty vehicles in The City of Calgary's Regional Transportation Model, rounded to $100 per hour. The savings were annualized based on a factor of 250 days per year (i.e. weekdays).

Action 1.2: Ensure the impacts to goods movement are identified in the evaluation of key infrastructure projects in the network

The City has several projects already underway, in planning and design phases, that could benefit goods movement. Additional infrastructure improvements were identified, through engagement and research, that can potentially benefit goods movement. Projects that already have committed funding should proceed. For other projects, a goods movement perspective should be incorporated explicitly in any evaluation and prioritization. For example, quantifying benefits from reductions in truck delay and accounting for them in the evaluation.

Action 1.3: Collaborate with Alberta Transportation to enhance the movement of goods along Deerfoot Trail, Stoney Trail and other regional highways

From the perspectives of truck volumes and delay, Deerfoot Trail and Stoney Trail are the two most important corridors for trucks in the Calgary Region. The City should work with the province to study and implement improvements on an ongoing basis. There are also potential improvements to other provincial highways in the region that should be considered.

Action 1.4: Work with the province and neighbouring municipalities to align corridor plans and funding projects across the region, to improve connectivity for goods movement

Goods movement activity occurs within Calgary and the surrounding region. To maximize the benefits of new infrastructure to goods movement while minimizing costs, The City should endeavour to align plans with surrounding municipalities, starting with any regional-level plans developed. A sustainable funding model for intersections and connections to Provincial highways should be explored. Consideration is also needed with respect to dealing with agricultural vehicles in the rural areas of the region.

Strategic direction 2: Collaborate with external partners to enhance regional goods movement

This strategic direction recommends three actions to enhance collaboration among public- and private-sector goods movement stakeholders. Ongoing collaboration amongst these groups will help implement solutions to existing challenges and establish a way to work together to address ongoing and future challenges.

Through its comprehensive engagement process, the Strategy has established a dialogue among key goods movement stakeholders. It provides the opportunity to continue this dialogue and potentially establish partnerships for implementing and possibly funding the Strategy's actions. It will also provide the opportunity for collaborating on future initiatives.

Challenge to be addressed: Ensure collaboration among The City, regional partners and industry stakeholders to help implement goods movement solutions and address ongoing challenges.

Action 2.1: Collaborate with regional partners, including the Calgary Metropolitan Region Board, on future land use and transportation plans that impact goods movement across the Calgary region, and continue to provide technical assistance with these plans

It is recommended that The City extend its existing informal cooperation with neighbouring municipalities to sharing staff-level expertise, data and tools with other municipalities in the region to address regional goods movement challenges. Smaller jurisdictions without staff knowledgeable about goods movement may benefit from the sharing of best practices on challenges like policy, planning and design.

Action 2.2: Promote cross-jurisdictional consistency on design standards and operational practices, including a regional truck network map

As described above, the Calgary Region is a key generator of truck trips across the province and beyond. However, some standards and practices vary by jurisdiction and can inhibit the efficient movement of goods. In addition to sharing technical expertise with its neighbours, it is recommended that The City regularly engage other Alberta municipalities to ensure alignment in regulations and design. This would include bylaws, oversize-overweight restrictions, goods movement routes and design/engineering standards. Coordination is also important across business units within The City.

Action 2.3: Establish a goods movement committee, consisting of key representatives from the public and private sectors

The creation and participation in a goods movement committee for the Calgary region is recommended. Goods movement committees, also called freight committees, are effective tools used in many cities to speak for the freight industry with one voice, to promote dialogue between private- and public-sector stakeholders, and to advance or advocate for projects benefiting goods movement. For the committee to maintain private-sector participation, it needs to deliver actions with immediate impacts and long-term benefits. It would also be appropriate for The City, as the largest and central municipality in the region, to manage the freight committee's activities and also include participation from Calgary's City Council.

Strategic direction 3: Promote planning for logistics centres and industrial areas

This strategic direction recommends five actions to enhance the road network and help Calgary International Airport, rail terminals, rail corridors and other strategic freight hubs continue to thrive in the future. These recommendations focus on how to safely improve traffic flow, land use planning policies and travel options for commuters.

Challenge to be addressed: Enhance the goods movement road network and help Calgary International Airport, rail terminals, rail corridors and other freight hubs to thrive in the future.

Action 3.1: Evaluate ways to improve the flow of trucks and other vehicles on the road and highway network while maintaining a safe environment for all road users

Building one's way out of goods movement challenges like congestion is not always the best option, or even necessarily a viable option. It is recommended that we study ways to improve the use of existing infrastructure so that it better serves the movement of goods. Specific approaches that should be studied are:

- **Preferential use truck lanes:** Exclusive or preferential truck lanes can increase the efficiency, reliability and safety of truck movements and can be considered on busy freight corridors.
- **Intelligent transportation systems:** These include technologies like: variable message signs, adaptive signal technologies, smart signals, traffic signal optimization and truck priority at intersections.
- **Traffic incident management:** Delays due to collisions and snowstorms can lead to significant reliability concerns on corridors such as Deerfoot Trail. Some traffic incident management techniques include dedicated facility service patrols, traffic screens to reduce rubbernecking, drones to expedite accident reconstruction and improved response coordination.
- **Freight network hierarchy:** This means expanding the designation of the Main and Supporting Goods Movement Corridors in the CTP's Primary Goods Movement Network to account for all roads. This allows the full network to accommodate goods movement in different manners that are appropriate to each road's function and land use. For example, ensuring freight-oriented design on primary freight corridors versus simply ensuring freight needs are accommodated in complete streets. Defining a network can help decision-makers better integrate the needs of goods movement alongside other road users to avoid conflicts between them, such as trucks and bicycles.
- **Review of snow route parking bans:** Snow route parking bans and lower clearance priorities for local roads in residential neighbourhoods can impede courier and express deliveries after a major event. The impacts of these bans and priorities on how they impact these types of deliveries should be reviewed.

Action 3.2: Promote the development of key goods movement facilities as mobility, employment and activity centres

There are several facilities in Calgary that have strategic value for goods movement, including Calgary International Airport and rail intermodal facilities. Calgary should promote the development of these facilities by:

- Accounting for their unique needs for goods movement connectivity.
- Ensuring that the lands adjacent to these facilities are developed for uses that are compatible with these facilities.
- Ensuring that these lands and other commercial-industrial sites around Calgary are appropriately planned so that they can move goods efficiently.

Action 3.3: Improve mobility options for employees in industrial areas

Partnering with private sector employers to fund or subsidize shuttle buses to connect remote employment centres with transit hubs should be investigated. This includes outside municipal boundaries and coordinating with neighbouring transit systems if necessary. Alternatively, partnering with an on-demand shared ride firm to provide subsidies where transit is not cost-effective should be investigated.

Ensuring that residents who commute to industrial areas for work have access to a wide variety of transportation options is important. Providing pathways, sidewalks and bikeways at remote employment centres can promote the use of transit, walking and cycling.

Action 3.4: Develop freight-supportive land use planning guidelines that protect complementary land use near major freight hubs and corridors

Land use conflicts occur when incompatible land uses are in close proximity, and can result in disruption to freight activities and dissatisfaction on the part of residents and communities. These conflicts can be partly mitigated through good planning. Some initiatives that should be considered for adoption or adaption include:

- **Freight planning guidelines:** such as the Ontario Ministry of Transportation's Freight-Supportive Guidelines, which are intended to incorporate goods movement needs into all aspects of community, corridor and site planning.
- **Railway proximity guidelines:** notably those issued by the Federation of Canadian Municipalities in association with the Railway Association of Canada. Calgary City Council approved the "Development Next to Freight Rail Corridors Policy" in 2018.
- **Protection of freight needs:** ensuring that new development does not interfere with operations at major freight generators, by restricting flight path access, curtailing 24-hour operations or restricting noise at pre-existing uses.
- **Land protection:** Reserving lands around freight facilities for complementary land uses, and avoiding proposals for incompatible residential developments around critical freight facilities such as the airport, rail terminals or major activity hubs.
- **Cargo-oriented development:** This involves concentrating freight uses in a single area – especially around rail, air, or other major transportation hubs – providing the appropriate massing of development, and ensuring that the local transportation network and accesses are designed to support freight activity while minimizing intrusion into neighbouring areas.

Action 3.5: Enhance Calgary's attractiveness as a logistics and distribution hub by deploying new technologies to enhance the region's competitive advantage

Staying on top of the latest technological developments can strengthen Calgary's position as western Canada's distribution hub and an inland port. This includes providing fibre communications and other utilities to potential industrial sites and subsidizing access to these sites. In collaboration with Calgary Economic Development, we should market these and other advantages to attract investments to enable Calgary to reach its potential as a logistics and distribution hub.

Strategic direction 4: Enhance last-kilometre deliveries

In recent years, we have seen an increase in deliveries of goods directly to homes and businesses. This strategic direction proposes seven actions to improve deliveries at and within buildings due to existing and emerging delivery requirements.

Challenge to be addressed: Improve deliveries at and within buildings to better account for emerging delivery requirements.

Action 4.1: Promote the inclusion of off-street delivery facilities into new or reconstructed non-residential developments

Due to the growth in courier and express delivery demand and increased use of active transportation for deliveries, ensuring that an adequate supply of off-street loading space in new developments and other changing delivery requirements be accommodated is recommended. To achieve this, we should:

- Ensure that building design standards are kept current to respond to changing delivery requirements. These standards should aim to improve the efficiency of deliveries on the site and within the building, while minimizing disturbances and inconvenience to occupants of the building and its neighbours.
- Support the use of flexible spaces, such as alleys, as spaces for delivery vehicles.
- Promote the use of off-peak deliveries to reduce peak congestion, by reviewing current bylaws that may limit the use of off-peak deliveries and working with private sector stakeholders to conduct pilot projects to alleviate potential concerns and obstacles.

Action 4.2: Enhance the supply and use of on-street loading areas

Access to on-street loading areas for deliveries is critical, especially downtown and in other high-density areas. To ensure an adequate supply of on-street loading areas, where demand exists or is growing, while keeping in mind the needs of other road users, we should:

- Designate additional curbside loading areas, even if only for specified delivery times, in consultation with delivery companies. Increased enforcement or smart technologies are recommended to ensure that they are used properly.
- Educate the public, especially residents and businesses, on the need to maintain access to curbside loading areas for their designated purpose at all times of the day.
- Investigate opportunities to improve the efficiency of loading zones via an online parking reservation system or apps to allow for real-time visibility. In 2019, we are planning to conduct an on-street loading zone pilot project that will examine the use of paid loading sessions to improve space availability and turnover at some locations in the downtown core.
- Consider creative solutions such as the use of staging areas, transload facilities or flexible use of public space (e.g. sidewalks) for couriers to encourage park-and-walk activity.
- Use time-of-day management in local areas with high levels of foot traffic.

Action 4.3: Improve delivery vehicle access and circulation

It is recommended that strategies to improve courier and truck circulation be implemented, such as:

- Encouraging the use of alley space for deliveries.
- Developing an online route finding app for commercial vehicles.
- Improving truck wayfinding through improving the quality of online maps, providing downloadable data and using variable message signs.
- Encouraging greater use of Stoney Trail, working with the province to review signage and explore greater use of e-information systems.
- Protecting access for aggregate movement in and around the quarries and aggregates processing facilities in northwest Calgary.

Action 4.4: Encourage the development of new truck parking/service areas to aid in the routing of trucks travelling to, from or through Calgary

Truck drivers need safe places that they can park their trucks while they are taking their required rest breaks. It is recommended that planning begin to ensure that the truck parking supply in Calgary can adequately meet the demands as they grow.

In collaboration with Alberta Transportation, landowners and the private sector, establish a location for a truck stop along Stoney Trail between McKnight and Country Hills Boulevard. This will assist in diverting some through truck trips to the ring road from other routes. It would be enabled through appropriate land use and access management.

Action 4.5: Partner with private sector to enhance and invest in infrastructure to improve goods movement

Working with the business community, it is recommended that investigating the feasibility of having individual businesses augment existing public funding sources by contributing directly to investment in local transportation and other infrastructure that directly benefits the community.

Action 4.6: Investigate new ways to minimize construction disruptions

Investigating the feasibility of additional measures that can reduce the disruptive effects of construction on trucks and other vehicles is recommended. Potential measures include reviewing the effectiveness of existing communication and consultation, early coordination with utilities, coordination of multiple road and utility projects at once, greater deployment of off-peak construction, accelerated construction, and alternative finance and procurement approaches to incentivize on-time completion.

Action 4.7: Partner with the private sector to pilot new delivery solutions

Many of the actions described here might be implemented best through pilot projects at specific locations, to uncover and address specific challenges that might not be apparent until they are procured and in operation. Pilot projects can reduce costs and risks while also establishing partnerships with the private sector or other governments to allow for broader implementation.

Investigating the potential for deploying pilot projects, along with the appropriate mechanisms to enable them, are recommended. This could include requesting proposals for innovative pilot projects from the private sector that could enhance goods movement in ways that complement or extend the actions described here.

Strategic direction 5: Develop flexible plans to adapt for a changing future

Recognizing and anticipating technological and other changes in the future, this strategic direction proposes four actions to help plan for a changing future.

Challenge to be addressed: Incorporate flexibility into future plans by recognizing and anticipating technological and other changes in the future.

Action 5.1: Review and update the processes of land use planning, site planning, transportation master plans, corridor plans, functional plans, etc. to prepare for new technologies that could change goods movement

It is recommended that we:

- Update the transportation plan evaluation practices to incorporate a protocol to evaluate goods movement innovations and new technologies.
- Pilot innovative technology initiatives (e.g. Smart Cities), including those with a freight focus.
- Use opportunities for reconstruction and other road works to install fibre and other technologies to prepare for the future deployment of these technologies on a larger scale.

We need to anticipate potential changes in infrastructure requirements, such as establishing dedicated lanes for autonomous vehicles. Recognizing and planning for flexibility in corridor plans and understanding, at a conceptual level, the possible implications on costs and land requirements. We should ensure that new developments account for access by new technology vehicles, bicycles and other alternatives to conventional trucks.

Action 5.2: Plan for changes in distribution and delivery requirements

We should plan for the deployment of innovative business solutions such as designated locker stations to accommodate changing online shopping habits. We should also support the efficient movement of goods by helping to promote freight exchanges, which are online marketplaces that assist carriers and shippers match loads with available trucking capacity. Freight exchanges help fill empty trucks so that they are not empty on return trips.

Action 5.3: Promote sustainable transportation modes for delivery of goods

Industry is already using alternative fuel vehicles; however, we should support further use of non-motorized or alternative fuel vehicles in appropriate settings. For example, partner with couriers to pilot cargo bicycles for last-kilometre delivery in selected urban areas, as is done in other cities such as Toronto.

Left: Hybrid electric delivery van in Calgary.

Right: Cargo bike used as a delivery vehicle by a Montreal laundry service.

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Action 5.4: Collaborate with the private sector and other stakeholders to address environmental and climate change impacts generated by goods movement
We should work with private industry to implement potential greenhouse gas reduction measures for goods movement, through promotion and the distribution of educational materials, etc. Potential measures range from short-term operational practices and educational programs, to the deployment of fuel reduction, alternative fuel and vehicle technologies and long-term planning.

Strategic direction 6: Enable data collection and collaboration on goods movement research

This strategic direction proposes three actions to improve access and use of data and research to anticipate and better plan for goods movement needs.

Challenge: Access and use data and research to anticipate goods movement needs and better plan for solutions.

Action 6.1: Collect, share and maintain goods movement data in collaboration with academic institutions and other partners
It is recommended that we update and augment our traditional data sources, this includes our existing methods for data collection. We should complement them with emerging data sources such as truck GPS traces.

Action 6.2: Support the creation of an urban freight research centre in Calgary, in collaboration with academic institutions and other partners
Collaborating with academia to address specific goods movement and logistics research needs and coordinating the collection and analysis of data through a formation of a new research centre is recommended. The research centre would support the implementation of individual actions by conducting dedicated research on specific questions. For example, some research topics suggested by stakeholders are quantifying the impacts of different GHG-reduction measures, breaking down collisions statistics for different types of goods movement vehicles and measuring the costs of alternative last kilometre delivery options.

Action 6.3: Conduct a new commodities flow survey and update the regional transportation model used by The City and regional partners

It is recommended that we update our regional transportation model using the information collected through the external truck origin-destination survey. We should also consider implementing a commodity flow survey, and use its findings to update the regional transportation model.

Implementation and monitoring

Implementation plan

The implementation of the Calgary Goods Movement Strategy is complex and multi-faceted. Some of the actions that are recommended can be implemented quickly and easily, while other actions require further research and additional information before implementation.

Prior to implementation, all 26 actions should be subjected to study and evaluation to ensure that they are the appropriate solutions to the challenges being faced by the goods movement industry. The implementation plan outlined in Appendix A serves as a road map for the actions. The benefits reflect the outcome of the implemented action, not of the preparatory study or review alone. This wording reflects the necessity of further detailing and consultation before an action can be prioritized, funded and implemented.

The time frame for implementation is presented as short-, medium- or long-term, depending on the most probable amount of time required to implement the action. "Ongoing" is also included to refer to continuous actions with indefinite start/end times. Appendix A further describes the benefits and costs of each action.

Three actions can be considered as enablers to broader actions, as they support the planning and detailing of goods movement actions rather than resulting directly in a specific change. These are Action 2.3 regarding the implementation of a freight council, Action 6.1 regarding data and Action 6.2 regarding information sharing and research.

Other strategy outcomes

The need for updates to the CTP's Primary Goods Movement Network was also reviewed, along with the desirability of consolidating and updating our truck bylaws. While the outcomes do not constitute policies, they are important to supporting the Strategy and its implementation.

The review of the Primary Goods Movement Network looked at how conditions have changed since the CTP was issued in 2009. Based on a review of where trucks travel, stakeholders' comments and connectivity to new and expanded multi-modal terminals in and around Calgary, the review recommended several additions to the Primary and Supporting Goods Movement Networks. The recommended additions are shown in Appendix C. No roads or highways were identified for removal from the Network.

Timeline for implementation of actions

Short-term	In the **short-term**, support actions that will have immediate and/or noticeable impacts. Maintain and encourage relationships that were established as part of the creation of the Strategy. Review processes related to transportation and land use planning, to prepare for new technologies and potential changes to the goods movement industry.	**Action 1.1:** Review signal timings to enhance the flow of goods along key corridors. **Action 2.2:** Promote cross-jurisdictional consistency on design standards and operational practices, including a regional truck network map. **Action 2.3:** Establish a goods movement council, consisting of key representatives from the public and private sectors. **Action 4.2:** Enhance the supply and use of on-street loading areas. **Action 5.1:** Review and update the processes of land use planning, site planning, corridor plans, functional plans, etc. to prepare for new technologies that could change goods movement. **Action 5.2:** Plan for changes in distribution and delivery requirements.
Medium-term	In the **medium-term,** work with stakeholders and partners to make improvements to the flow of vehicles travelling on the road and highway network, minimize construction disruptions and pilot new solutions to existing challenges. Work with partners and academia to review, collect and update data that will impact future decision making related to goods movement. Establish an urban freight research center in collaboration with academic institutions and partners.	**Action 1.3:** Collaborate with Alberta Transportation to enhance the movement of goods along Deerfoot Trail, Stoney Trail and other regional highways. **Action 3.1:** Evaluate ways to improve the flow of trucks and other vehicles on the road and highway network. **Action 3.3:** Improve mobility options for commuters to industrial areas. **Action 4.1:** Promote the inclusion of off-street delivery facilities into new or reconstructed non-residential developments. **Action 4.3:** Improve delivery vehicle access and circulation. **Action 4.4:** Encourage the development of new truck parking/service areas to aid in the routing of trucks travelling to, from or through Calgary. **Action 4.5:** Partner with private sector to enhance and invest in infrastructure to improve goods movement. **Action 4.6:** Consider new ways to minimize construction disruptions. **Action 4.7:** Partner with the private sector to pilot new delivery solutions. **Action 6.1:** Collect, share and maintain goods movement data in collaboration with academic institutions and other partners. **Action 6.2:** Support the creation of an urban freight research centre in Calgary, in collaboration with academic institutions and other partners. **Action 6.3:** Conduct a new commodities flow survey and update regional transportation model used by The City and regional partners.
Long-term	In the **long-term**, ensure that impacts to goods movement are identified when key transportation network projects are evaluated. As well, promote the development of key goods movement facilities as mobility and employment centres.	**Action 1.2:** Ensure the impacts to goods movement are identified in the evaluation of key infrastructure projects in the network. **Action 3.2:** Promote the development of key goods movement facilities as mobility and employment centres.
Ongoing	Continue to work with Regional partners to align corridor plans and funding priorities across the region, to improve connectivity for goods movement. Develop land use planning guidelines that protect complementary land use near major freight hubs and corridors. Continue to collaborate with partners to address the impacts of goods movement on the environment.	**Action 1.4:** Work with the province and neighbouring municipalities to align corridor plans and funding priorities across the region, to improve connectivity for goods movement. **Action 2.1:** Collaborate with regional partners, including the Calgary Metropolitan Region Board, on future land use and transportation plans that impact goods movement across the Calgary region, and continue to provide technical assistance with these plans. **Action 3.4:** Develop freight-supportive land use planning guidelines that protect complementary land use near major freight hubs and corridors. **Action 5.3:** Promote sustainable transportation modes for delivery of goods, where practical. **Action 5.4:** Collaborate with the private sector and other stakeholders to address environmental and climate change impacts generated by goods movement.

The review of the three truck bylaws found that Bylaw 26M96, the Traffic Bylaw, is linked to provincial laws that regulate all vehicular traffic movement. Due to this, it would be difficult to extract the parts that pertain specifically to goods movement. As a result, it should be maintained as a separate self-contained document. The bylaw has been updated several times since its 1996 enactment, so it is recommended that we review it to simplify and update the language.

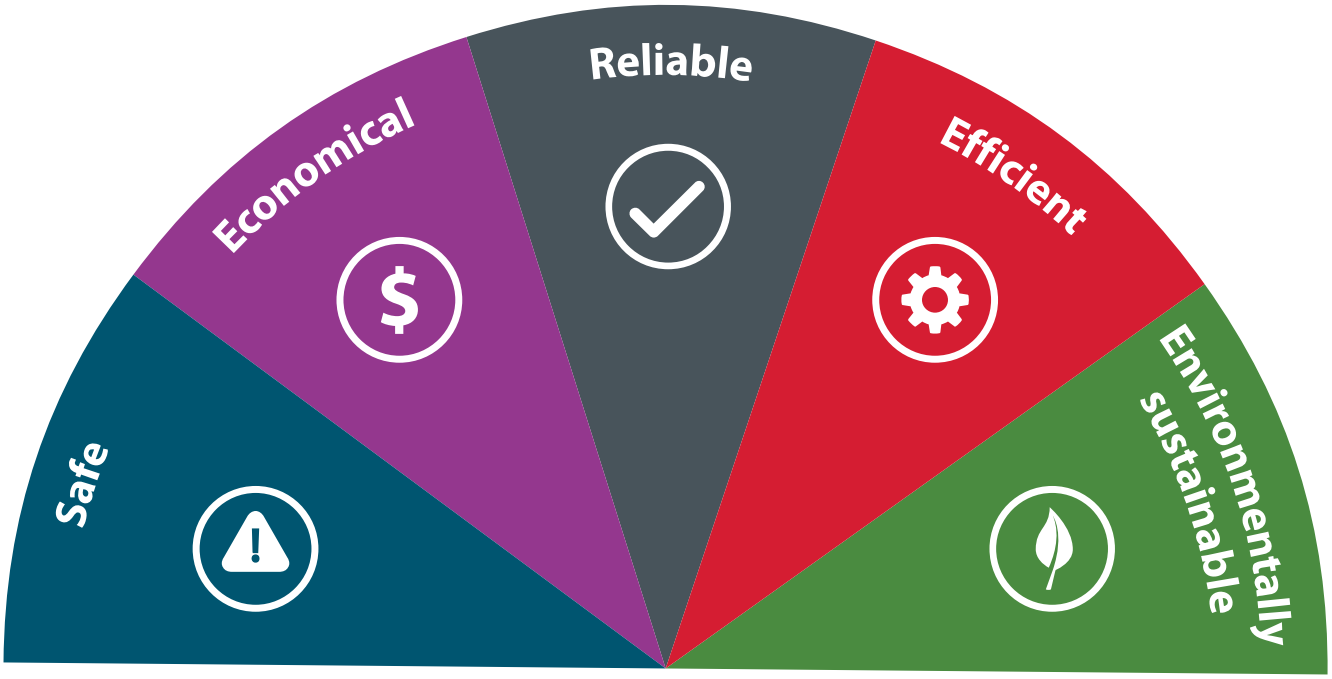
Bylaw 60M90 (Calgary Truck Route Bylaw) and Bylaw 13M2004 (Calgary Dangerous Goods Bylaw), as amended by Bylaw 23M2005, pertain specifically to goods movement within Calgary. They are already supported by a map that shows truck routes and dangerous goods routes within City boundaries. It is recommended that we combine the two bylaws to provide the relevant information in a single document. The wording also should be updated. Other recommendations are to include links where truck routes are discontinuous to complete connections between other truck routes, the introduction of future connections to major projects that are now being planned or are under construction and the introduction of future connections to developing areas. In addition, it is recommended that the map be updated for clarity.

Measures of success

Once we begin to implement the actions within the Calgary Goods Movement Strategy, it is important to measure how effective our efforts have been and how much progress has been made. A variety of qualitative and quantitative indicators have been proposed to help us assess the effectiveness of the Strategy and progress on implementing its actions. They can also be used to adjust the implementation plan based on progress that's been made.

Appendix D outlines the indicators of success. The indicators are tied to the five elements of the vision: "a multi-modal system that is safe, economical, reliable, efficient and environmentally sustainable". A sixth category is also included to account for communications and information to support the Strategy.

Measuring the success of the vision for goods movement in Calgary



Safe	Economical	Reliable	Efficient	Environmentally sustainable
Reduce the number of fatal and serious injury crashes involving trucks.	Reduce the costs of implementing improvements.	Reduce travel times/speeds by time of day.	Increase the percentage of trucks that use desirable routes, such as the Primary Goods Movement Network, and reduce the percentage using other routes, such as local roads.	Increase percentage of urban goods movement trips made in alternative fuel vehicles or by active transportation.
Reduce bicycle-truck collisions.	Reduce the costs of maintaining infrastructure.	Improve reliability of truck travel times.	Increase the percentage of trip distances made via Primary Goods Movement Network.	Increase average vehicle fullness and reduce empty vehicle kilometers travelled.
Reduce the number of accidents involving dangerous goods spills.	Reduce the average truck operating cost.	Improve the percentage of on-time deliveries.	Increase percentage of deliveries made with vehicles parked close to destination.	Reduce number and severity of dangerous goods spills involving trucks.

Appendix A: Implementation plan

The table below indicates our role and the role of others in implementing the action, as well as a time frame for implementation. Since many of the actions are multifaceted, a detailed cost is not projected. Instead, costs are rated on a three-point scale (represented as $, $$, $$$) where the first level represents low-cost policy directions or studies, the second level represents larger-effort strategies and programs, and the third level represents significant infrastructure investments.

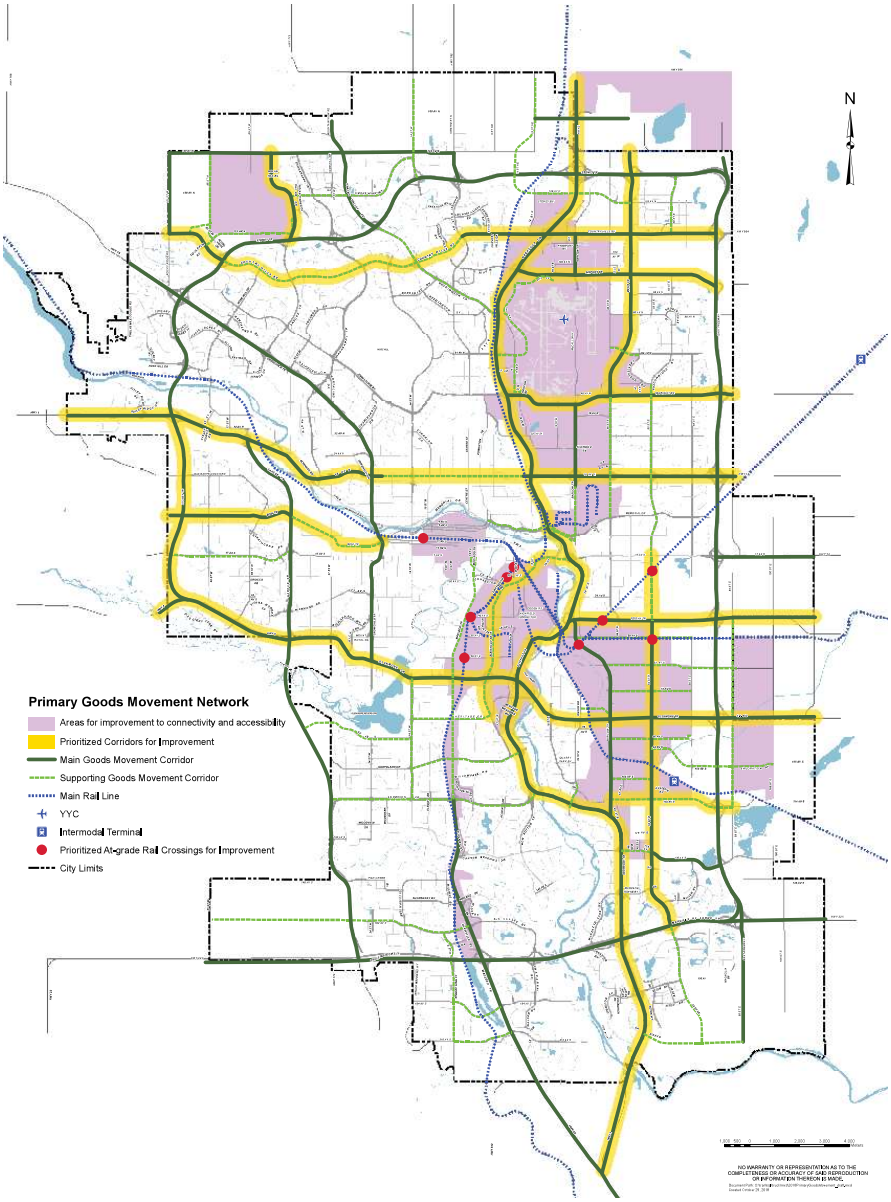
Action	Benefit	Cost	Leading/supporting roles	Time frame
Strategic direction 1: Continue to invest in transportation infrastructure to enhance goods movement.				
Action 1.1: Review signal timings to enhance the flow of goods along key corridors.	Updating, as appropriate, signal timings at intersections and corridors that have high volumes of truck traffic can reduce delay and minimize stop-start conditions for all private sector goods movement stakeholders (the "private sector") and for all traffic generally.	$ – $$	The City of Calgary to review and, as appropriate, implement. Appendix B shows transportation infrastructure improvement projects that could be implemented in the short-, medium- and long-term.	Short-term
Action 1.2: Ensure the impacts to goods movement are identified in the evaluation of key infrastructure projects in the network.	Private sector and other road users benefit from more direct routing and reduced congestion, thereby improving productivity, lowering costs and potentially reducing accidents. Land owners in industrial areas benefit from increased accessibility. The public-sector gains from potential tax revenues through the development of newly accessible lands, while supporting CMRB development aspirations.	$$$	The City of Calgary to review and, as appropriate, prioritize and implement. Appendix B shows transportation infrastructure improvement projects that could be implemented in the short-, medium- and long-term.	Long-term
Action 1.3: Collaborate with Alberta Transportation to enhance the movement of goods along Deerfoot Trail, Stoney Trail and other regional highways.	Private sector and other road users benefit from increased opportunities to bypass congested urban roads, reduced congestion and improved accessibility. Residents and businesses along urban roads, such as 16th Avenue North, benefit from reduced through truck traffic. Land owners in industrial areas benefit from increased accessibility. The public-sector gains from increases in tax revenues through the development of newly accessible lands.	$$ – $$$	The City of Calgary to work with Alberta Transportation to review and, as appropriate, prioritize and implement. This might also include developing a solid funding model from the province for improving or adding interchanges and intersections on provincially-owned facilities. Appendix B shows the projects that were identified by stakeholders, to be considered for further analysis.	Medium-term
Action 1.4: Work with the province and neighbouring municipalities to align corridor plans and funding priorities across the region, to improve connectivity for goods movement.	Municipalities across the Calgary Region gain from increased attractiveness of lands to potential businesses and from optimization of capital works, hence reduced costs. The private sector and the Calgary Region workforce benefit from greater economic potential as new industries are developed.	$ – $$	The City of Calgary to lead, in coordination with other municipalities and, likely, the CMRB.	Ongoing

Action	Benefit	Cost	Leading/supporting roles	Time frame
Strategic direction 2: Collaborate with external partners to enhance regional goods movement.				
Action 2.1: Collaborate with regional partners, including the Calgary Metropolitan Region Board, on future land use and transportation plans that impact goods movement across the Calgary Region, and continue to provide technical assistance with these plans.	Private sector benefits from greater coordination. City of Calgary and other municipalities benefit from shared knowledge.	$	The City of Calgary to lead, in coordination with other municipalities and, possibly, CMRB.	Ongoing
Action 2.2: Promote cross-jurisdictional consistency on design standards and operational practices, including a regional truck network map.	Private sector benefits from greater coordination of bylaws, oversize-overweight restrictions, and design/engineering standards.	$	The City of Calgary to lead, in coordination with other municipalities and Alberta Transportation.	Short-term
Action 2.3: Establish a goods movement council, consisting of key representatives from the public and private sectors.	Goods movement industry stakeholders ensure their voice is heard on a regular basis. The goods movement industry can speak "with one voice." Public agencies benefit from a closer understanding of goods movement needs, challenges and emerging trends. All benefit from improved coordination of actions and priorities. This action is an enabling action.	$	The City of Calgary to create a freight council with private sector, public sector and other partners.	Short-term
Strategic direction 3: Promote planning for logistics centers and industrial areas.				
Action 3.1: Evaluate ways to improve the flow of trucks and other vehicles on the road and highway network.	These sub-actions would improve the time and reliability performance of goods movement. Several sub-actions could also have benefits to passenger vehicles from reduced congestion. Safety benefits in many cases.	$$ – $$$	The City of Calgary should conduct targeted studies to study traffic flow options, and produce a strategic goods movement network (hierarchy) to serve as a road map for other sub-actions.	Medium-term
Action 3.2: Promote the development of key goods movement facilities as mobility and employment centres.	Consolidating complementary uses in hubs improves efficiency and can reduce conflicts with passenger vehicles and other traffic. Developing the airport as a transportation hub supports regional economic development.	$$	The City of Calgary to use land use, transportation, industrial lands and economic development policies to support freight hubs, and work with Calgary Airport Authority towards enhancing the airport vicinity as an air hub.	Long-term
Action 3.3: Improve mobility options for commuters to industrial areas.	Freight-dependent businesses benefit from employees having easier access to work. Improves competitiveness of Calgary (ready access to employee base).	$$	The City of Calgary to study alternative transit options in combination with neighbouring municipalities.	Medium-term

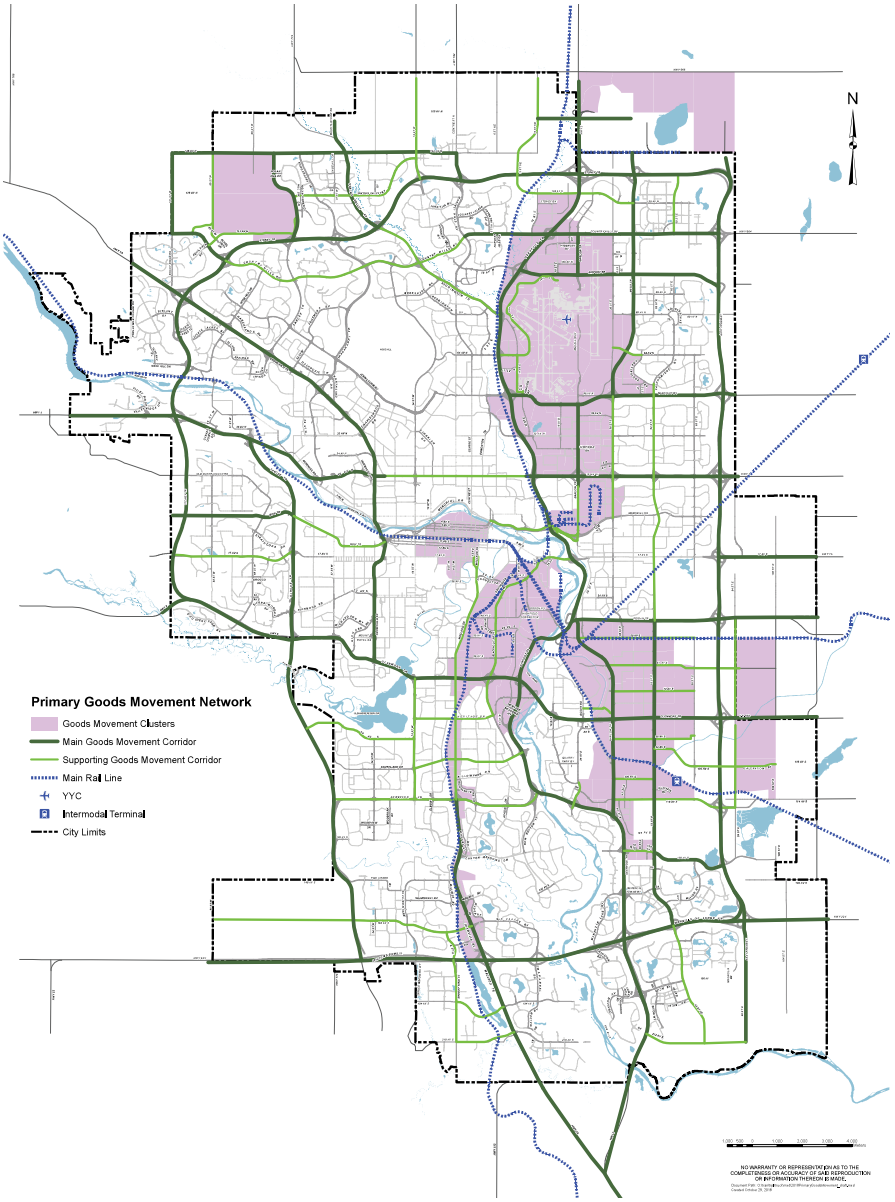
Action	Benefit	Cost	Leading/supporting roles	Time frame
Action 3.4: Develop freight-supportive land use planning guidelines that protect complementary land use near major freight hubs and corridors.	Avoiding these conflicts increases efficiency and safety for shippers and carriers; also, benefits residents and the public.	$	The City of Calgary to review which best practice ideas could be applied from other jurisdictions and, in consultation with stakeholders and facility owners, develop / update land use policies to minimize conflicting land uses at appropriate locations.	Ongoing
Action 3.5: Enhance Calgary's attractiveness as a logistics and distribution hub.	Greater economic competitiveness for the region.	$$ – $$$	The City of Calgary to work with private sector and use freight council to stay on top of latest developments, and make necessary investments, in coordination with the CMRB and local municipalities.	Long-term
Strategic direction 4: Enhance last-kilometre deliveries.				
Action 4.1: Promote the inclusion of off-street delivery facilities into new or reconstructed non-residential developments.	Faster and more efficient deliveries. Benefits to residents from reduced disturbances.	$$	The City of Calgary to review development standards and update as appropriate. Some concerns might be addressed through the existing development planning process.	Medium-term
Action 4.2: Enhance the supply and use of on-street loading areas.	Faster and more efficient deliveries.	$ – $$	The City of Calgary to review curbside management strategy and update as appropriate.	Short-term
Action 4.3: Improve delivery vehicle access and circulation.	Greater efficiency for shippers and carriers.	$	The City of Calgary to review opportunities to improve circulation, prioritizing challenges raised by industry while accounting for other factors as well.	Medium-term
Action 4.4: Encourage the development of new truck parking/service areas to aid in the routing of trucks travelling to, from or through Calgary.	An increased supply of truck parking improves operating efficiency; also improves safety as informal/illegal parking spots are avoided.	$	The City of Calgary to review adequacy of truck parking supply and, working with landowners, the trucking industry and Alberta Transportation, identify potential locations for truck parking.	Medium-term
Action 4.5: Partner with private sector to enhance and invest in infrastructure to improve goods movement.	Private funding can in some cases supplement public funding on local infrastructure.	$	The City of Calgary to investigate feasibility of BIAs to supplement funding for local infrastructure.	Medium-term
Action 4.6: Consider new ways to minimize construction disruptions.	Fewer construction disruptions mean reduced delays and improved reliability for the trucking industry.	$–$$	The City of Calgary to carry out a review of additional opportunities to reduce construction impacts on traffic.	Medium-term
Action 4.7: Partner with the private sector to pilot new delivery solutions.	Industry partners can provide fresh approaches leveraging new technologies and tools. Openness to new solutions can support Calgary's reputation as an attractive place to do business.	$	The City of Calgary to announce invitation to industry stakeholders to pitch and test innovative delivery solutions, and work with other levels of government to ensure enabling laws are in place.	Medium-term

Action	Benefit	Cost	Leading/supporting roles	Time frame
Strategic direction 5: Develop flexible plans to adapt for a changing future.				
Action 5.1: Review and update the processes of land use planning, site planning, corridor plans, functional plans, etc. to prepare for new technologies that could change goods movement.	Having a defined protocol is helpful for evaluating the impacts of innovative disruptions – including planning for both upsides and downsides of new technologies.	$	The City of Calgary to develop / update technology policy documents to guide adaptations to new technologies that influence goods movement.	Short-term
Action 5.2: Plan for changes in distribution and delivery requirements.	E-commerce is fundamentally changing how deliveries are made, and this action will improve the understanding of its implications on planning and operations of municipal infrastructure.	$	The City of Calgary to study e-commerce needs and implications on future, including detailed review of best practices elsewhere.	Short-term
Action 5.3: Promote sustainable transportation modes for delivery of goods, where practical.	Non-motorized modes for last-kilometre delivery can have environmental, safety and congestion benefits.	$	The City of Calgary to support non-motorized last-kilometre solutions, working with private sector to implement pilot projects.	Ongoing
Action 5.4: Collaborate with the private sector and other stakeholders to address environmental and climate change impacts generated by goods movement.	Range of solutions – focus on those solutions, such as vehicle technologies and operational efficiencies, that can save money for industry while also benefiting the environment.	$ – $$$	The City of Calgary to support education and awareness of GHG reduction measures and, with the provincial and federal governments and others, investigate feasibility of implementing supporting infrastructure. Private sector to investigate and implement GHG reduction measures.	Ongoing
Strategic direction 6: Enable data collection and collaboration on goods movement research.				
Action 6.1: Collect, share and maintain goods movement data in collaboration with academic institutions and other partners.	Better goods movement data mean improved decision-making. This action is an enabling action.	$–$$	The City of Calgary should update existing but now-dated data sources, add new and emerging data sources and integrate these together.	Medium-term
Action 6.2: Support the creation of an urban freight research centre in Calgary, in collaboration with academic institutions and other partners.	Academic organizations and private partners all bring complementary capabilities to the table, and can augment public sector research. This action is an enabling action.	$–$$	The City of Calgary to work with academic research centres and private partners to investigate setting up a joint goods movement research centre.	Medium-term
Action 6.3: Conduct a new commodities flow survey and update regional transportation model used by The City and regional partners.	Greater ability to plan for and enhance goods movement infrastructure, through a better understanding of the value of the improvements.	$$	The City with its regional partners.	Medium-term

Appendix B: Areas and corridors for improvements



Appendix C: Recommended Primary Goods Movement Network



Appendix D: Measures of success indicators

The table below describes the success indicator, its purpose and data source. Comments are also noted, to provide additional information and clarification.

Vision element / indicator	Description	Object	Data source	Comments
Safe for all system users				
Reported fatal and serious injury crashes and injuries	Number of reported fatal and serious injury crashes and injuries involving trucks per 1,000 population or per million truck vehicle-kilometres travelled (VKT)	Reduce rate	CPS accident records	
Reported bicycle-truck collisions.	Subset of the preceding measure	Reduce rate	CPS accident records	
Reported accidents involving dangerous goods spills.	Number and severity of crashes involving trucks in which spills occurred	Reduce number	CPS/CFD records	
Economical to implement, operate, maintain and use				
Economical implementation	Unit costs of implementing improvements on Primary Goods Movement Network and truck route network, relative to those of other routes	Reduce relative to other unit costs.	Capital budgets	Encourage improvements on routes that will be used by trucks over other investments, all else being equal.
Economical operation and maintenance	Unit costs of operating and maintaining Primary Goods Movement Network and truck route network, relative to those of other routes	Reduce relative to other unit costs.	Operating, maintenance and rehabilitation budgets	Encourage improvements on routes that will be used by trucks over other investments, all else being equal. Encourage implementation of appropriate pavement and other structures to support trucks. Encourage appropriate operation, maintenance and rehabilitation schedules to keep trucks on desired routes.
Variance in truck operating costs	Changes in vehicle operating costs for selected routes	Reduce average operating costs: function of changes in average travel times and reliability	Sample truck fleets to determine changes in costs as travel times/ reliability change. Alternatively, use truck travel time and travel time reliability measures as proxies.	Data may be held as confidential by trucking fleets. Costs likely will vary by fleet type and size. Requires common definition of composition of operating costs. Hence proxies may be more practical alternative.

Vision element / indicator	Description	Object	Data source	Comments
Reliable service, travel times and network redundancy				
Truck travel times	Mean door-to-door journey times (or speeds) by time of day on selected routes	Reduce travel times (speeds) by time of day	GPS traces or travel time surveys, taken at discrete time intervals.	Depending on the data source, can be difficult to isolate travel times for trucks.
Reliability of truck travel times	Standard deviation of door-to-door travel times (or speeds) by time of day on selected routes	Reduce journey time (speed) variability by time of day	GPS traces or travel time surveys, taken at discrete time intervals.	Depending on the data source, can be difficult to isolate travel times for trucks.
Congestion	Per cent on-time deliveries made, i.e., per cent made within defined delivery schedules	Improve per cent on-time deliveries	Sample truck fleets to determine per cent deliveries that have been made within a defined delivery schedule.	Data may be held as confidential by trucking fleets. May not be representative for all fleet types and sizes.
Redundancy	Per cent on-time courier deliveries made, i.e., per cent made within defined or promised delivery schedules	Improve per cent on-time deliveries	Sample couriers to determine per cent deliveries that have been made within a defined delivery schedule.	Aims to measure accessibility for couriers. Data may be held as confidential by trucking fleets. May not be representative for all fleet types and sizes.
Efficient directness, connectivity, intermodal interchange				
Truck contribution to the traffic stream	Per cent truck traffic on selected routes	Increase per cent of trucks on desirable routes (e.g., Primary Goods Movement Network/reduce per cent on other routes (e.g., local roads)	Traffic counts	Aim is to promote use of certain routes over others.
Directness	Actual distance travelled against potential shortest path, via Primary Goods Movement Network for selected routes	Bring actual distances closer to potential shortest distances	GPS traces versus model- or Google- (or similar-) based shortest paths.	
Connectivity	Per cent of door-to-door trip distance made on Primary Goods Movement Network for selected routes	Increase per cent of trip distance made via Primary Goods Movement Network	GPS traces	
Intermodal interchange	Proximity/availability of on-street loading spaces to destination	Per cent of deliveries made with vehicle legally parked within short (to be defined) distance of destination	Establishment surveys, especially including couriers.	New establishment survey required.

Vision element / indicator	Description	Object	Data source	Comments
Environmentally sustainable, reducing fuel use, GHG and air pollutants				
Share of road-based goods trips made in alternative fuel vehicles or by active transportation	Per cent shares of goods VKT made in alternative fuel vehicles or by active transportation	Increase per cent	Surveys of establishments. A simpler alternative is to count goods trips by mode at screenlines and estimate a synthetic origin-destination matrix.	Could be derived for the entire city or for specific areas such as downtown. New establishment survey required. New screenline counts required.
Efficiency of road-based goods trips	Fullness of delivery trips	Increase average vehicle fullness/ reduce empty VKT	Establishment surveys or roadside surveys	New establishment survey required.
Spills of dangerous goods from or involving trucks	Reportable incidents of spills, including runoff	Reduce number and severity of incidents	Calgary Fire Department	Proxy measure of utilization of trucks, appropriately designed dangerous goods routes, etc.
Communications and information to support the Strategy				
Goods movement council	Establishment of an ongoing goods movement council	Number of participating organizations (membership to be determined)	The City of Calgary	
Awareness and education	Deployment of Strategy's educational materials	Number and type of applications, references, etc.	The City of Calgary	
Guides and standards	Updates/implementation of design standards to account for changing delivery requirements, evaluate new technologies, promote common infrastructure design standards, etc.	Account for changing goods movement needs in standards, plan evaluation, etc.	The City of Calgary in consultation with private sector, other municipalities, Alberta Transportation, etc.	
Goods movement data	Enhancement/update of data for goods movement planning	Implement ongoing goods movement data collection	The City of Calgary	
Research	Establishment of research collaborations	Establish ongoing goods movement research	The City of Calgary, with academic and industry partners	
Demonstrations	Implementation of programs to demonstrate sustainable technologies and practices, etc.	Pilot technologies that could reduce GHGs and fuel consumption	The City of Calgary with academic and industry partners	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