


# Calgary Transportation Plan

Adopted by Council
September 2009

## Document Updates:

| Date | Report | Description |
|---|---|---|
| 2012 January 10 | C2012-03 | Delete and replace Maps 1, 2, 5, 6 and 7 to relfect boundary change. |
| 2013 July 22 | M-2013-007 | Delete and replace Map 2 entitled “Primary Transit Network”.<br>Delete and replace Map 7 entitled “Road and Street Network”. |
| 2014 January 13 | M-2013-018 | Delete and replace Map 1 entitled “Primary Cycling Network”.<br>Delete and replace Map 2 entitled “Primary Transit Network”.<br>Delete and replace Map 5 entitled “Primary Goods Movement Network”.<br>Delete and replace Map 6 entitled “Primary HOV Network”.<br>Delete and replace Map 7 entitled “Road and Street Network”. |

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# Part One

## Contributing to the Plan It Calgary vision

## 1.1 Purpose of the Calgary Transportation Plan

The design of the transportation system has a significant impact on the urban form of the city. It contributes to the shape of our communities and employment centres, and it determines how we move within and among these places. It supports the economy by facilitating the timely movement of goods, services and people within the city and to regional or international destinations. It can either enhance or degrade the environment depending on how well it is integrated with its surroundings and the degree to which we depend on fossil fuels to reach our destinations. The decisions made today about where and what to build will affect Calgarians for 100 years or more – just as decisions made in the past affect us today.

Going forward, the transportation system must perform a wide variety of roles and consider the context of surrounding land uses, be they natural or manufactured. It must provide more choice for Calgarians – realistic choices that are convenient, affordable and attractive. These choices include walking, cycling, transit, high occupancy vehicles (HOV or carpooling) and single-occupant vehicles (SOV). The needs of commercial vehicles (goods and services) and emergency services (police, fire, EMS and emergency management) must be considered in context.

Successful application of the CTP policies will move Calgary towards a more sustainable future – for our economy, our environment and our citizens.

The Calgary Transportation Plan (CTP) provides policy direction on multiple aspects of the city's transportation system. To make the application of these policies as clear as possible, they are broken down into two categories:

### Requirements

- contain the word "must"
- these policies apply in all situations, without exception

### Recommendations

- contain the word "should"
- these policies are to be applied in all situations, unless it can be clearly demonstrated to the satisfaction of The City that the policy is not reasonable, practical or feasible in a given situation
- proposed alternatives must be to the satisfaction of The City with regards to design and performance standards

In each section, words shown in *italics* (with the exception of sub-section titles) are defined in the glossary located in Appendix C.

## 1.2 Linking to the Municipal Development Plan

The policies contained in the CTP are linked directly to the Municipal Development Plan (MDP). In order to meet the statutory requirements of the Municipal Government Act, and provide additional context for the land use policies, the MDP contains a summary of the transportation objectives from section 3 of the CTP. It also contains the Primary Transit Network and *Road* and *Street* Network maps. Some of the policy sections in the CTP also contain references to sections in the MDP that need to be considered when planning transportation infrastructure in Calgary.

The MDP provides detailed policies for multiple land use areas known as *typologies*. The *Typology* section of the MDP contains detailed descriptions of each *typology*, along with land use, urban design and mobility policies. While the CTP provides a comprehensive policy framework for transportation in Calgary, transportation professionals should also familiarize themselves with each of the *typology* areas in the MDP to understand fully the differences in transportation priorities. The maps contained in the CTP show the key *typologies*, such as *Activity Centres*, *Corridors* and industrial areas, related to each transportation network.

## 1.3 Aligning with the *Calgary Metropolitan Plan*

The policies contained in the CTP align with the goals and policy direction of the *Calgary Metropolitan Plan*. The transportation networks identified in the CTP accommodate connections for multiple modes of transportation to adjacent municipalities (Rocky View County, MD of Foothills, Town of Chestermere) and the Tsuu T'ina Nation that will enhance the region's competitive advantage regionally, nationally and globally.

Investment decisions for Calgary's transportation infrastructure will consider the needs and impact on adjacent municipalities, and support long-range plans for regional transportation systems. Calgary will also participate in regional transit planning to provide effective transportation options that support long-range land use objectives in Calgary and the region.

## 1.4 The Sustainability Principles and Key Directions for Land Use Mobility

In January of 2007, City Council adopted the *Sustainability* Principles for Land Use and Mobility. The Principles were derived from current City of Calgary policy direction, well recognized Smart Growth principles, and the direction of the Long Range Urban *Sustainability* Plan for Calgary (imagineCALGARY). The *Sustainability* Principles for Land Use and Mobility are:

1. Create a range of housing opportunities and choices.
2. Create *walkable* environments.
3. Foster distinctive, attractive communities with a strong *sense of place*.
4. Provide a variety of transportation options.
5. Preserve open space, agricultural land, natural beauty and critical environmental areas.
6. Mix land uses.
7. Strategically direct and manage *redevelopment* opportunities within existing areas.
8. Support compact development.
9. Connect people, goods and services locally, regionally and globally.
10. Provide transportation services in a safe, effective, affordable and efficient manner that ensures reasonable *accessibility* to all areas of the city for all citizens.
11. Utilize *green infrastructure* and buildings.

In November of 2008, City Council also approved the Key Directions for Land Use and Mobility for use in the development of the MDP and CTP. The Key Directions represent the strategic moves that need to be accomplished in order to guide Calgary towards the imagineCALGARY vision and the *Sustainability* Principles for Land Use and Mobility. The Key Directions for Land Use and Mobility are:

1. Achieve a balance of growth between established and greenfield communities
2. Provide more choice within *complete communities*
3. Direct land use change within a framework of nodes and corridors
4. Link land use decisions to transit
5. Increase mobility choices
6. Develop a Primary Transit Network
7. Create *Complete Streets*
8. Optimize infrastructure

## 1.5 Transportation goals

Each section in the CTP indicates support for a combination of Council-approved Key Directions for Land Use and Mobility and the following transportation goals. The seven transportation goals give additional direction to all aspects of transportation in Calgary and provide more detail to the overall transportation goal contained in the MDP, which is:

To develop an integrated, multi-modal transportation system that supports land use, provides increased mobility choices for citizens, promotes vibrant, connected communities, protects the natural environment, and supports a prosperous and competitive economy.

**Transportation Goal #1:** Align transportation planning and infrastructure investment with city and regional land use directions and implementation strategies.

City and regional land use directions are designed to reduce our ecological footprint and promote the conservation and responsible consumption of natural resources including land, energy and water. Commitment to these directions will achieve greater use of more sustainable travel modes such as walking, cycling and public transit, while also reducing the average distance travelled by automobiles.

**Transportation Goal #2:** Promote safety for all transportation system users.

The City should ensure that all aspects of the transportation system are safe and secure, and enable prompt and effective emergency response. These objectives will be achieved through ongoing operations, maintenance and public education programs, as well as mobility management and land use strategies that will reduce vehicular travel and improve public safety and health.

**Transportation Goal #3:** Provide affordable mobility and universal access for all.

Citizens must be provided with a range of affordable travel options regardless of income or ability, including walking, cycling, public transit, and taxis. The built environment and transportation infrastructure should incorporate principles of universal access.

**Transportation Goal #4:** Enable public transit, walking and cycling as the preferred mobility choices for more people.

An integrated strategy is required that includes substantial transit expansion, investment in new pedestrian and cycling infrastructure, *transit-oriented* land use and supportive *street* and parking policies. These strategies will reduce demands on the transportation system by reducing vehicle trip distances and making public transit, walking and cycling more appealing mobility choices for more people.

**Transportation Goal #5:** Promote economic development by ensuring the efficient movement of workers and goods.

The transportation system must foster economic development by facilitating the efficient movement of workers and goods by *roadway*, rail and air. Transportation facilities must provide access to major industrial and employment locations.

**Transportation Goal #6:** Advance environmental *sustainability*.

The transportation system should be planned, designed, operated and maintained to reduce the impact of travel on the environment by curbing land consumption, protecting air and water quality and reducing energy consumption and *greenhouse gas emissions*.

**Transportation Goal #7:** Ensure transportation infrastructure is well managed.

Sound management of all transportation infrastructure will promote efficiency, infrastructure preservation and value, safety and a healthy environment.

## 1.6 Public and community engagement

The increasing complexity of issues faced by "city builders" requires that all disciplines work together to achieve outcomes that would not be possible for any one discipline acting alone. Involvement of broad stakeholder groups will also be important in the planning, design and operation of the transportation system.

Collaborative processes should be undertaken when planning new transportation infrastructure, upgrading existing infrastructure, or evaluating the impacts of new developments. Impacted stakeholder groups, including but not limited to community residents and associations, local businesses and the development industry should be engaged early in planning processes to build understanding of transportation issues, and ensure that infrastructure meets the needs of all users and adjacent properties.

## 1.7 Amending the CTP

Like the MDP, the CTP is a living document and will be kept current by reviewing, updating and amending it as required. Any changes to policies, maps or appendices in the CTP as proposed by Administration will require approval by resolution of Council. Amendments to the CTP may also be triggered by amendments to the MDP.

## 1.8 Implementation

All policies contained in the CTP are in effect immediately upon the date specified through approval by resolution of Council. Over time, updates to existing transportation plans and guidelines would align to the contents of the CTP (such as *Street* classifications and nomenclature).

A companion implementation plan will contain the 10-year actions necessary to achieve the policies contained in the CTP, and will indicate the phasing and resource requirements associated with the actions. The implementation plan should be updated with each three-year business cycle to maintain alignment with the growth, planning and investment objectives contained in the MDP and CTP. Where and when investments are made in transportation infrastructure is a critical component of the overall CTP implementation strategy. Part 2 of the CTP contains implementation policies to align infrastructure investment with the goals and objectives of the CTP and MDP.


# Part Two

## Implementation through strategic investment

# Part 2 – Implementation through strategic investment

**Objective** Align transportation planning and investment decisions with strategic corporate growth policies in order to increase municipal fiscal *sustainability*.

## Discussion

The MDP contains a process and policies to guide growth decisions in Calgary, called the Strategic Framework for Growth and Change (referred to as the MDP Framework for Growth and Change in this document). The MDP Framework for Growth and Change contains a variety of policies to address key growth challenges in Calgary, and ensures the best possible social, environmental and economic outcomes for citizens both now and in the future.

The decision making process described in the MDP Framework for Growth and Change contains criteria for selecting growth areas in both developed and greenfield areas of the city. It also more clearly links land use planning and infrastructure investment decisions back to the long-range plan contained in the MDP, and consequently the CTP as well.

This new process has several policy implications for the provision of transportation infrastructure in Calgary:

- Infrastructure management programs will be designed to support the objectives of the MDP;
- Municipal capital investment in infrastructure (including new and maintenance/refurbished) should be prioritized in the following manner:
  - i. Support intensification of Developed Areas of the city;
  - ii. Expedite the completion of communities in Planned Greenfield Areas of the city (as defined on the MDP Urban Structure Map).
  - iii. Supporting the development of Future Greenfield Areas.
- Align The City's capital planning programs, such as the Transportation Infrastructure Investment Program, the Emergency Response Infrastructure Investment Program, the Culture, Parks and Recreation Infrastructure Investment Program, etc., to support the direction of the MDP and CTP.
- Upon adoption of a new Local Area Plan (as defined in the MDP), all relevant maps in the MDP and CTP must be updated.

Future transportation planning and investment activities need to align with the MDP Framework for Growth and Change in order to achieve the goals of the MDP and CTP. However, transportation investments must also take into account the ongoing infrastructure management needs of existing facilities and additional priorities in the CTP that are beyond the scope of the MDP Framework for Growth and Change (such as improvements to the Primary Goods Movement Network described in section 3.4). The following transportation policies address these issues.

## Policies

a. Transportation planning priorities and investment decisions must be aligned and co-ordinated with the MDP Framework for Growth and Change, and the CTP transportation goals.

b. The highest priority for transportation capital and operating investment should be the Primary Transit Network and supporting infrastructure (including walking and cycling infrastructure and *Complete Streets*) in *Activity Centres* and *Corridors*.

c. Transportation capital and operating investments that will enhance the reliability and safety of goods movement should be given increasing priority.

d. Ongoing operating and maintenance costs must be considered in the approval process for transportation infrastructure projects.

e. New funding sources should be identified and pursued to fund both transportation capital and operating costs.

f. The *capacity* and life-cycle of existing transportation infrastructure should be optimized before investing in new infrastructure in existing areas.

g. The infrastructure and implementation strategies identified in the CTP should be reviewed and prioritized within the context of The City's current and future financial capacities.

# Part Three

## Transportation policies

# Part 3 – Transportation policies

The following sections outline the transportation policies that work in conjunction with the land use policies of the MDP. The CTP policy areas that contribute most to achieving the Key Directions for Land Use and Mobility and the transportation goals are:

- Transit
- *Complete Streets*

Given their importance, these two sections contain more extensive background information and policies to aid implementers in achieving the desired outcomes.

All maps referred to in the following sections are located in Appendix D.

## 3.1 Transportation choice

**Objective** Maintain automobile, commercial goods and emergency vehicle mobility in Calgary while placing increased emphasis on sustainable modes of transportation (walking, cycling and transit).

### Supports

***Key Direction #5:*** Increase mobility choices.
***Key Direction #7:*** Create *Complete Streets*.

***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.

***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.

### Discussion

Calgary's current transportation system is focused primarily on *roadways* and the efficient movement of motorized vehicles. With the exception of transit service to the downtown, other modes of transportation (such as walking and cycling) have been given less priority. This has happened largely out of necessity. Over the last 50 years, land uses have been increasingly segregated, with homes located further and further away from jobs and amenities. Population growth has gone almost entirely to the edges of the city, while employment continues to cluster in the downtown and east industrial areas. With trip distances increasing each year, the private automobile has naturally become the preferred travel choice.

The CTP and MDP represent a new direction for transportation in Calgary. The more compact form of development envisioned in the MDP will bring homes, jobs, services and amenities closer together. This will make non-automobile modes of travel more convenient, and therefore give Calgarians choices when travelling around the city. More choice means that Calgary's transportation system will:

- improve overall mobility;
- better withstand rising energy costs or other economic shocks;
- reduce energy use and emissions;
- provide travel options for all Calgarians, regardless of age or income; and
- increase Calgary's competitive advantage in the global marketplace.

In most cases, it will not be practical to accommodate all modes of travel equally in every part of Calgary. Decisions will need to be made on which modes should be emphasized in each part of the city. Sustainable modes of transportation should be emphasized where they can provide convenient and realistic travel choices. The Transportation *Sustainability* Triangle in Figure 1 shows the relative *sustainability* of each transportation mode, with walking being the most sustainable.

Walking, cycling and transit are all more sustainable modes because:

- they require less energy;
- need less infrastructure and typically cost less to build; and
- are available to almost all Calgarians.

Commercial vehicles are also a critical element of Calgary's economy, and must be accommodated in most parts of the city, with emphasis on several key areas (such as the airport, industrial areas, *intermodal* rail terminals, and on heavily used goods movement corridors such as Deerfoot Trail and the Ring Road).

Emergency services (police, fire, ambulances) are not explicitly shown in Figure 1 because they are unique users of the transportation system and operate in all parts of the city. Access to emergency services must be considered in the planning, design and operation of the transportation system.

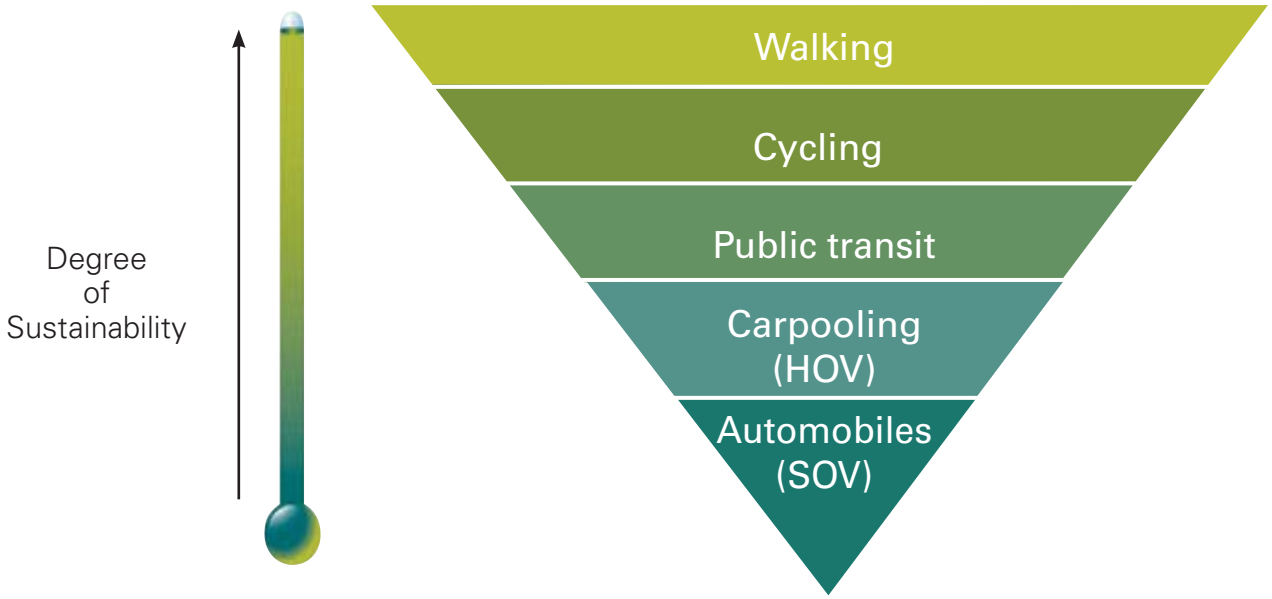



Figure 1 – The Transportation *Sustainability* Triangle

Although walking, cycling and transit are more sustainable modes of transportation, the majority of daily trips are expected to continue to be made by private vehicles. Figure 2 shows the travel choices for all trips today compared to projected travel choices 60 years in the future based on the recommended land use patterns and transportation systems contained in the MDP and CTP.

It is clear that private vehicles will continue to be the most common travel choice, particularly in outlying areas of the city where most destinations are too far to reach by walking and cycling, and where transit service is not as frequent or efficient as a vehicle. Transportation networks will be designed to manage the demand for vehicle use, and will be optimized using a wide range of tools and technologies.

Increased walking and cycling activity will occur primarily in the *Activity Centres* and *Corridors* located across the city. Homes, jobs, services and amenities will be located in close proximity to each other in these locations. The needs of pedestrians and cyclists should therefore be given the highest priority in *Activity Centres* and *Corridors*. Well designed infrastructure and direct connections between destinations will allow walking and cycling to be the most convenient way to travel in these locations.

Transit service will offer the most convenient choices to people travelling between *Activity Centres* and along the *Corridors* that connect them. Priority measures will enhance the reliability of transit services within and between these strategic locations, making transit competitive and an attractive option to private automobiles.

The increasing variety of transportation choices made by Calgarians in the future can be effectively accommodated by putting the right type of infrastructure in the right place. Figure 3 in section 3.7 of the CTP shows how the new *Road* and *Street* Palette provides a range of *road* and *street* types that emphasize different transportation modes. The CTP recommends that the majority of the *road*s and *street*s built in Calgary be types that emphasize private vehicles and goods movement. This reflects both the existing infrastructure that has been built in Calgary, and the transportation needs for much of the city in the future.

Specialty *street*s that emphasize walking, cycling and transit will comprise a lesser amount of the *Road* and *Street* Network. However, these *street*s will be strategically located in *Activity Centres* and *Corridors* where the majority of walking, cycling and transit activity is expected to occur.

| Mode of Transportation | Per cent of all daily trips | |
|---|---|---|
| | Current | Recommended Direction |
| Walk/Cycle | 14% | 20% - 25% |
| Transit | 9% | 15% - 20% |
| Vehicles (SOV & HOV) | 77% | 65% - 55% |

Figure 2 – Current and future travel choices

In conjunction with other transit and cycling infrastructure, this combination of *road* and *street* designs will make it possible to meet the increasingly diverse travel needs of Calgarians now and in the future.

## Policies

a. The needs of sustainable modes of transportation (walking, cycling and transit) should be considered in all transportation planning projects.

b. Pedestrians and cyclists should be given the highest priority in the planning, design, operation and maintenance of transportation infrastructure in *Activity Centres* and *Corridors*.

c. Along the Primary Transit Network, priority should be given to transit in the planning, design, operation and maintenance of the transportation system, with the goal of minimizing person delay rather than vehicle delay.

d. Emphasis should be placed on the efficient movement of commercial vehicles in industrial areas, along corridors defined as part of the Primary Goods Movement Network, and to access the airport or *intermodal* rail facilities.

e. In areas where walking, cycling and transit cannot provide convenient and reliable travel choices, emphasis should be placed on mitigating *congestion* and improving *capacity* for private vehicles.

f. The needs of emergency vehicles and large-scale evacuation equipment must be considered in the planning and design of all transportation infrastructure.

g. The needs of emerging modes of transportation (meaning modes not commonly used today) should continue to be monitored, and planned for as necessary.

h. On facilities where multiple users compete for priority, a balanced approach should be used to address the trade-offs and risks of various design decisions.

## 3.2 Walking and cycling

**Objective** To make walking and cycling attractive and convenient through the provision of additional or enhanced infrastructure, and through land use planning that brings homes, jobs, services and amenities closer together.

### Supports

***Key Directions #2:*** Provide more choice within *complete communities*.
***Key Directions #5:*** Increase mobility choices.
***Key Directions #7:*** Create *Complete Streets*.
***Key Directions #8:*** Optimize infrastructure.

***Transportation Goal #2:*** Promote safety for all transportation system users.
***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.
***Transportation Goal #7:*** Ensure transportation infrastructure is well managed.

### Discussion

#### Walking

Walking is the simplest type of transportation; it offers health and wellness benefits, costs very little and is available to almost everyone, regardless of age, gender, ability or income. It is quiet, doesn't pollute and fosters social interaction. Pedestrians include all persons walking or jogging, using wheelchairs or mobility aids, walking their dogs, people with children's strollers or wheeled carts, in-line skaters and skateboarders.

Like any mode of transportation, people will choose to walk if it is a convenient way to travel. Making walking a convenient, year-round option for more Calgarians requires:

- direct and convenient connections to destinations;
- sufficient unobstructed space to walk comfortably;
- well-maintained routes with character that feel safe and secure;
- adequate separation from traffic; and
- round-the-clock pedestrian activity.

Public places such as *street*s and plazas should have high-quality urban design elements wherever possible. Pedestrians should be provided with different views, a positive ambiance, public art and spaces for rest and play. Section 3.7 on *Complete Streets* provides additional information regarding urban design and other pedestrian requirements in relation to surrounding land uses.

Since virtually all people walk for at least a short distance to take transit, there must also be continuous, consistently maintained pedestrian routes to transit stops. The design of transit stops and stations must place high priority on pedestrian movement, waiting and comfort, as well as convenient access for transit vehicles arriving at those stops.

The needs of pedestrians, including those who use mobility aids, are considered throughout the CTP. Access to transit, the design of pedestrian-friendly *street*s and providing more direct connections between destinations in new communities and *Activity Centres* are key *pedestrian-oriented* initiatives in the CTP.

### *Cycling*

Bicycles are more than recreational tools. They are efficient human-powered machines that improve health and enable travel five times faster than walking. Due to the relatively low cost, cycling is also available to almost everyone. Cyclists include persons riding any cycle, whether propelled by human effort or a power-assisted device.

While cyclists are allowed on almost all Calgary *street*s, additional guidance can be provided through signs or by designating extra space on *street*s to increase cyclist comfort and safety. Cycling can be accommodated on low-volume, low-speed *street*s or in wide curb lanes, bike lanes or separate on-*street* bicycle lanes. Off-*street* cyclists can also travel on walkways, pathways, trails and, in the future, *cycle track*s (an off-*street* bicycle lane next to the vehicle lanes).

Making cycling a convenient, year-round option for Calgarians requires:

- smooth travelling surfaces free of obstacles;
- well-maintained, clear routes;
- connected and continuous routes that give cyclists the ability to maintain speed;
- bicycle parking and amenities at destinations;
- routes with character that offer safety and a feeling of security; and
- education and enforcement for all transportation system users.

Connecting bicycle trips to transit service enables longer trips, enlarges transit catchment areas, enables cyclists to bypass topographical barriers and increases transit ridership. Examples of integration measures include safe and secure bicycle parking at transit stations, allowing bicycles on trains and buses and improvements to bicycle routes and transit station access.

## Physical Activity, Urban Form and Obesity

**In Canada, the prevalence of obesity has more than doubled in the last 20 years. The most extreme forms of obesity, where body mass index (BMI) exceeds 40 or more, increased the most dramatically – 225 per cent between 1990 and 2003. In Calgary, 32 per cent of adults were classified as overweight in 2003, and an estimated 14 per cent were obese. Although nearly 60 per cent of Calgarians indicated that they were "at least moderately active" in leisure activities in 2003, 45 per cent of the city's population is not active enough to achieve health benefits.**

***Walkable*, *transit-supportive* built environment patterns have been associated with higher amounts of active transport and more physical activity overall. Less *walkable*, vehicle-dependent built environments have been correlated with higher body weights, obesity, and their associated chronic diseases.**

*- Dr. Larry Frank, The Built Environment and Health: A Review*

Cycling is supported in the CTP through policies for the introduction of new types of cycling facilities, improved design of future and redeveloped *street*s and through the provision of better connections in new communities and *Activity Centres*. A new Primary Cycling Network has also been designated for Calgary. This network will connect major destinations such as *Activity Centres*, *Corridors* and major institutions. Each segment of the network will include the best possible cycling infrastructure that can reasonably be accommodated. Connections will be as direct as possible, making cycling between these locations direct and expedient, while also safe and appealing. In order to make this a year-round alternative to travel in Calgary, the Primary Cycling Network must have high priority for maintenance and be kept clear of debris, snow and ice. Where the Primary Cycling Network incorporates pathways, the needs of both recreational users and commuters should be considered carefully in the design and operation of those facilities.

The Primary Cycling Network does not outline all future bicycle routes. Instead, it defines high-priority bicycle routes where the most concentrated activity will occur. All other existing and future bicycle routes will be identified through periodic updates of the Calgary bikeway and pathway maps.

The Primary Cycling Network is shown in Map 1 in Appendix D.

The following policies, and associated design considerations contained in Section 3.7, comply with existing legislation regarding the operation and control of bicycles on public *rights-of-way*. However, updates and improvements to existing legislation should be endorsed to further promote safe and convenient bicycle operation on city *street*s.

## Policies

a. Pedestrian and bicycle routes should be provided throughout the city.

b. The type of cycling facilities implemented on the Primary Cycling Network should be based on the surrounding land uses and *right-of-way* restrictions. Cycling facilities should also be enhanced as *redevelopment* of corridors along the Primary Cycling Network occurs.

c. The amount, directness, connectivity, *accessibility*, comfort, character and safety of pedestrian and bicycle routes should be increased.

d. The quality of pedestrian and bicycle environments should be emphasized in all transportation studies and in all future development or *redevelopment* plans for *Activity Centres*, *Corridors*, TOD sites and residential communities.

e. Walking and cycling must be integrated with transit services and improve *intermodal* opportunities at the community, city and regional scales.

f. Design of facilities, public education and law enforcement should be used to increase acceptance, understanding and decrease conflicts among all users of the *roadway*, pedestrian and bicycle networks.

g. Safe, barrier-free walkways and pathways should be provided in community designs to reduce pedestrian and bicycle distance to transit service and community amenities.

h. Bicycle parking should be provided at destinations in *Activity Centres*, *Corridors*, TOD sites, employment centres and parks and open spaces.

i. A full range of strategies such as traffic signal optimization, pedestrian scramble crossings and pedestrian countdown timers should be used to improve convenience for pedestrians and cyclists at locations where high volumes of pedestrians and cyclists already exist or are expected in the future.

j. Disruptions to pedestrian and bicycle travel should be minimized during construction.

k. The Transportation Department and Parks Business Unit must co-ordinate the design, operation and maintenance of all pathways (including snow clearing) that form part of the Primary Cycling Network to accommodate the needs of both recreational users and commuters.

# 3.3 Transit

**Objective** To provide a safe, accessible, customer focused public transit service that is capable of becoming the preferred mobility choice of Calgarians.

## Supports

***Key Direction #2:*** Provide more choice within *complete communities*.
***Key Direction #3:*** Direct land use change within a framework of nodes and corridors.
***Key Direction #4:*** Link land use decisions to transit.
***Key Direction #5:*** Increase mobility choices.
***Key Direction #6:*** Develop a Primary Transit Network.
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #1:*** Align transportation planning and infrastructure investment with city and regional land use directions and implementation strategies.
***Transportation Goal #2:*** Promote safety for all transportation system users.
***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.
***Transportation Goal #6:*** Advance environmental *sustainability*.

## Discussion

High-quality public transit service is an essential requirement for the creation of attractive, vibrant and economically competitive cities. Investment in transit improvements can significantly improve the social, economic and environmental health of communities by:

- enabling citizens to participate in the social and economic life of the community;
- providing lower cost mobility options for transportation users and society by reducing the need for and expense of new *roadway* and parking infrastructure and operation of private vehicles;
- improving air quality and reducing energy demands and *greenhouse gas emissions* that are contributing to global climate change;
- helping to shape and create more intense, mixed-use development within walking distance of public transit stops and stations which, in turn, will generate increased transit use; and
- ensuring labour force mobility to support economic development.

## Creating a new transit vision for Calgary and region

People will choose to use transit if it satisfies their mobility needs. Substantial improvements in the frequency, speed, comfort, reliability, convenience and safety of transit service are necessary to make transit an appealing mobility option. These actions must be supported by complementary *Complete Street* and parking strategies. In order to substantially increase transit ridership and enable transit to shape land use changes, all of the following success factors for transit must be achieved:

### Make transit a convenient and comfortable travel alternative through the development of a Primary Transit Network

Development of the Primary Transit Network will make transit appealing by connecting major travel destinations more directly, making these connections

faster and more reliable by expanding the use of transit priority measures and increasing the frequency of service so that customers can "show up and go" without having to consult a transit schedule. The Primary Transit Network will also be integrated with other city, regional and inter-city transit services.

#### Link land use decisions to transit

Compact, mixed-use development and pedestrian-friendly designs are required along the existing and future Primary Transit Network. This will be supported by timely investment in new transit lines and improved transit service levels to support land use intensification.

#### Integrate transit with civic life

It is essential that transit service is centrally located and effectively integrated with surrounding land uses. Transit infrastructure must also be designed and maintained to a high standard to provide a safe, clean and comfortable environment where transit riders feel welcome and valued.

#### Incorporate new transit technologies and innovations

Opportunities exist to incorporate advancements in transit vehicle technology, traffic engineering and customer information systems (e.g., real-time schedule information) to improve customer experience and enhance transit efficiency.

#### Sustain fleet and infrastructure

Invest in new maintenance infrastructure to support transit system expansion and undertake essential life-cycle maintenance to sustain existing operations.

## Expanding the Calgary Transit network

The CTP proposes the creation of an integrated family of transit services, including (1) a Base Transit Service, to provide good coverage and a basic level of service to all areas of the city, and (2) a Primary Transit Network, which will provide a well connected, high frequency route network to support the framework of *Activity Centres* and *Corridors*.

The CTP transit strategy represents a transit service commitment to Calgarians that will guide the allocation of financial resources for service expansion in future years.

## Base Transit Service

Base Transit Service includes a comprehensive range of transit services (e.g., feeder routes, mainline and cross-town transit services) that will support the Primary Transit Network by providing comprehensive community coverage. Base Transit Service may also augment the Primary Transit Network by meeting additional needs (e.g., cross-town travel, local circulator services within the Centre City and *Activity Centres*) that involve high ridership but not necessarily full Primary Transit levels of service.

Base Transit Service will provide a comfortable and safe environment and be integrated with the Primary Transit Network to enable convenient transfers. It will extend far enough to ensure that at least 95 per cent of development is within a five-minute walk from transit service (i.e., 400 metres). Development served by the Base Transit Service should also have a sufficient *intensity* of population and employment to achieve the minimum Council-approved performance policies for transit service.

## Primary Transit Network

The Primary Transit Network is defined by level of service – not by mode. It comprises a permanent network of high-frequency transit services (i.e., LRT, *Bus Rapid Transit* (BRT), *streetcars*/trams and frequent bus service) that will operate every 10 minutes or less over an extended operating period, seven days a week. The Primary Transit Network will form the foundation of the transit system and

incorporate the highest standards with regard to level of service, operating speed, connectivity and amenities to attract new customers.

The proposed Primary Transit Network concept plan is shown in Map 2 in Appendix D. Proposed transit service for Centre City is shown in Map 3. For ease of understanding, two types of Primary Transit service have been identified:

1. A skeletal network of existing and proposed LRT lines which form the backbone of the Primary Transit Network and which operate in dedicated or semi-exclusive *rights-of-way*, separate from auto traffic.

2. A network of other radial and cross-town transit services that will operate in dedicated *rights-of-way*, High Occupancy Vehicle (HOV) lanes and mixed traffic, with priority over automobiles at signalized intersections. Transit service in these corridors will begin with bus service and may eventually evolve into higher order rail service based on future corridor development and travel demand.

The Primary Transit Network will be developed in phases over the next 30 years and will be monitored closely based on five key measures of transit service quality. The measures are:

### Frequency

During core operating periods, combined service frequency will be every 10 minutes or better for all modes of Primary Transit. This level of service will enable seamless connections between transit services and make it possible for people living near these services to make spontaneous trips along the transit corridors without consulting a transit schedule.

### Span of service

Core operating periods on the Primary Transit will be at least 15 hours a day, seven days a week. Less frequent service will continue to be provided outside the core operating period. This is important in ensuring that all types of trips can be accommodated on the Primary Transit Network – not just work and school commuting.

### Speed and directness

Route directness and operating speed are critical to the success of the Primary Transit Network since most travellers will choose the fastest mode when planning their trips. A range of transit priority measures will be implemented, with a “transit first” philosophy along the Primary Transit Network.

### Service reliability

Service reliability is one of the critical measures of transit service quality. Users can expect the Primary Transit Network to operate on a reliable schedule to minimize customer wait times. All Primary Transit services should operate within three minutes of scheduled arrival times.

### Increased transit *capacity*

The Primary Transit Network will be closely monitored to ensure that sufficient capacity is available to accommodate ridership demand. Improved frequencies and selection of appropriate transit vehicles will be necessary to provide adequate capacity for a comfortable ride. Strategically located Activity Centres and Corridors will also support more efficient use of transit by supporting more balanced, two-way passenger flows on the Primary Transit Network.

## Regional transit

The *Calgary Regional Partnership* (CRP) has identified enhanced regional transit services within and between its communities, integrated with growth corridors and nodes, as a cornerstone of the proposed *Calgary Metropolitan Plan*.

The short-term regional transit goal is to implement an integrated, regional *Bus Rapid Transit* (BRT) service that would provide two-way service between key destinations within The City of Calgary and adjacent regional communities. These services would be connected through a network of Transit Mobility Hubs. Transit Mobility Hubs are a place of connectivity where different modes of transportation (i.e., walking, cycling, bus and rail transit) come together seamlessly, and where there is an attractive, intensive and diverse concentration of housing, employment, shopping and other amenities around a major transit station. Regional transit hubs will be located to support other medium- and longer-term transit investments such as inter-city commuter rail and LRT services.

The City of Calgary supports the development of an integrated, high *capacity* regional transit service, and will identify and acquire mobility corridors within Calgary for future regional and inter-city transit services. The City will also take a leadership role in the co-ordinated planning and development of regional transit services in collaboration with CRP communities.

The conceptual vision for regional transit service is shown in Map 4 in Appendix D.

## New transit river crossings

To improve transit connectivity, speed and service reliability, new river crossings of the Bow River and the Elbow River for Primary Transit Service may be required in the future, on the west side of the city, to respond to increased traffic volumes in major transportation corridors such as Glenmore Trail, Sarcee Trail, Crowchild Trail and Bow Trail. These connections would enable the creation of priority transit connections linking proposed *Activity Centres* at the University of Calgary, Mount Royal College, Chinook Centre and the southeast industrial area and prevent transit vehicles from getting 'stuck in traffic'. If feasible, the new transit river crossings could also incorporate provision for pedestrians, cyclists and emergency services to improve Police, Fire and EMS response times and provide new pedestrian and bicycle connections.

Before planning any new river crossings, other strategies should be implemented to optimize the operation of existing transportation corridors for Primary Transit and emergency services operation. See sections 3.5 and 3.6 for further information on tools and techniques that can be used to optimize existing transportation infrastructure.

Detailed technical analysis and community engagement will be required to establish the location, design and cost of any new river crossings. Some key stakeholders have indicated that new river crossings may be acceptable for transit, walking, cycling and emergency services if there is a persuasive and demonstrable need, and if they are located and designed to successfully mitigate environmental and community impacts. Principles and design considerations for river crossings are outlined in Appendix B.

## Linking transit and land use

Today, a small percentage of all population and less than one-third of jobs are located within 400 metres walking distance of LRT service, which is the only transit mode that currently operates near Primary Transit service levels. The strategic location of *Activity Centres* and *Corridors* along existing and future Primary Transit corridors will significantly increase the people and jobs within walking distance of the Primary Transit Network.

## Policies

### Regional transit service

a. In collaboration with the *Calgary Regional Partnership* and other stakeholders, The City should take a leadership role in the planning and co-ordination of an integrated regional transit system that supports the strategic directions of the *Calgary Metropolitan Plan*.

b. *Right-of-way* requirements for future regional and Primary Transit services must be identified and opportunities to acquire additional *right-of-way* should be investigated if necessary.

c. In collaboration with the *Calgary Regional Partnership* and other stakeholders, The City should participate in the co-ordinated planning and development of a system of Transit Mobility Hubs for interconnection of Primary Transit services and regional and inter-city passenger transport modes.

### Expanding the Calgary Transit network

d. Base Transit Service should be provided to facilitate convenient access to developments that have a sufficient *intensity* of population and employment, in order to achieve minimum Council-approved performance standards for transit service.

e. A Primary Transit Network of high-frequency transit routes should be developed to improve transit access to the Centre City and support *Activity Centres* and *Corridors*.

f. Urban design principles that respect existing communities and utilize environmental best practices should be used in the design and construction of the Primary Transit Network.

g. Timely investment in new transit lines and improved transit service levels, focusing on the Primary Transit Network, should be provided to support existing higher *intensity* areas and encourage *intensification* of new, priority-growth areas.

h. Community design should minimize pedestrian *street* walking distance to transit service (i.e., a bus zone or LRT station) to 400 metres or less in all areas of the city. In recognition of unusual circumstances, up to five per cent of the area population (i.e., dwelling units) may be located beyond 400 metres *street* walking distance from transit service.

### Improving transit speed and reliability

i. A full range of strategies such as transit signal priority, intelligent priority and information systems, High Occupancy Vehicle (HOV) lanes, queue-jump lanes and bus stop consolidation should be utilized to optimize transit travel times.

### Passenger comfort and convenience

j. All transit infrastructure should be designed, operated and maintained to provide a safe, clean and comfortable environment and ensure ease of transfer between transit services and with other modes of transportation.

k. Advancements in transit vehicle technology and Intelligent Transportation Systems (ITS) should be used where appropriate, along with best operating practices to improve passenger information, amenities, transit *capacity* and operating efficiency.

### Integration with other modes

l. Other modes of transportation, specifically walking, cycling, private vehicles, rail and air, should be integrated with transit services.

m. Transit Mobility Hubs should accommodate efficient transit access, comfortable passenger waiting areas and safe, direct, unobstructed routes for pedestrians and cyclists.

### Social considerations

n. A range of affordable, accessible, fixed-route and specialized door-to-door transit services should be provided to address the mobility needs of persons with disabilities and low income Calgarians who depend on public transit for their mobility.

### River crossings

o. Planning and design of any new river crossings must consider the principles and design considerations documented in Appendix B of the CTP.

# 3.4 Goods movement

**Objective** To recognize the important economic role of goods movement by providing a safe, efficient and connective goods movement network that supports the Calgary International Airport, the Canadian National (CN) and Canadian Pacific (CP) *intermodal* facilities, transportation and distribution districts and goods movement routes, while also minimizing impacts on surrounding communities.

## Supports

***Key Direction #5:*** Increase mobility choices.
***Key Direction #7:*** Create *Complete Streets*.
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #1:*** Align transportation planning and infrastructure investment with city and regional land use directions and implementation strategies.
***Transportation Goal #2:*** Promote safety for all transportation system users.
***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.
***Transportation Goal #7:*** Ensure transportation infrastructure is well managed.

## Discussion

Calgary has proven itself to be a global economic leader by offering a full range of multi-modal services and solutions. The city is a major part of the east-west trade corridor in Western Canada and is a key distribution point for movement of Asia-Pacific-related imports and exports. Calgary is currently home to 500,000 jobs in a variety of areas, including 50,000 jobs related to the transportation sector. Approximately two out of every five employees in Calgary work in wholesale, warehousing, distribution and storage. As import/export traffic grows, there will be direct benefits to Calgary in terms of employment and the local economy.

As urban goods movement has grown, so has associated *congestion*, energy consumption and safety concerns. A proactive approach is required to develop strategies that will ensure the city remains competitive economically on the local, national and global stage. The City must also work in conjunction with the provincial and federal governments to create a sustainable goods transportation system that addresses local, regional, national and international needs.

An effective and reliable goods movement network will be required to support some of the key industrial areas and projects emerging from the Calgary area, including:

- the northeast and southeast industrial areas;
- the Shepard Industrial Area;
- expansion plans for CN and CP *intermodal* facilities; and
- the Calgary International Airport expansion.

In order to sustain a vibrant economy in Calgary, it is important to consider all of the goods movement modes in any major planning process. The three primary modes responsible for goods movement in the Calgary region are air, rail and truck. Each of these modes plays a distinct role in goods movement, and they must be capable of working together in order to drive the economy.

### Air

Airports are a critical component of Calgary's transportation infrastructure. Air cargo demand is increasing, along with continued growth of passenger air transportation. Air cargo is one of the fastest growing modes of transportation for high-priority, time-sensitive shipments. Aircraft maintenance and manufacturing is also an important part of the aviation industry in the Calgary region. In addition, logistics and aviation training is provided at several post-secondary institutions in Calgary.

The Calgary International Airport is one of only two Canadian airports with direct cargo connections to Asia and Europe. With no curfews or noise restrictions, the Calgary International Airport operates 24 hours a day, seven days a week. In addition, the Calgary International Airport has award-winning, first-class cargo facilities and services, a premier livestock handling facility, on-site refrigeration facilities and 17 acres of runway-side warehouse and *logistics* lands. Aviation *logistics* also provides support for energy management and banking industries in Calgary.

### Rail

Rail transportation is a key component of the *logistics* and distribution sector in the Calgary Region, serving as a critical link in the supply chain for many businesses. CN and CP both have major rail *intermodal* facilities in southeast Calgary.

Calgary is a major redistribution point for goods destined to Western Canada and the United States (U.S.) arriving by rail via Vancouver's seaports, with 40 per cent of all inbound shipments from Vancouver redistributed through Calgary. Goods movement by rail accounts for 27 per cent of imports to and 23 per cent of exports from Calgary.

Trains operating in urban areas sometimes cross *roadway*s, and the need for safer infrastructure arises from the interaction between railway and *roadway* users. There are numerous level rail crossings within Calgary city limits. In order to mitigate the risks and traffic delays associated with level rail crossings, The City will continue to review the need for grade separation of rail from *roadway*s in key corridors.

#### The significance of air and rail goods movement

Via airplane, cargo shipments of 134,000 tonnes passed through the Calgary International Airport in 2007, with continued growth expected.

Through Canada's two major rail companies, both CN and CP transport 330,000 20-foot equivalent units (TEUs) combined annually. Both companies have plans to expand facility capacity that could bring total volumes up to over 700,000 TEUs per year.

Calgary is a significant distribution hub in Western Canada. Combined with the goods movement network utilizing trucks and other commercial vehicle modes, Calgary will continue to be a competitive centre in the distribution of goods to Canada and the U.S.

### Truck

Within Alberta, trucking is the primary mode for the movement of goods. Calgary plays an important role as a trucking hub with major highway connections passing through the city. Highway 2 (Deerfoot Trail) is the major north/south route as part of the CANAMEX highway system; it also provides connectivity to the Alberta oilsands in the northeast part of the province. The Trans-Canada Highway (16th Avenue North) is the major east/west route providing connectivity across Canada. Once completed, portions of the Calgary Ring Road will also play a central role in facilitating goods movement to every quadrant of the city.

Goods movement by truck accounts for 46 per cent of imports to and 64 per cent of exports from Calgary. There were over 265,000 commercial vehicle trips per day in 2006, accounting for 12 per cent of vehicle kilometres travelled (VKT) in Calgary and the surrounding region. Of these commercial vehicle trips, nearly 80 per cent had origins/destinations within the city limits, with the remaining 20 per cent travelling to/from the surrounding Calgary area. Only three per cent of commercial vehicle trips bypass Calgary.

The City is responsible for the design and review of the truck route network within Calgary, including high load and dangerous goods routes. In determining appropriate network connections, The City must balance the needs of goods and services movement with the needs of residential communities impacted by truck routes. Impacts on adjacent municipalities should also be considered. Ultimately, the truck routes within Calgary are reviewed through Council-approved goods movement transportation policies, and designated routes are provided in goods movement bylaws. As per City bylaw, trucks over a certain weight must stay on designated routes while travelling within Calgary city limits. Trucks may only deviate from assigned routes to access their destinations using the shortest path to and from designated truck routes.

The CTP includes a new Primary Goods Movement Network that will facilitate the movement of goods and services in Calgary. The Primary Goods Movement Network does not outline all future truck routes, but defines high-priority goods movement routes where the most concentrated activity will occur. All existing and future truck routes, including high load and dangerous goods corridors, will be identified on an ongoing basis through regularly issued bylaw updates.

The Primary Goods Movement Network is shown in Map 5 in Appendix D.

Increasing transportation options, and therefore reducing automobile use, will mitigate the impact of *congestion* on commercial vehicle movements. Additional transportation tools and techniques outlined in Section 3.6 will optimize the flow of traffic in Calgary and further increase reliability and *capacity* for goods movement.

#### Trucks versus commercial vehicles

Commercial vehicles are responsible for goods and services movement and include heavy trucks, medium truck, and light vehicles that are used for commercial purposes. Heavy and medium trucks are covered by The City's bylaws, requiring them to use designated truck routes during transportation. Light commercial vehicles (e.g., small couriers, electricians, cable providers) provide small-scale goods and services movement, making up 50 per cent of the distance traveled for all commercial vehicles. It is critical for businesses to have a reliable network of *roadways* where light commercial vehicles and larger trucks can all travel efficiently between stops.

## Policies

a. The importance of *intermodal* facilities and a connected goods movement network should be recognized to ensure reliable goods movement and land *accessibility*.

b. The City, regional partners and other stakeholders should co-ordinate the development of *roadway* connections in the city and region, with consideration for the location of industrial land uses.

c. The integrity of major goods movement routes should be protected by limiting direct driveway access to *roadway*s that form part of the Primary Goods Movement Network, while encouraging appropriate adjacent land use planning with adequate truck *accessibility*.

d. Intelligent Transportation Systems (ITS) should be used to improve traffic flow and travel time reliability on the Primary Goods Movement Network.

e. The retention and expansion of existing railway corridors within city limits should be supported.

f. The City should consider the impact of goods movement routes on roadways in adjacent municipalities.

## 3.5 High Occupancy Vehicles (HOV)

**Objective** Optimize the person-moving *capacity* of the transportation system by increasing average vehicle occupancy and reducing reliance on single-occupant vehicles for commuting in Calgary, and improve operating speeds and reliability of transit service by creating priority along Primary Transit corridors.

### Supports

***Key Direction # 4:*** Increase mobility choices.
***Key Direction # 7:*** Create *Complete Streets*.
***Key Direction # 8:*** Optimize infrastructure.

***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #6:*** Advance environmental *sustainability*.

### Discussion

A High Occupancy Vehicle (HOV) is defined in Calgary as a bus, any motor vehicle with two or more occupants, including taxis, or a bicycle. HOV lanes can take many forms, including lanes restricted for use by carpoolers, transit-only lanes, bus-only shoulders and queue jumps. HOV lanes are most successful when supported by complementary infrastructure, such as dedicated carpool parking stalls, as well as public awareness campaigns and regular enforcement.

Providing HOV lanes supports strategic goals to reduce reliance on single-occupant vehicles and helps make public transit more appealing by improving transit travel speeds and service reliability. HOV facilities can also help improve air quality, reduce energy demands and *greenhouse gas emissions* and support more land use *intensification* by linking *Activity Centres* and *Corridors*. A comprehensive and interconnected HOV network will help to manage transportation demand efficiently by optimizing the use and people-moving *capacity* of existing *roadway* infrastructure.

The CTP defines a Primary HOV Network that effectively connects major destinations throughout the city. Further evaluation of some HOV facilities is required to determine their configuration (e.g., transit only, carpool only) and implementation opportunities (e.g., widening, lane reversal, lane conversion).

The Primary HOV Network is shown in Map 6 in Appendix D.

A variety of factors were considered to determine HOV corridors, including:

- alignment with the Primary Transit Network;
- projected transit volumes and operations;
- projected carpool volumes;
- *congestion*;
- corridor characteristics;
- adjacent land uses; and
- strategic context.

The proposed HOV network totals approximately 220 kilometres (440 lane-km), excluding potential Provincial HOV corridors and will be implemented over the next 10 to 60 years. Other corridors may be identified in the future for inclusion in the Primary HOV Network.

## Policies

a. A comprehensive network of HOV lanes and supportive infrastructure should be developed that are appropriate to the current and future needs of Calgarians.

b. HOV priority measures should be implemented during new construction, improvement or widening projects on City-owned *roadway*s shown on the Primary HOV Network, unless such measures are demonstrated to be inappropriate at that time or place.

c. The provincial government, The City and other municipal governments should work collaboratively to develop an inter-municipal network of HOV lanes and supportive infrastructure to serve regional transportation goals.

d. HOV lanes and supportive infrastructure such as designated carpool parking lots should be developed in tandem to move people more effectively.

### HOV lanes in Calgary

Calgary's first HOV lane is located on Centre Street North between 20th Avenue North and 3rd Avenue South. During weekday rush hours, the curb lane in the peak direction is reserved for vehicles with two or more occupants, buses and cyclists. The HOV lane operates in conjunction with a lane reversal system that designates three of the four Centre Street traffic lanes for peak direction travel. The Centre Street HOV lane is one of approximately two dozen arterial HOV facilities currently operating in Canada.

## 3.6 Quality of service

**Objective** Provide high-quality service for all modes of transportation using effective and cost-efficient transportation management tools and techniques.

### Supports

***Key Direction #5:*** Increase mobility choices.
***Key Direction #6:*** Develop a Primary Transit Network.
***Key Direction #7:*** Create *Complete Streets.*
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #1:*** Align transportation planning and infrastructure investment with city and regional land use directions and implementation strategies.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.
***Transportation Goal #7:*** Ensure transportation infrastructure is well managed.

### Discussion

Calgary, like most North American cities, has placed the highest priority on accommodating private vehicle use over the last 50 years. Significant investments have been made to develop a *Road* and *Street* Network capable of moving high volumes of vehicular traffic over long distances. However, despite these investments in vehicle-oriented infrastructure, *congestion* and delays have continued to increase in Calgary and every growing major city in North America. In large part, this is because of the separation between residential communities, employment centres and services. This separation has increased the distances people are required to travel, making private vehicles the most convenient option.

Evaluation of transportation networks has focused traditionally on peak morning or afternoon rush hour and the associated traffic *congestion*. The anticipated traffic volume relative to the *capacity* of a *roadway* or interSection has, therefore, been the primary measure of service levels. The shift in emphasis to all modes of transportation requires us to b*road*en our definition of service to include walking, cycling, transit, goods movement and carpooling. When levels of human activity increase in a growing city, it also becomes important to consider the entire day rather than just peak travel times. This means evaluating the overall quality of service for all modes of transportation, rather than just peak-hour traffic *congestion*. As well, the expectations of citizens in a city of 2.3 million people can be very different from those in a city of one million people, just as the expectations of small town dwellers differ significantly from those living in mid-sized cities.

Evaluating quality of service also means that we must consider both quantitative and qualitative measures. Efficiency and reliability must be considered in conjunction with attractiveness and impacts on surrounding communities. For example, transit quality of service depends on reliability, frequency, speed, convenience, cleanliness and safety. The level of traffic *congestion* is only one of many factors influencing the quality of service perceived by transit customers.

Quality of service for pedestrians and cyclists can best be measured by evaluating how far people are willing to walk or cycle to reach different destinations. This means assessing how direct the connections are between homes, schools, community centres, leisure facilities, parks and jobs. Equally important, although difficult to measure, is the attractiveness and safety of the routes available for pedestrians and cyclists.

Vehicles will continue to be a popular mode of transportation in the future. Many businesses rely on light commercial vehicles to deliver goods and services throughout Calgary. However, by making other modes of transportation realistic choices for many of the trips in Calgary, automobile use per person will be reduced over time and mitigate the impact of *congestion* on those people or services that must drive.

There are a variety of tools and techniques that can be used to mitigate the effects of *congestion* for all modes of transportation and improve the flow of traffic. These include:

### Travel Demand Management (TDM)

TDM uses policies, programs, services and products to encourage a shift in travel behaviour from single-occupant vehicles to more sustainable modes of travel, including walking, cycling, transit and carpooling. Examples include car sharing, universal transit pass programs for post-secondary educational institutions, promoting working from home and changing the time of day people travel. TDM saves people time by helping them travel more efficiently, and it improves health by promoting both physical activity and more environment-friendly travel that reduces greenhouse gas emissions and other air pollutants. It benefits employers by increasing productivity, reducing parking costs and helping to attract and retain workers. It promotes economic development by reducing congestion and enhancing worker mobility.

## Assessing quality of service for proposed developments

The standard Transportation Impact Assessment (TIA), which has been used to determine the impact of large developments on Calgary's transportation network, needs to be updated since it focuses heavily on automobile use and mitigating additional traffic through *roadway* improvements. Assessment of mobility impacts in areas within walking distance of Primary Transit needs to focus on *transit-oriented* improvements, enhanced walking and cycling environments, the optimization of more sustainable transportation modes and vehicle trip reduction programs. The new framework for assessing the transportation impacts of *Transit-Oriented Developments* is called a Mobility Assessment and Plan (MAP).

A MAP will generally include:

An assessment of the alignment of proposed development with the most important components of *Transit-Oriented Development.*

- Analysis of street infrastructure layout and design that supports efficient transit service.
- Alignment with City plans for adjacent Primary Transit corridors and Base Transit Services.
- Analysis and plan to improve pedestrian and bicycle routes.
- Analysis and plan for parking supply and demand, including park and ride facilities.
- Analysis and plan for vehicle and truck access and circulation.
- Community and stakeholder engagement, identification and assessment of mobility issues.
- Phasing of development for large projects.
- Identification of appropriate trip reduction programs.

## Traffic and *Transit-Oriented Development* (TOD)

Four cities in the U.S. were the subject of a study* of the travel behaviour of residents in TOD areas. Transportation data was collected at 17 TOD areas in the Philadelphia, Portland, Washington, D.C. and San Francisco metropolitan areas. The study revealed that people living in TOD areas drive less often than people living in conventional developments and require less parking. Over a typical weekday period, the 17 sites averaged 44 per cent fewer automobile trips than equivalent developments as estimated by the Institute of Transportation Engineers Trip Generation Manual. Also, the demand for parking spaces was approximately half that of conventional developments.

When TOD areas include *mixed uses* (i.e., employment, residential and commercial), there are additional benefits when travellers make trips in different directions (not just in the peak direction), at different times of day (outside peak periods) and using existing *infrastructure.*

** Transit Co-operative Research Program Report 128, 2008*

### Transportation System Management (TSM)

TSM involves cost-efficient measures that focus on improving the operational efficiency and effectiveness of transportation infrastructure to reduce overall delay for all users. Many TSM measures involve traffic control changes and small-scale roadway improvements, and they provide benefits for multiple modes of transportation. Reversible lanes are one example of how TSM measures have been used in Calgary. TSM projects, which may cost from a few thousand to several hundred thousand dollars, may delay or even eliminate the need for multi-million dollar capital construction projects. And while major infrastructure projects can take years to plan and build, most TSM projects can be implemented much more quickly.

### Intelligent Transportation Systems (ITS)

ITS is the application of advanced technology to improve transportation operations, including the control and management of traffic flow and communication of relevant information to travellers and service providers so they can respond to changes in travel conditions or times as necessary. These technologies can enhance all forms of personal mobility, as well as goods movement, protective services and parking facilities.

### Incident management

Incident management involves a set of actions to manage traffic during unplanned incidents such as motor vehicle collisions or planned events such as construction detours. Effective management of incidents increases the reliability of the transportation network, which provides direct economic benefits with regard to goods movement and worker mobility, and helps to maintain transit schedules. Increased reliability of travel time has even been found to be more important than total travel time for commuters.

### Transportation pricing

The use of pricing (i.e., charging a fee to use a transportation facility) as a transportation management tool can help optimize the use of the transportation system. This approach should be considered where new infrastructure construction is not possible or desirable. Revenues from pricing initiatives should be reinvested back into the transportation system.

Effectively combining these tools and techniques will have a variety of benefits for Calgarians, including:

- improving mobility options on existing infrastructure, reducing overall delay for all transportation modes;
- improving the speed and reliability on goods movement corridors;
- managing traffic more efficiently during planned events or unplanned incidents;
- reducing the need for costly infrastructure improvements; and
- providing motorists and transit users with better information that helps them to make effective travel choices.

## Responding to traffic *congestion*

The CTP recognizes that actions which improve vehicle mobility will continue to be important to Calgarians. Land use changes that reduce our dependence on vehicles, thereby enabling more trips to be made by *active modes* or transit, will have the greatest impact on travel times in Calgary. Reduced vehicle use, over the long term, will minimize the impacts of *congestion* for those who choose to drive.

Every street in Calgary is designed to move vehicles. The new *Road* and *Street* Palette (described in section 3.7) provides a wider variety of *street* types; some put more emphasis on vehicles, while others place a high priority on other modes of transportation. Mobility for vehicles and all other modes of transportation will be facilitated by putting the right type of street in the right place.

Improving both traffic flow and the reliability of the transportation system, now and in the future, will provide direct benefits to motorists in Calgary. Some improvements will require the construction of new *infrastructure* such as *roadways* and interchanges. However, many traffic problems impacting cars can be mitigated through less costly and more efficient transportation management tools.

## Policies

a. TDM strategies should be implemented first to reduce or eliminate the need for new links in the transportation system, and must be integrated into all municipal approval processes to promote more sustainable travel choices.

b. Incentives should be provided to developers to make sustainable travel options such as walking, cycling, transit and carpooling integral to all TOD projects.

c. Appropriate TSM, ITS and incident management strategies should be used to mitigate *congestion*, improve safety, increase travel time reliability for all modes of transportation and to better manage competing demands for *right-of-way* space between different transportation users.

d. The reliability of the transportation system should be maintained by actively managing planned events or unplanned incidents.

e. Ongoing educational opportunities should be provided to the public regarding their role in minor traffic collisions, and first responders should be trained to manage traffic effectively during incidents.

f. Strategic improvements should be identified on the transportation network that would benefit response times for emergency services.

g. Transportation system maintenance, construction-related lane closures and detours should be managed to reduce vehicular *congestion* and minimize rerouting of traffic, and restrictions on HOV/transit lanes should be adhered to during incidents to ensure reliable service for those modes.

h. Transportation pricing tools that take into account the economic, environmental and social costs of travel should be considered in order to achieve more efficient use of existing and future transportation infrastructure.

i. The unique travel characteristics of higher density, mixed-use developments, such as *Activity Centres*, *Corridors* and TODs, must be recognized by adjusting mobility requirements to support and promote all modes of transportation.

## 3.7 Complete Streets

**Objective** Increase the attractiveness, convenience and safety of all modes of transportation by creating a new selection of multi-modal *street*s that emphasize different modes of transportation, incorporate elements of *green infrastructure* and function in the context of surrounding land uses.

### Supports

***Key Direction #2:*** Provide more choice within *complete communities*.
***Key Direction #5:*** Increase mobility choices.
***Key Direction #6:*** Develop a Primary Transit Network.
***Key Direction #7:*** Create *Complete Streets*.
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #2:*** Promote safety for all transportation system users.
***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #5:*** Promote economic development by ensuring efficient goods movement and labour force mobility.
***Transportation Goal #6:*** Advance environmental *sustainability*.

### Discussion

What is a *Complete Street*? It is a *street* that:

- Moves people, by foot, bike, bus and car
- Is a place where people can live, work, shop and play
- Supports the natural environment
- Facilitates movement of trucks and service vehicles, and supports our economy

The main function of a *street* is to provide a connection between origins (i.e., where we are) and destinations (i.e., where we want to go). Building multi-modal *streets* that do not focus exclusively on vehicles creates options for people who want to walk, cycle or take transit. This, in turn, increases the *capacity* of the overall transportation system and mitigates traffic *congestion* by reducing the number of unnecessary automobile trips on the transportation system. Creating more mobility choices also maximizes *accessibility* and the ability to travel for all Calgarians.

*Road*s and *street*s also provide space for all of the various utilities that are necessary to support adjacent land uses. These include *shallow utilities* like gas and phone lines, and deeper utilities like water pipes and sewers.

*Street*s, along with the vehicles and people that use them, have a direct impact on the environment. They contribute to traffic noise, degradation of air and water quality and *greenhouse gas* (GHG) *emissions*. In 2005, 30 per cent of *GHG emissions* in Calgary came from transportation sources. These sources also impact water quality through the deposition of air pollutants, oil spills and *roadway* de-icing. Many of these impacts can be mitigated and/or eliminated through sustainable design, particularly by implementing *green infrastructure* design approaches.

*Street*s also have a major role in placemaking – creating places where people can meet, live, shop, work and play. Traditionally, *streets* were the centre of civic life, creating focal points for communities and businesses. In the past 50 years, more emphasis has been put on moving large numbers of vehicles at high speed over long distances. Greater emphasis on the *public realm* can create economic and social benefits for communities, business owners and the city as a whole.

## Creating a complete street

The 17th Avenue SE corridor is envisioned to become an Urban Boulevard. Mixed land use development *with* a pedestrian-friendly *streetscape* will support Primary Transit, and strong urban design elements will enhance the *public realm* to create a safe, vibrant, and attractive *street*. Wide sidewalks allow for comfortable and unobstructed movement of pedestrians. Adjacent land use development will be integrated with the *street*, providing continuous building façades and windows onto the *street* that will improve pedestrian comfort. Inclusion of *green infrastructure* (such as trees and additional buffer planting) will reduce the impacts of vehicle traffic on pedestrians.

17th Avenue S.E. before

17th Avenue S.E. after (concept only)

*Credit: Design Centre for Sustainability, SALA, UBC*

Not every *street* in Calgary will be able to meet the needs of all users. Different types of *streets* have different functions, so their design should fit with the community context. By building a fully integrated, balanced, connected transportation network that minimizes conflict between different functions of the *street* (mobility, the environment and placemaking) we can meet the needs of Calgarians now and in the future.

In the future, new river or creek crossings will be required to increase roadway capacity as strategies to optimize operation of the existing infrastructure are exhausted. Also, new river or creek crossings may be necessary to provide roadway connectivity either city-wide as part of the *road* and *street* network, or to connect locally by *Residential Streets* in the community. In those cases, the principles outlined in Appendix B, must be applied during the planning and designing process of any *road*, *street* and *Residential Street*, respecting natural *ecosystem*s and adjacent communities.

### The *Road* and *Street* Palette

The new *Road* and *Street* Palette has been developed to differentiate between more traditional "*roads,*" which primarily serve long-distance vehicle trips and provide limited access to adjacent land uses, and "*streets*," which serve a broader range of transportation modes and interact directly with adjacent land uses.

*Streets* and *roads* should provide mobility for a wide range of users, facilitate the movement of goods and services to support the economy and incorporate elements of *green infrastructure* to enhance the environment. However, *streets* also contribute to placemaking, while the primary role of *roads* is the movement of people and goods over long distances at higher speeds.

The priority level for each transportation mode (walking, cycling, transit, goods movement and vehicles) is clearly defined for each type of *road* and *street* in Figure 3.

> **"The street is the river of life of the city, the place where we come together, the pathway to the center."**
>
> *William H. Whyte, an American sociologist and journalist*

Each is strongly linked to the adjacent land use context within the applicable *typologies*, as described in the MDP. The examples provided in Figure 3 represent transportation facilities where land uses are expected to evolve over time to support the proposed *street* type (e.g., MacLeod Trail as an Urban Boulevard). Actual design parameters and operational processes for each facility reflect the priorities assigned to each mode of transportation in Figure 3 (appropriate *Complete Streets* handbooks and guidelines will provide design information in detail).

Every *street* should create an environment that is comfortable for all transportation modes, but *street*s in Figure 3 that prioritize walking and cycling require careful attention to design elements that support placemaking and the *public realm*. These *street*s are locations where large numbers of people will spend time walking, cycling, shopping, and socializing. *Public realm* policies are contained in the MDP, and highlight important design considerations for these *streets*.

*Roads* and *streets* that focus on the movement of private vehicles and commercial vehicles will make up 88 per cent of the future network, while the remaining 12 per cent will be composed of *street*s that emphasize pedestrians, cyclists and transit. The purpose of all six *road* and *street* types can be summarized as follows.

| Facility | | Transportation Modes | | | | | Current or Future Examples | Per cent of future Network (centre-line) |
|---|---|---|---|---|---|---|---|---|
| | | Walking | Cycling | Transit | Goods | Autos | | |
| Road | Skeletal Road | | | | | | Deerfoot Trail<br>Glenmore Trail | 34% |
| Street | Arterial Street | | | | | | Country Hills Blvd<br>Southland Drive | 44% |
| | Industrial Arterial | | | | | | 72 Avenue S.E. | 10% |
| | Urban Boulevard | | | | | | 16 Avenue N.<br>Macleod Trail | 5% |
| | Neighbourhood Boulevard | | | | | | 17 Avenue S.W.<br>Kensington Road | 3% |
| | Parkway | | | | | | Memorial Drive<br>Elbow Drive | 4% |

**Legend:**

- Accommodated with High standards
- Accommodated with variable standards
- Not required, or poor peformance is acceptable

Note: Access to emergency services and incorporation of emergency evacuation routes must be considered in the design of all *road* and *street* types.

Figure 3 – The *Road* and *Street* Palette

## Roads

***Skeletal Roads*** promote the movement of vehicular traffic over longer distances. They typically operate at high speeds and have little direct access and interaction with adjacent land uses. Ideally, they should be spaced approximately three to five kilometres apart to form a grid across the city. Skeletal

Roads may present opportunities to implement *green infrastructure* in order to maximize water infiltration, slow, detain and filter *roadway* runoff, and preserve and enhance *biodiversity.*

Note: *Road*s equate to "expressways" and "freeways" from previous classifications.

## Streets

***Arterial Streets*** provide a high-quality environment for all modes of transportation, and are the most common type of *street* in the transportation system. They have varying degrees of interaction with adjacent land uses, but on average allow for greater connectivity than Skeletal *Road*s. Arterial *Street*s are not destinations themselves but provide a reasonably direct connection between multiple communities and major destinations. Ideally, they should be spaced approximately 800 metres to 1600 metres apart. *Green infrastructure* strategies might include, among others, vegetated swales, rain gardens, filter strips, and native vegetation.

***Industrial Arterials*** are located in industrial areas throughout Calgary. Their first priority is the efficient movement of heavy trucks, but, as *street*s, they still accommodate all modes of transportation. They tend to be lower-speed *street*s with a high percentage of truck volume, which often represents up to 30 per cent of all traffic. The level of connectivity provided is dependent on a number of factors, including the size of adjacent industrial lots.

***Urban Boulevards*** form the backbone of higher-density *Corridors* and *Activity Centres*. They give the highest priority to walking, cycling and transit, but accommodate reasonably high volumes of vehicular traffic. These *streets* are destinations, both locally and regionally. They are fully integrated with adjacent land uses (see the Urban *Corridor typology* in the MDP) and provide high levels of connectivity to surrounding communities or destinations. High-quality urban design and *green infrastructure* are critical components of Urban Boulevards. Snow clearing should be handled in such a way that it does not interfere with pedestrian and bicycle movement.

***Neighbourhood Boulevards*** are similar to Urban Boulevards, but on a smaller scale. These *streets* support retail and medium-density residential *Corridors*. Pedestrians and cyclists have the highest priority on Neighbourhood Boulevards. These *streets* are destinations, but primarily for the local communities surrounding them. They are fully integrated with adjacent land uses (see the Neighbourhood *Corridor typology* in the MDP) and provide the highest level of connectivity of all *street* types. High-quality urban design and *green infrastructure* strategies are incorporated into Neighbourhood Boulevards. Snow clearing should be handled in such a way that it does not interfere with pedestrian and bicycle movement.

***Parkways*** focus on integration with natural areas. Natural vegetation and new forms of stormwater management are integrated with the *street*. Adjacent land uses would include large natural parks, waterways or special public institutions. Parkways present many opportunities to maximize water infiltration, slow and detain rainfall, filter *roadway* runoff, enhance the *urban forest*, preserve and enhance *biodiversity* and increase habitat connectivity between adjacent land uses. Parkways focus on pedestrian and cyclist movements (both recreational and commuting) but accommodate all modes of transportation.

Note: All of the above *street* types equate to "Major *Street*s" from previous classifications.

***Residential Streets*** are a seventh classification that is not shown in Figure 3 since they are smaller-scale *street*s that do not serve a city-wide role. They are *street*s that serve primarily residential areas, although they can also be found in *Activity Centres*. Residential Streets include several sub-categories, including Collector *Street*s, Local Streets and alleys.

## Design speed and traffic calming

Traffic calming measures are used to mitigate the conflict between mobility and placemaking, and lower operating speeds on *streets* in Calgary communities.

A traffic speed study was undertaken on the Collector *streets* in the Shawnee-Evergreen community, and showed 85th percentile speeds in the range of 70 km/h. The posted speed limit on these *streets* is 50 km/h. Traffic calming measures have recently been approved to retrofit several *streets* in an effort to reduce these operating speeds.

Research shows that intersection and driveway density, pedestrian activity, on-street parking, median design, roadside development, traffic signal density and adjacent land uses all have an effect on vehicle speed. Selecting appropriate elements in the initial design to achieve desired operating speed may preclude the eventual need for traffic calming measures.

These *street*s generally have narrower rights-of-way than the *street*s identified in the Road and Street Palette (Figure 3). They are designed to maximize access to homes and local amenities, and focus on the needs of pedestrians, cyclists, private automobiles and on-street parking. Given the relatively low traffic volumes they are intended to accommodate, Residential Streets may offer significant opportunities to implement *green infrastructure* strategies, such as reducing effective impervious surfaces, maximizing infiltration, slow and detain runoff and enhancing the urban forest. Equivalent *street* types can be found throughout industrial areas, but are designed primarily to accommodate the needs of commercial goods movement and access to industrial buildings.

Additional cross-sections will need to be developed for Residential *Street*s in order to further clarify transportation mode priorities, align with the Complete *Street* policies, and to take full advantage of green infrastructure design elements.

The *Road* and *Street* Network, composed of these seven facility types, is shown in Map 7 in Appendix D.

The *Road* and *Street* Palette applies to all parts of the city, with the exception of Centre City (the downtown and Beltline), where a unique set of *street* classifications were developed through the Centre City Mobility Plan. The *streets* that connect into Centre City on the city-wide *Road* and *Street* Network map have been classified to align closely with the design and function of the *streets* within Centre City.

### *Green infrastructure*

*Green infrastructure* refers to an interconnected network of green spaces and natural corridors that perform numerous environmental services in urban environments. For *green infrastructure* to be fully integrated throughout parks, open spaces, *street*s and other natural corridors, it must become part of the underlying framework that is used to guide future development patterns. A proactive approach enables *green infrastructure* to be considered in advance of development and in conjunction with growth and development planning.

Providing opportunities for more sustainable modes of transportation, and the associated infrastructure, is one way of protecting the environment. Another way is to apply *green infrastructure*, which is targeted primarily toward reducing negative impacts on air, water and habitat, and also contributes to the aesthetic value of the *road* or *street*.

Additional background information on *green infrastructure* and environmental policies can be found in the MDP. More detailed information of the *green infrastructure* application to *road*s and *street*s design will be incorporated in appropriate *Complete Streets* handbooks and guidelines.

### Public realm

*Public realm* in *streets* is generally focused on the area between travel lanes and adjacent land uses. This space can contain a combination of privately-owned land and public domain. Improving the *public realm* design of *streets* improves compatibility with adjacent land uses, creates attractive pedestrian environments, provides public space for activities and art, and provides space for business activities such as shop kiosks or patios, all of which enhance Calgarians' quality of life.

The MDP contains a set of urban design and *public realm* policies that should be followed when designing *streets* to function in the context of the surrounding environment.

## High stormwater flow impacts our rivers

In Calgary, *roads, streets* and parking areas represent over 24 per cent of all impervious land area. This contributes to higher storm flow volumes and pollutant loads to urban stormwater than any other source area in urban development. *Street* design can have a powerful impact on stormwater quality, both by generating large areas of impervious land coverage and by collecting non-point source pollutants from automobiles and associated transportation *infrastructure*. *Streets* are also almost always directly connected to an underground stormwater system.

### Complete *Streets* zones

Traditionally, the elements within the *right-of-way* (e.g., travel lanes, medians, sidewalks, underground utilities, streetlights) have been the main focus of transportation planning and design. However, the *right-of-way* is only part of the overall *Complete Street. Complete Streets* include not only transportation and utility components but also *green infrastructure* and *public realm* elements. How each of these elements is combined depends on the surrounding land use context and on the expectations for how people will use the *street*. Adjacent land uses might range from parks and green space to intense corridor development with a mix of commercial and residential buildings.

*Complete Streets* consist of horizontal and vertical environments, as shown in Figure 4.

The horizontal environment of a *Complete Street* consists of a *right-of-way* (roadway and roadside zones) and the interface zone with adjacent buildings and uses within them. The roadway zone provides travel and parking lanes for motorized vehicles and bicycles in a mixed traffic environment. The roadside zone includes the *green infrastructure*, street furnishings, and travel lanes for pedestrians and cyclists. The interface zone includes *pedestrian-oriented* land use and design. The vertical environment consists of aerial, surface and buried zones.

The *green infrastructure* and *public realm* elements are present in both horizontal and vertical zones. Tree plantings, one of the *green infrastructure* strategies, may be a component of all zones, but it also contributes to the *public realm*. Tree *canopy*, (which may be part of all three horizontal zones) reduces the urban heat island effect and improve air quality. Shallow utilities and tree roots may share space in a buried, interface zone. Tree planting strips provide an additional buffer between the pedestrians and vehicles, enhance the aesthetics of the *streetscape* and encourage walking and public transit use.

**Complete Street Vertical and Horizontal Zones**

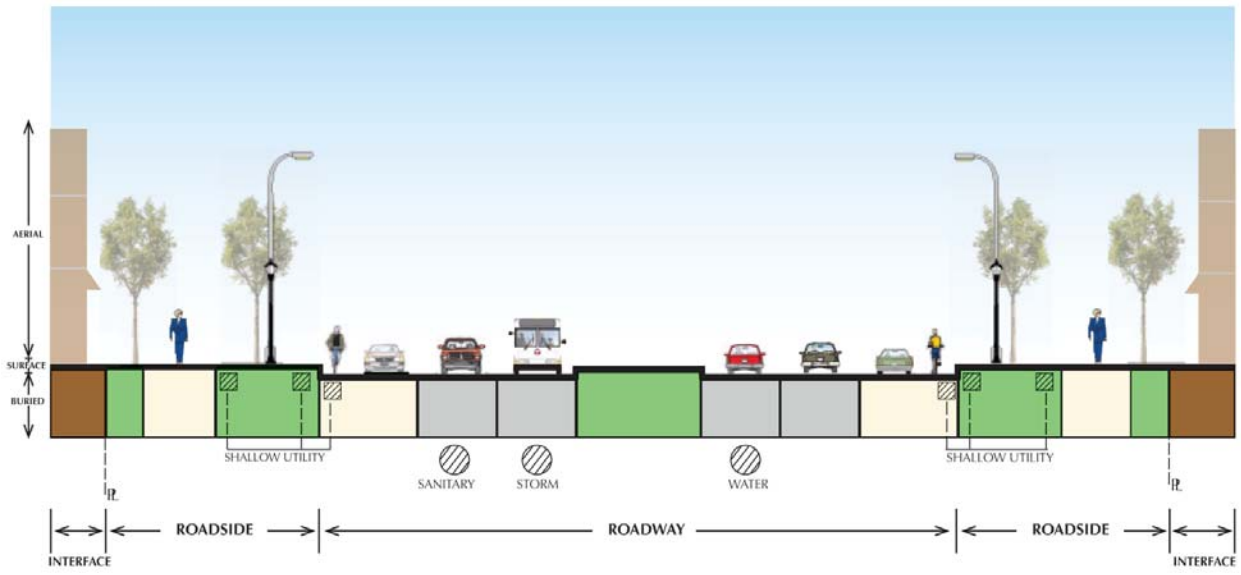



Figure 4 - *Complete Street* zones

| Zone | Interface | Roadside | | | Roadway | | |
|---|---|---|---|---|---|---|---|
| | Frontage | Through | Furnishing | Edge | Auxiliary Lanes | Travel Lanes | Median |
| Aerial | Building Overhang<br>Tree *Canopy* | Tree *Canopy* | Lighting<br>Tree *Canopy* | Lighting<br>Tree *Canopy* | Lighting<br>Tree *Canopy*<br>Signal Heads<br>Signs | Signs<br>Signal Heads | Lighting<br>Signal Heads<br>Signs |
| Surface | Awnings<br>Entries<br>Plantings | Sidewalk<br>Urban Braille<br>Multi-use pathways | Lights,<br>Utility Poles<br>Transformers<br>Pedestals<br>Hydrants<br>Transit Shelters<br>Containers<br>Bike Racks<br>Benches<br>Plantings | Curbs<br>Metres<br>Signs<br>Shoulders<br>Bollards | Transit Lane<br>Shared Lane<br>Turn Lanes<br>Bike Lane<br>Parking<br>Loading Zones<br>Curb Extensions | Through Lanes | Raised Plantings<br>Flush<br>Depressed<br>Turning Lane |
| Buried | Parkades<br>Plant Trenches<br>Shallow *utilities* | Shallow *utilities* | Plant Trenches<br>Shallow *utilities* | | Shallow *utilities* | Deep *utilities*<br>Manholes | Tree Trenches<br>Shallow *utilities* |

Figure 5 – *Complete Street* zone details

The *Complete Street* design elements for each zone should be selected based on the transportation facility function, adjacent land use context and the priorities set out in the *Road* and *Street* Palette. Elements of each horizontal and vertical zone are shown in Figure 5.

It is important to understand that the zone elements in a *Complete Street* are related. Some elements will need exclusive use of space (such as travel lanes on the surface in the *roadway* zone), while others could potentially share space in designated zones (e.g., *shallow utilities* and vegetation). The interface zone between *Complete Streets* and adjacent land uses is crucial in order to maximize *accessibility* between the two.

Not all elements of the mobility corridor, *green infrastructure* or *public realm* will be used in a design of a *Complete Street,* especially in a retrofit situation (i.e., available right-of way could be a limiting factor). Mobility and *accessibility* for goods and services is an essential function of Skeletal Roads, which means they have little need for *pedestrian-oriented public realm* improvements. However, they may have elements of *green infrastructure*. Conversely, on Neighbourhood Boulevards, wide sidewalks and high-quality aesthetic elements are crucial for supporting adjacent shops and public spaces. Ensuring the right balance between mobility, *green infrastructure* and *public realm* will result in *roads* and *streets* that effectively meet the goals of CTP.

## Policies

### Planning, design and maintenance of *Complete Streets*

a. The *road* and *street* design parameters and operational processes must adhere to the priorities set out in the *Road* and *Street* Palette for each mode of transportation, as shown in Figure 3 of the CTP.

b. *Roads* and *streets* must be designed with consideration for the context of surrounding land uses, and should incorporate universal access principles.

c. The *road* and *street* design must consider which elements are appropriate in each *Complete Street* zone based on the function of the transportation facility and adjacent land use context.

d. Design speed (and resulting operating speed) should be selected based on the function of the transportation facility and adjacent land use context. All other *road* and *street* design elements must be set to complement intended operating speed.

e. Intersection spacing should be determined to optimize mobility and connectivity of all transportation modes based on the priority set out in Figure 3 of the CTP.

f. Intersections should be designed to accommodate the needs of all users safely.

g. All new and retrofit bridges and interchanges on facilities Arterial Streets and lower should be designed and built to accommodate pedestrian and bicycle use.

h. Planning studies for Urban Boulevards and Neighbourhood Boulevards should seek to mitigate operational impacts on adjacent communities by including *street*s and connections at least one-and-a-half blocks to either side of the Boulevard.

i. Snow clearing should be handled in such a way that it does not interfere with pedestrian and bicycle movement on Urban Boulevards, Neighbourhood Boulevards and Parkways, once these *street*s have been upgraded to meet the design guidelines for their classification.

j. Appropriate transitions for road and street cross-sections should be developed where City infrastructure connects to infrastructure in surrounding municipalities.

### Adaptability

k. Existing *rights-of-way* should be protected to allow for future upgrading of existing *streets* defined as Urban Boulevards, Neighbourhood Boulevards and Parkways, and opportunities to acquire additional *right-of-way* should be investigated where necessary.

l. Future *right-of-way* width should complement the priorities set out in Figure 3 of the CTP for each mode of transportation and allow for flexibility and adaptability to accommodate travel changes over time.

### Access

m. Driveway accesses on existing *street*s designated as Urban Boulevards, Neighbourhood Boulevards and Parkways should be consolidated as *redevelopment* occurs over time, in order to minimize impacts on pedestrian and cycling facilities, while respecting access needs.

n. All new and retrofit *roads* and *streets* should provide adequate access for emergency vehicles, waste and recycling, *street* maintenance and other city services to meet their legislative policy requirements.

### Green infrastructure

o. All new and retrofit *road* and *street* designs should incorporate *green infrastructure* strategies to contribute to the environmental health and visual aesthetics of the urban fabric.

p. In all designs, natural processes should be maintained and re-established by conserving, protecting and restoring habitat quantity and quality. *Watershed*s should be protected by filtering *roadway* run-off.

q. Native vegetation and a layered tree *canopy* should be incorporated within corridors to reduce the urban heat island effect and improve air quality.

### Public realm

r. The *public realm* design for *street*s should adhere to the *public realm* policies set in Parts 2 and 3 of the MDP.

### Utilities and line assignments

s. The priority alignment and placement for *shallow utilities* infrastructure (trenches and above-ground equipment) should be as follows:

   i. in back alleys and lanes;

   ii. in *shallow utility* easements on private property;

   iii. within *right-of-way*, placed in the roadside zone; and

   iv. within *right-of-way* under the *roadway* (i.e., parking, shared or bike lanes or paved shoulders).

t. *Deep utilities* should be located so that manholes and appurtenances do not interfere with the movement of pedestrians, cyclists and vehicles.

### River and creek crossings

u. Planning and design of any new river or creek crossings must consider the principles and design consideration documented in Appendix B of the CTP.

### Collaboration and public engagement

v. Residents, businesses and other stakeholders should be engaged and encouraged to actively participate in the development of *street* design and landscaping standards in order to foster a community's *sense of place* and the ownership of *Complete Streets* over time.

# 3.8 Local transportation connectivity

**Objective** Create better connectivity in future communities and *Activity Centres* for walking, cycling and *street* networks, while also increasing access and reducing response times for emergency services.

## Supports

***Key Direction #2:*** Provide more choice within *complete communities*.
***Key Direction #5:*** Increase mobility choices.

***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.

## Discussion

Connectivity describes all the different ways we can get from one place to another, by foot, bicycle, transit or car. Within residential communities or *Activity Centres*, all of this movement happens on the local transportation network. The elements of the network can be combined in a wide variety of patterns and have a significant impact on how people choose to travel.

Research completed by Plan It Calgary and many other cities shows that increased connectivity has a number of benefits, including:

- enhancing public safety by reducing response times for emergency services;
- improving the health of citizens by making walking and cycling viable options for travelling to work or other daily needs;
- improving *accessibility* to the regional *street* system and reducing delays for motorists entering or leaving developments;
- reducing walking distances to transit stops and improving routing for City services such as Calgary Transit and Waste & Recycling Services;
- building communities that have the ability to adapt over time; and
- increasing social interaction between residents.

Most Calgary communities built prior to the 1970s (such as Brentwood and Glamorgan) use 'modified grid' networks that allow people to move easily within their communities, and many provide the benefits listed above. Several more recent communities provide similar levels of connectivity. However, most communities built in the last 30 years (such as Chaparral and Hawkwood) use 'curvilinear' networks which are more convoluted and therefore provide limited connectivity. This has resulted in increased emergency response times, reduced walking and cycling opportunities, and increased *congestion* for residents entering or leaving their communities. Future Greenfield communities should therefore be designed in ways that achieve the higher levels of connectivity, and associated benefits, already present in many Calgary communities today.

Increasing opportunities for walking and cycling, as well as improved transit circulation, is even more important in higher density, mixed-use *Activity Centres*. The close proximity of homes, jobs, services and amenities will make walking and cycling very convenient, as long as high levels of *street* and walkway connectivity are provided.

Effective design of local transportation networks, in Calgary and other North American cities, has shown that the land requirements for transportation infrastructure can be minimized using a variety of different *street* networks, while enhancing connectivity relative to recent curvilinear designs. Typical modified grid networks in Calgary use

an average of 26% of the total land area for streets, and plans for proposed modified grid communities in Calgary require as little as 22%. Typical curvilinear communities require a similar amount of land at 23% to 25%. This clearly demonstrates that well connected communities can be built without an excessive increase in land required for transportation infrastructure.

Within Future Greenfield communities, concerns about traffic on residential *streets* can also be mitigated through the proper design of *streets* to manage the flow of traffic and discourage undesirable driver behaviour.

A separate "Connectivity Handbook" will outline the methodology and associated design targets that can be used to improve connectivity in Future Greenfield communities and *Activity Centres*. Such measures would not apply to existing communities, although opportunities to enhance connectivity (particularly for walking and cycling) may be explored if community support exists.

## Policies

a. Connectivity should be maximized for pedestrians, cyclists, emergency vehicles and private vehicles in all Future Greenfield communities and Activity Centres. Limitations caused by natural topographic features, waterways and other obstructions (such as adjacent Skeletal Roads) must be taken into account when planning connected *street* and walkway networks.

b. All Outline or Subdivision Plans for Future Greenfield communities and Activity Centres must provide quantitative measures demonstrating the degree of connectivity that is achieved for pedestrians, cyclists, emergency vehicles and private vehicles.

c. *Street* and walkway configurations should be designed to maximize *accessibility* to major destinations and transit facilities within Future Greenfield communities and *Activity Centres*, while also minimizing the impact of traffic on other users, adjacent businesses and residents.

d. Residential *street* block lengths should be minimized in order to facilitate the movement of pedestrians, cyclists and transit within Future Greenfield Communities and Activity Centres.

e. Access into and out of Future Greenfield communities, new major commercial developments and industrial developments should be maximized to improve emergency response times and reduce congestion.

f. Evacuation route plans should be established for all future developments and identify at least two evacuation routes connecting to at least two different *street*s that lead away from those developments.

g. Two access points (defined as intersections or roundabouts that provide direct access into or out of an area for vehicular traffic) must be provided to any new residential, commercial or industrial area once homes or businesses begin to be occupied. The second access point could be a temporary access exclusive to emergency vehicles if two full access points are not practical. All temporary and permanent access points should also be designed to serve as emergency evacuation routes.

# 3.9 Parking

**Objective** Manage parking in Centre City, *Activity Centres*, *Corridors* and TODs to support an affordable and diverse housing mix, promote development, consider business vitality, increase densities, encourage using all modes of transportation, improve air quality and reduce the environmental footprint of the city.

## Supports

***Key Direction #3:*** Direct land use change within a framework of nodes and corridors.
***Key Direction #4:*** Link land use decisions to transit.
***Key Direction #5:*** Increase mobility choices.
***Key Direction #7:*** Create *Complete Streets.*
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #1:*** Align transportation planning and infrastructure investment with city and regional land use directions and growth management strategies.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.
***Transportation Goal #6:*** Advance environmental *sustainability*.

## Discussion

The availability of parking is an important factor in what modes of transportation people choose to use. Traditionally, cities have required ample amounts of parking to alleviate parking *congestion*. However, an abundance of free parking encourages vehicle use, consumes useful land and is expensive to construct and maintain. Solving this problem by providing additional parking further increases parking demand, perpetuating the cycle.

The move towards more *Complete Streets* that support walking, cycling and transit requires complementary parking management strategies. The Downtown Parking Strategy has been highly successful at managing traffic flow into the core, increasing transit use, managing the total number of long-stay stalls and creating a dynamic downtown. Continuing these strategies and expanding them to other key locations served by the Primary Transit Network throughout Calgary over time will continue to shift the focus from providing an abundance of free parking to a more managed approach to parking.

### Park and ride

Historically, park and ride facilities have been developed in strategic locations, generally beyond a five kilometre distance from the Centre City. These facilities intercept vehicles at the earliest opportunity and help to reduce *congestion* closer to Centre City. This also helps to protect established inner city communities from undesirable traffic problems.

However park and ride facilities must be planned in concert with other transit access modes (e.g., feeder buses, walking, cycling and passenger drop-off). Excessive parking detracts from the goal of maintaining an effective feeder bus service and may limit opportunities for TOD. For these reasons, the determination of park and ride requirements has been based on consistent application of Council-approved guidelines.

The current park and ride strategy should be reviewed to consider current and future needs for park and ride, as well as the overall parking strategy for TOD nodes. Alternatives such as sharing parking with complementary developments (e.g., shopping centres, movie theatres, churches), structured parking and flexible guidelines for park and ride for *Activity Centres* and *Corridors* should be considered in order to reduce the footprint of park and ride development in strategic locations.

### Parking and green infrastructure

Parking lots and urban water run-off are closely linked. *Street*s and parking areas represent over 24 per cent of the impervious land area in Calgary, contributing higher storm flow volumes and pollutant loads to urban stormwater than any other source area in urban development. Parking design can have a powerful impact on stormwater quality, both by generating large areas of impervious land coverage and by collecting non-point source pollutants from vehicles and *roadway* surfaces.

Three key methods to reduce *impervious surfaces* are:

- retaining natural landscape;
- minimizing pavement;
- promoting natural infiltration to the soil; and
- pervious pavement.

Once these are accomplished, appropriate design solutions should be applied. Section 3.7 provides guidance to planners, engineers and other specialists to include *green infrastructure* into the planning and design of *road*s and *street*s. The same strategies should be applied to parking lots.

## Policies

a. The Downtown Parking Strategy is a key element to manage downtown traffic demand, and should continue to be aligned with long-term transit *mode split* targets for Centre City.

b. Funds collected from parking fees and levies should be used for funding related transportation improvements.

c. Long-stay parking in *Activity Centres* and *Corridors* should be limited where high-quality alternative modes of travel are in place (such as LRT or BRT).

d. Technology, time restrictions and pricing should be used for addressing parking demand issues, instead of increasing supply in existing areas of the city.

### Downtown Parking Strategy

Calgary has taken an active role in the planning of downtown parking since 1966. At that time, the Downtown Master Plan identified strategic locations for parking in the downtown. In the 1970s the cash-in-lieu program was created to collect monies to build shared parking in these strategic locations. Current cash-in-lieu parking requirements are for only 50% of required parking to be provided on site. The combination of these initiatives helped foster a strong relationship with transit (7th Avenue) and the pedestrian (8th Avenue). The 1995 GoPlan also identified the relationship of parking and transit ridership. The GoPlan policies helped Calgary achieve a 45% transit *mode split* to downtown in 2006. The policies identified in the CTP continue to respect the important relationship of parking and transit use.

e. *Parking facilities* should be encouraged to provide priority, high quality parking locations and/or rates for "preferred parkers" (carpool parkers, car-sharing vehicles, cyclists, teleworkers, motorcycles and scooters).

f. The design of *Parking facilities* should consider adaptability for future uses that may or may not be related to parking.

g. Shared parking should be used to optimize existing facilities and *park and ride lots*.

h. Park and ride development must be managed strategically to optimize the development of the transit market and minimize the land area used.

i. *Green infrastructure* principles should be integrated into the design of *parking facilities*.

# 3.10 Transportation safety

**Objective** Continue to enhance safety for all users of the transportation system, accommodate increased walking, cycling and transit use by addressing the safety concerns of network users, and support emergency management processes.

## Supports

***Key Direction #5:*** Increase mobility choices.
***Key Direction #7:*** Create *Complete Streets*.

***Transportation Goal #2:*** Promote safety for all transportation system users.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.

## Discussion

### Transportation system safety

The transportation system in Calgary supports community safety, security and vitality. By providing connections between communities, safe routes to schools, accessible rapid transit and more, the transportation system is a catalyst for community health, safety and security. Safety in the system is critical, and safety is one of the overarching transportation goals in the CTP.

A user's perceived safety is important. People may spend a lot of time on the transportation network during the course of a day, so they need to feel comfortable when they use it. If users feel unsafe, they may not use elements of the transportation network even if they are physically able to. Calgary's transportation network must be safe and feel safe for all users, whether they are walking, cycling, riding transit or driving.

### Safety and public transit

**Cities with higher transit ridership have fewer traffic fatalities per capita, including fatalities involving transit, automobiles and pedestrians. Increased transit ridership also improves transit user safety and security.**

*Todd Litman: Evaluating Public Transit Benefits and Costs, 2009*

A city's approach to safety is framed in terms of risk. Risk depends on the likelihood of something occurring and the impact or consequences if it occurs. Whether as individuals or as a group, when we make decisions, we decide risks are:

- acceptable;
- acceptable, but with effective monitoring;
- acceptable, but only with risk management to minimize exposure to the risk (to keep the likelihood of occurrence low) and/or to minimize the impact; or
- unacceptable.

Risk management is a critical consideration in all transportation planning, design and operational decisions. A significant improvement in transportation safety comes from changing travel behaviour to minimize exposure to traffic collisions. Shifts from private vehicle use to public transportation have been shown to reduce injuries and fatalities. To encourage this shift, the real and perceived safety of users of the public transportation system must be addressed.

As more people are encouraged through supportive land use to walk, bike and use public transportation, a proactive approach to safety on *roadways*, pathways and sidewalks is needed. Changes to the way *roads*

and *streets* are used by drivers, pedestrians and cyclists involve risk. Individuals and communities often react by citing the risks as obstacles (e.g., increased pedestrian/vehicle conflicts). The CTP includes policies that address these risks. Engineering, education, enforcement, enhancement and encouragement all play a role in developing an integrated approach to safety for all users.

**Engineering** Using elements of design to influence travellers' behaviour.

**Education** Reaching out to the public through a variety of media.

**Enforcement** Ensuring adherence to laws, bylaws and regulations.

**Enhancement** Addressing safety issues through physical improvements.

**Encouragement** Addressing users' perceived level of safety by encouraging use of new public facilities.

### Emergency management

In addition to promoting and enhancing safety on the transportation system during normal operating conditions, The City must be prepared for unforeseen emergencies that require swift and co-ordinated responses. The Emergency Management Agency has responsibility for pre-planning and organizing City responses to emergency situations that require evacuation of large urban sectors in Calgary. They are supported by the Calgary Fire Department, Calgary Police Service, the Transportation Department, Disaster Social Services and many other support services. Transportation plays an important role in developing operational procedures that facilitate the efficient and orderly movement of people away from disaster locations (including traffic signal coordination and provision of transit services). Continued involvement by Transportation is crucial in the successful development of emergency response plans.

### Designing for safety

**By designing with safety in mind for the built environment, Crime Prevention through Environmental Design (CPTED) promotes design principles that encourage safe behaviour and reduce the opportunities for crime to occur. Strategies include the encouragement of social interaction within the community.**

*Crime Prevention Unit: CPTED. Calgary: The City of Calgary, Calgary Police Service*

### Dangerous goods movement

The movement of dangerous goods (materials that pose a risk to public health, property or the environment when transported in quantity) is necessary for some business functions in Calgary. The risk posed by the movement of these goods must therefore be mitigated, or prevented if possible. Through regular bylaw updates, the Transportation Department must evaluate and identify specific *roadways* that can be used to move dangerous goods while minimizing these risks.

## Policies

a. Transportation safety issues should be identified and resolved on a priority basis through engineering, enforcement, education, enhancement and encouragement.

b. The transportation system should be planned and operated in a manner that promotes safety for all users and ensures the City is able to sustain that safety during unforeseen emergencies that require swift and co-ordinated responses.

c. CPTED design guidelines, and emergency management considerations, should be incorporated into the planning and design of all transportation infrastructure.

d. Statistics on community transportation safety must be kept and recorded to identify progress in reducing injuries and fatalities.

e. The Transportation Department should work with the Emergency Management Agency and its members to prepare emergency evacuation plans for individual sectors of the city (e.g. square-mile residential grids, the downtown).

## 3.11 Universal access

**Objective** Ensure access and freedom of mobility for all Calgarians, providing all citizens with the opportunity to travel and participate in public life.

### Supports

***Key Direction #5:*** Increase mobility choices.
***Key Direction #6:*** Develop a Primary Transit Network.
***Key Direction #7:*** Create *Complete Streets.*

***Transportation Goal #3:*** Provide affordable mobility and universal access for all.
***Transportation Goal #4:*** Enable public transit, walking and cycling as the preferred mobility choices for more people.

### Discussion

The transportation system should offer choices for all people, regardless of their income, age, literacy, mental and physical ability or cultural background. An accessible transportation system that incorporates walking, cycling, transit, carpooling, private vehicle use and other options offers all citizens the opportunity to participate in the economic and social activities of the city.

*Universal design* makes the transportation system, and the places it connects, accessible to everyone. *Universal design* also benefits people without disabilities, such as older adults, people with temporary injuries, parents with strollers, individuals with wheeled grocery or luggage carts and delivery people with numerous boxes in hand.

Transportation infrastructure and services can be designed and operated in a way that meets the needs of all citizens. By reducing barriers that exclude individuals from participating in the community, all Calgarians will be able to move freely and engage in economic, social and cultural life.

### Policies

a. Affordable mobility choices should be provided to Calgarians.

b. *Universal design* principles should be applied in the planning, design, operation and maintenance of all transportation infrastructure and services.

c. The Primary Transit Network, including all vehicles and supporting infrastructure (such as sidewalks and buildings), should be designed and built to accommodate the needs of all citizens.

# 3.12 Environment and Transportation

**Objective** Protect air, land, water and *biodiversity* in the planning, design, operation and maintenance of all transportation infrastructure.

## Supports

***Key Direction #7:*** Create *Complete Streets*.
***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #6:*** Advance environmental *sustainability*.

## Discussion

The Calgary Ecological Footprint for 2008 stood at 9.4 global hectares (gha) per capita, which is above the national average of 7.1 gha per capita. The transportation system contributes 11 per cent to the city's Ecological Footprint. Increasing emphasis on more sustainable modes of transportation can help reduce Calgary's impact on the environment, and mitigate consequences such as:

- degradation of air quality and increasing *greenhouse gas emissions*;
- impairment of water quality associated with deposition of air pollutants;
- increased traffic noise; and
- impacts from oil spills, de-icing and other transportation activities.

Many of these impacts can be mitigated and/or eliminated through sustainable design and the application of best practices. Examples are Ride the Wind (public transit based on 100 per cent wind energy) and *green infrastructure* (protecting water quality by greening *streetscapes* and reducing *impervious surfaces*). The following policies support integrated design strategies contained in the CTP that are aimed at eliminating, reducing or mitigating the environmental impact of the transportation system.

## Policies:

a. Protect the quality and quantity of water in urban environments by mimicking natural *hydrology* in the design and operation of transportation infrastructure.

b. Improve the air quality on and around mobility corridors by increasing vegetation, decreasing *impervious surfaces* and supporting the use of renewable energy and other techniques to mitigate climate change.

c. Preserve and enhance *biodiversity* to support the natural environment in and around mobility corridors.

## 3.13 Infrastructure management

**Objective** Use best infrastructure management practices to keep Calgary's transportation infrastructure safe and reliable, and minimize future expenditures by optmizing the life-cycle of existing and future facilities.

### Supports

***Key Direction #8:*** Optimize infrastructure.

***Transportation Goal #7:*** Ensure transportation infrastructure is well managed.

### Discussion

Like other cities in North America, Calgary's transportation infrastructure is reaching a point where much of it will start to require additional maintenance, refurbishment or replacement as a result of its age. However, sufficient funding is unavailable to support all of the new infrastructure requirements of Calgary's current pattern of growth in addition to the increasing costs associated with managing Calgary's existing infrastructure. As a result, many transportation projects remain unfunded, resulting in an infrastructure gap. Additional priority will now also need to be given to the management of walking, cycling and transit infrastructure.

In general, infrastructure management includes all work that preserves the integrity and value of transportation infrastructure. This includes all work associated with operating and maintaining the infrastructure in a reasonable condition so that it is able to deliver its intended duration and level of service to The City and to Calgarians. Along with operations and maintenance, timely rehabilitation and refurbishment of infrastructure has been shown to delay the need for more costly replacements of existing infrastructure, thus optimizing the use of limited available resources. In addition, proper infrastructure management can help to improve *capacity* and quality of service for all modes of transportation and enhance the *streetscapes* that beautify our city by keeping The City's transportation infrastructure in safe and reliable condition.

It has become increasingly evident that The City cannot afford to continue expanding outwards and increasing linear infrastructure while supporting built infrastructure. The problems of rapid growth are compounded by the desire for increased service levels in the maintenance and replacement of existing infrastructure. The combination of these two issues results in considerable strain on available funding for infrastructure management.

The City and the Transportation Department have already initiated *asset management programs* aimed at addressing these issues.

### Policies

a. Existing and future transportation infrastructure should be managed (through operations, maintenance, refurbishment and replacement) in a manner that ensures that infrastructure is safe, reliable and achieves its optimum life-cycle.

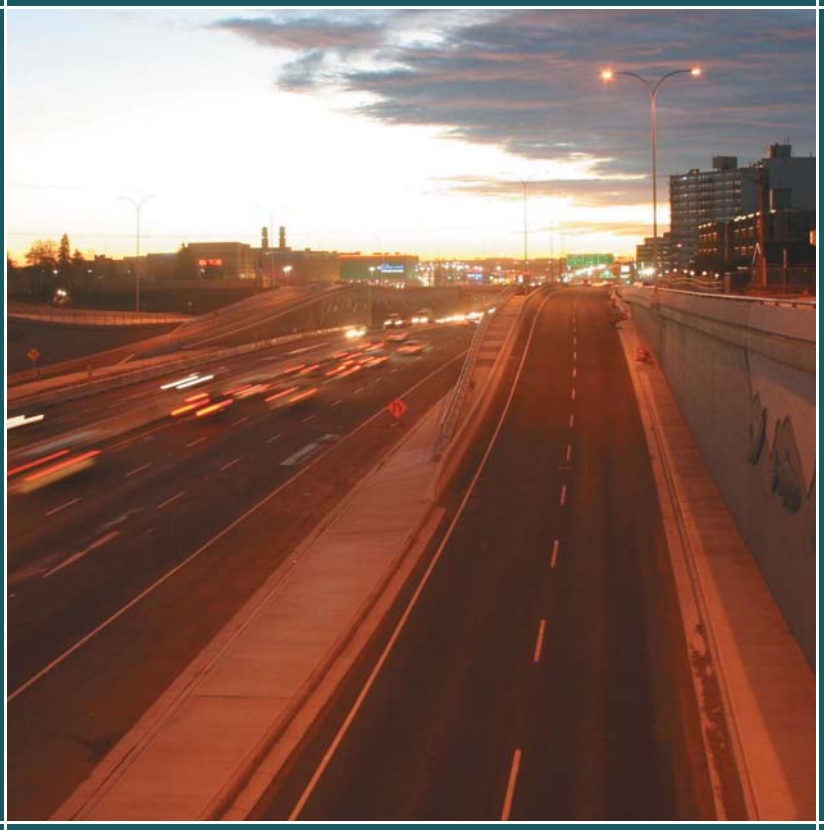
b. A *life-cycle costing* and management program should be used to optimize the recommendations for infrastructure investment, which should be aimed at improving the overall condition of the transportation infrastructure and minimizing the overall *life-cycle cost*.

c. New construction or *redevelopment* projects within transportation *rights-of-way* should be co-ordinated with planned maintenance projects to minimize the impact on the transportation infrastructure, the duplication of repair efforts, the premature shortening

of infrastructure life and the impact on the natural environment.

d. Primary networks for the movement of cyclists, transit, and goods (as depicted in CTP maps 1, 2 and 5) should be given high priority for clearing of snow, ice or gravel and debris.

e. Environmental best practices must be incorporated into all infrastructure management activities to minimize impact on the environment and integrated *green infrastructure*.



# Part Four

## Monitoring and reporting

# Part 4 – Monitoring and reporting

**Objective** Provide a basis for effective strategic decision making by monitoring and reporting on the progress made towards achieving the goals and objectives of the MDP and CTP.

## Discussion

The MDP and CTP are not static documents. They establish strategic policy directions, but periodic progress checks must be undertaken to review whether progress is being made.

To evaluate progress toward the policy direction of the MDP and CTP, a broad spectrum of indicators and targets has been developed. The Core Indicators for Land Use and Mobility can be found in Figure 6. These indicators are proxy measures for the social, environmental and economic performance of the MDP and CTP. They are intended to track the overall progress towards achieving the goals and objectives of the MDP and CTP. However, these indicators are not intended to be applied to individual Local Area Plans and land use applications. It is important to note that no one or two measures in isolation can indicate progress. The full set of indicators should be measured and reported in order to provide a comprehensive picture.

Each of the indicators is accompanied by a target. The targets provide a desired performance outcome for an indicator over a specified period of time. The targets were based on benchmarking of other cities and engagement with stakeholders. The targets represent a direction that The City wishes to achieve through its planning and investment processes and through collaborative working with other orders of government, the public and stakeholders.

A monitoring and reporting program will be developed for the Core Indicators for Land Use and Mobility as part of the MDP/CTP implementation program. A regular cycle of reporting on the Core Indicators will provide performance information to Council, Administration and the public. Reporting will be conducted in advance of each 3-year City business planning cycle and will assist in developing investment strategies and strategic growth decisions. The reporting process will also help ensure that implementation strategies and corporate processes are aligned with the long term goals of the MDP and CTP. In addition to evaluating progress towards the targets contained in this section, additional reports will look at current growth forecasts, market trends and The City's financial capacity.

A major review of the Core Indicators for Land Use and Mobility should occur on a ten year basis as part of the CTP policy review process (which will assess whether the policy direction remains appropriate or requires adjusting). Each metric and target will be evaluated to ensure that they align with the updated vision and policies of the MDP and CTP.

A regular cycle of reporting on the indicators will provide information for Council, administration and the public. This is supported by policy direction in the MDP, which states that:

- The City will measure the Core Indicators for Land Use and Mobility on a continuous basis, and report to Council, Administration and the public regarding the progress towards the targets prior to each business planning cycle.

| Core Indicators for Land Use and Mobility | | | | |
|---|---|---|---|---|
| # | Core Indicators | Metric | Baseline | 60-year Target |
| 1 | Urban Expansion | Per cent of population growth accommodated within developed area (2005 boundary area) | In 2005, the developed area of the city was losing 5% of population to greenfield area. | 50% |
| 2 | Density | People per hectare | In 2005, Calgary had a population density of 20 people per hectare. | 27 |
| | | Jobs per hectare | In 2005, Calgary had employment density of 11 jobs per hectare. | 18 |
| 3 | Population / Jobs Balance | Population/Jobs East/West ratio | In 2005, the population/jobs East/West ratio was 2.7. | 1.7 |
| | | Population/Jobs North/South ratio | In 2005, the population/jobs North/South ratio was 1.9. | 1.7 |
| 4 | Mix Land use | Land Use Diversity Index | In 2008, land use mix diversity index was 0.53. | 0.7 |
| 5 | Residential Mix | Residential Diversity Index | In 2008, residential diversity index was 0.19. | 0.4 |
| 6 | *Road* and *Street* Infrastructure | *Roads* to *Streets* ratio | 0.72 (42% *Roads* and 58% *Streets*) | 0.57 (36% *Roads* and 64% *Streets*) |
| 7 | *Accessibility* to Primary Transit Network | Per cent of population within 400m of Primary Transit Network | LRT is the only transit service approaching Primary Transit levels of service in Calgary today. | 45% |
| | | Per cent of jobs within 400m of Primary Transit Network | LRT is the only transit service approaching Primary Transit levels of service in Calgary today. | 67% |
| 8 | Transit Service | Annual transit service hours per capita | Currently, 2.2 transit service hours are provided for each resident in Calgary annually. | 3.7 |
| 9 | Goods Access | Per cent of *intermodal* and warehousing facilities within 1600m (actual) of Primary Goods Movement Network | Currently, 73% of *intermodal* and warehousing facilities are located within 1600m of Primary Goods Movement Network. | 95% |
| 10 | Transportation *Mode Split* | Walking and Cycling *Mode split* (all purpose trips, 24 hours, city-wide) | In 2005, walk and bike trips contributed to 14% of all trips made. | 20% - 25% |
| | | Transit *Mode split* (all purpose trips, 24 hours, city-wide) | In 2005, 9% of all trips were made by transit. | 15% - 20% |
| | | Auto *Mode split* (all purpose trips, 24 hours, city-wide) | In 2005, 77% of all trips were made by car. | 65% - 55% |
| 11 | *Accessibility* to Daily Needs | Per cent of population within Major and Community *Activity Centres*, and 600m of Urban and Neighbourhood *Corridors* | In 2006, 18% of all population was located within Major and Community *Activity Centres*, and 600m of Urban and Neighbourhood *Corridors* | 30% |
| 12 | *Watershed* Health | Per cent of impervious surface | In 1998, 32% of land cover was impervious (made up of *roadways*, parking and buildings) | 10% - 20% |
| 13 | *Urban forest* | Per cent of tree *canopy* | *Canopy* cover was 7% in 1998. | 14% - 20% |
| 14 | District Energy | Per cent of land area with densities supportive of district energy systems | In 2005, only 0.3% of land area had densities supportive of district energy systems. | 1.7% |

Figure 6 - Core Indicators for Land Use and Mobility


# Appendices

# APPENDIX A – Transit system phasing and design

The development and *redevelopment* of cities is an uncertain process. However, significant benefit can be achieved when a degree of certainty is provided to major stakeholders (e.g., developers, communities, infrastructure and service providers) with regard to where, when and how cities will grow. Decisions affecting the expansion of major municipal infrastructure and services such as water, waste water, transit and *roadways* help to shape the direction for growth within the Calgary Region and affect the social, environmental and economic health of our communities.

## Primary Transit service

The Key Directions for Land Use and Mobility recognize that, in order to move towards a sustainable city, land use and transit decisions need to be linked to ensure that the urban form supports quality transit service and that quality transit service is provided in a timely manner to support land use *intensification*. In this regard, the Primary Transit Network will be an organizing tool for transit planning and land use to ensure that each element supports the other.

The Primary Transit Network consists of an amalgamation of individual transit routes that operate in a specific corridor. One of the core elements of the CTP transit strategy is to commence upgrading major transit corridors (e.g., LRT and mainline bus service) to Primary Transit service levels within the next five years to 'lead development' and stimulate land use *intensification* of *Activity Centres* and *Corridors*.

The following criteria will be used to guide decisions about the phasing of transit investments in Primary Transit corridors to support strategic land use directions.

### Ridership demand

Many proposed Primary Transit corridors (e.g., LRT corridors, Centre Street) carry heavy volumes of passengers and operate at frequencies of 10 minutes or less for extended time periods. These corridors are capable of being upgraded to Primary Transit service levels with a modest level of investment. Focusing investment in existing high-demand transit corridors will achieve the dual benefit of increasing transit capacity to attract new transit riders and providing incentives for more intensive, mixed use development.

### Support growth in strategically located *Activity Centres* and *Corridors*

The Primary Transit Network serves as an organizing tool for both Transit and Land Use Planning to ensure that both elements support one another. It is a commitment that quality transit service will be available if land use and *street* designs achieve good *transit-oriented* forms. Timely investment in improved transit service will help motivate market responses, focusing infill and greenfield *intensification* within walking distance of the Primary Transit Network.

### Corridor completion

Ideally, specific route investments should align with Primary Transit corridors as much as possible to achieve the desired 10-minute service levels. These criteria may also result in rationalization of transit routes to align with proposed Primary Transit corridors.

### Improve cross-town transit services

More emphasis and resources must be directed toward the upgrading of existing cross-town transit services to Primary Transit service levels and the creation of new cross-town transit connections. These

investments will enable Transit to attract a greater share of the substantial volume of cross-town work, school, shopping trips that are occurring between residential and employment areas in suburban areas, and it will support the development of new transit connections between proposed compact, mixed-use *Activity Centres* and *Corridors*.

**New corridor development**

It is anticipated that several major mainline and cross-town transit corridors will be upgraded to Primary Transit service levels within the next five to 10 years. However, some components of the Primary Transit Network involve the creation of new transit corridors (e.g., new river crossings for transit, walking, cycling and EMS) and may require an extended time period to develop to Primary Transit service levels, as they are not currently anchored or supported by *Transit-oriented Developments*.

Using the priorities and criteria described above will make frequent, direct, reliable transit service available to the greatest number of people and achieve a *built form* that will foster integration between land use/community design and transit service.

## Transit implementation policies

Calgary City Council has approved macro level policies that provide a framework for the planning and implementation of transit service in Calgary. These policies encompass decisions relating to maximum walking distance for access to transit service and fare policy, as well as system and route level performance standards. Taken together, these policies drive decisions regarding route structure, level of service, phasing of service and cost of delivering transit service to the community.

The following guidelines should be used to guide the planning and implementation of transit services.

- Community design will minimize pedestrian *street* walking distance to transit service (i.e., a bus zone or LRT station) to 400 metres or less.
- In recognition of unusual circumstances, up to five per cent of the area population (dwelling units) may be located beyond 400 metres *street* walking distance from transit service (i.e., a bus zone or rail station). In site specific conditions, this guideline may be exceeded and compromises will be necessary.
- Council-approved route performance measures are used to ensure bus routes are operating efficiently:
  - Regular bus – minimum of 20 to 25 boarding passengers per operating hour;
  - Community Shuttle – minimum of 12 to 15 boarding passengers per operating hour; and
  - Current policy requirements that Calgary Transit recover 55 per cent of its operating costs (revenue-cost ratio) through transit fares and other sources of revenue.
- In accordance with the above policies, transit service will be extended to developing areas as soon as possible subject to:
  - The provision of *streets* adequately located and constructed for transit use; and
  - The location of the developing service area contiguous to existing service areas, so that service is provided in accordance with approved minimum ridership policies.
- Subject to the above policies and the individual characteristics of the service area, in response to customer demand, transit service within a service area will generally be staged as follows:
  - Weekday a.m. and p.m. peak-period service;

- Weekday service between the a.m. and p.m. peak periods;
- Saturday service;
- Evening service on all weekdays and Saturdays; and
- Sunday service.

- The normal service delivery sequence may be altered in communities that have unusual service requirements.
- Bus and LRT service will operate within a schedule adherence range of zero to less than three minutes of the design schedule. Buses or LRT will not depart a scheduled time-point early.

## Regional transit phasing plan

The short-term regional transit goal is to implement an integrated, regional *Bus Rapid Transit* (BRT) service that would provide two-way service between key destinations within Calgary and adjacent regional communities. These services would be connected through the proposed network of Transit Mobility Hubs. Regional Transit Hubs will be located to support other medium and longer-term transit investments such as inter-city commuter rail and LRT services.

The future vision for regional transit service is illustrated in Map 4, in Appendix D, and includes:

- Commuter rail service to Cochrane, Canmore and Banff (projected 60-year corridor population growth of 116,000).
- Commuter rail service to Okotoks, High River and Nanton (projected 60-year corridor population growth to 121,000).
- Commuter rail service to Airdrie (projected 60-year corridor population growth to 130,000).
- New regional transit routes between communities outside of Calgary (e.g., Cochrane to Airdrie).

## Transit Mobility Hubs

A Transit Mobility Hub is a place of connectivity where different modes of transportation (i.e., walking, cycling, bus and rail transit) come together seamlessly and where there is an attractive, intensive and diverse concentration of housing, employment, shopping and other amenities around a major transit station.

Transit stations are the key point of contact between the traveller and the transit system; therefore, these facilities should be designed to enable efficient movement and stopping of transit vehicles, provide a safe, clean and comfortable environment for transit customers and contribute to the creation of attractive *Transit-oriented Developments*.

Some transit stations are particularly important because they are focal points for terminating transit lines or provide important connections between intersecting inter-city, regional and city transit routes. These stations will service the highest proportion of transit network trips and should be designed to provide comfortable, seamless connections for transit riders.

As a general principle, the first priority in the design of Transit Mobility Hubs should be to accommodate the requirements for efficient transit access, comfortable passenger waiting areas and safe, direct, unobstructed routes for pedestrians and cyclists. As discussed in section 3.1, transit, walking and cycling are more sustainable modes of transportation in that they require less energy, need less infrastructure and are available to almost all Calgarians. Giving priority to these access modes will foster greater mobility choices and support the creation of attractive *Transit-oriented Developments*.

It is essential that Transit Mobility Hubs are designed and maintained to a high standard to provide a safe, clean and comfortable environment where transit riders feel welcome and valued. The following types of facilities should be incorporated:

- Bus layover spaces;
- *Transit priority roadways;*
- Taxi stands;
- Stations that are comfortable, clean, attractive, safe and accessible and provide good interaction with adjacent land uses;
- Shaded areas to mitigate hot weather conditions and heated areas to provide a comfortable environment during cold weather conditions;
- Well-designed, amply-sized pedestrian walkways and customer waiting areas;
- Commercial/retail space, public washrooms and telephones;
- Secure storage facilities for bicycles;
- *Pedestrian-oriented* lighting;
- Attractive public art;
- Way finding signage to direct people to their destinations;
- Real time schedule information;
- Fare purchase equipment;
- *Green infrastructure* to increase infiltration and perviousness and manage storm water run-off; and
- Park and ride, if provided, sized appropriately to the required access.

Three categories of Transit Mobility Hubs have been identified:

i. Regional/inter-city gateway hubs

Regional/inter-city gateway hubs are located at major regional and inter-city interchange points between the Primary Transit Network and other modes of public transportation. Regional/inter-city gateway hubs would be located at the following locations:

- Calgary International Airport;
- At connection points between the Primary Transit Network and future inter-city high-speed rail service (CP Railway corridor and 96 Avenue N. and the "Rail-town" development at 9 Avenue and 8 Street S.E.);
- At connection points between the Primary Transit Network and future regional commuter rail and *Bus Rapid Transit* corridors; and
- At connection points between the Primary Transit Network and inter-city bus services (e.g., Greyhound and Red Arrow Express).

ii. Primary Transit hubs

Primary Transit hubs are focal points for terminating primary transit lines or major transfer centres between intersecting Primary Transit lines. These stations will accommodate higher passenger volumes than other transit stations and, therefore, should include enhanced amenities to provide a pleasant customer experience and to accommodate expected ridership levels. Primary Transit hubs generally coincide with Major *Activity Centres* and Community *Activity Centres* (see the Urban Structure Map in the MDP), which will further increase transit demand and reduce single occupant vehicle use.

iii. Transit centres

Transit centres are points between intersecting transit lines where there is significant passenger activity but not at the scale of a Primary Transit Hub. Transit centres are located at the intersection between Primary and Base Transit services (e.g., Sunnyside, Fish Creek Lacombe Station and Rundle Station).

# APPENDIX B – Principles and design considerations for river crossings

Within the Calgary Region, there are many crossings of river, creek and ravine systems by transportation infrastructure, including freight railways, major *roadway* corridors, *Light Rail Transit* lines and pedestrian bridges. This infrastructure provides essential mobility and connectivity between communities and external destinations, and it supports economic development by ensuring the efficient movement of people and goods at a city-wide and regional level.

All transportation crossings of rivers and creeks require the construction of culverts, piers and bridges, and have the potential to affect riparian areas and river and creek habitats. For these reasons, the need for river and creek crossings must be balanced with impacts to the environment and be treated with the utmost environmental sensitivity.

During the next 30 years, components of Calgary's *roadway*, transit and pathway systems will require new crossings of river or creek systems, or widening or modification of existing bridge structures. *Watercourse* crossings may also be needed for electrical transmission, telecommunications, water or wastewater lines. In such projects, it is essential to balance the need for expanded infrastructure with the significance of the environmental areas and communities that may have to be crossed. When a crossing is deemed necessary, these facilities should be designed and constructed to protect the rivers, creeks and other natural *ecosystems* that will be affected.

The following discussion describes seven key principles that should be considered whenever a new or expanded river or stream crossing is contemplated.

### Principle 1: Demonstrated need for the crossing.

A balanced triple bottom line framework should be used to assess the social, economic and environmental implications of the crossing and the corridor it serves and all alternatives, including the option of doing nothing.

### Principle 2: Advanced planning for appropriate siting based on all relevant factors.

Several factors play a role when considering, planning, designing and constructing these crossings. These factors include:

- City-wide *street*, transit and utility connectivity to promote compact growth and public transit while reducing vehicle dependence;
- Use of river and stream corridors by people, fish, migratory birds and other wildlife and the sensitive integration of human development within *watercourse ecosystems*;
- Waterway constraints, such as *hydrology* (e.g., volume of water from droughts to floods), hydraulics (e.g., erosion power of moving water and ice) and channel morphology (e.g., meandering, braiding, entrenchment, etc.);
- Location and design of stream channel crossings; and
- Bridge design principles (e.g., structural, aesthetic).

River crossing sites should only be chosen after careful determination of the least damaging crossing location – before the crossing and the associated infrastructure leading to it are designed.

### Principle 3: Adherence to the recommendations of a comprehensive biophysical and social impact assessment.

The biophysical impact assessment should consider:

- plants and animals;

- seasonal and climate-related hydrological changes (droughts, floods, ice conditions etc);
- conditions and functionalities before and after construction;
- hydraulic conditions and functions (e.g., erosion, scouring and deposition;
- connectivity of viable wildlife habitats;
- fish passage; and
- long term impacts from operations.

The social impact assessment should build on the needs assessment (see Principle 1) and cover all relevant issues related to how the crossing, corridor or related infrastructure will affect people, their quality of life, their behaviour and the communities in which they live.

**Principle 4: Successful minimization of impacts from construction, rehabilitation and ongoing operation and maintenance through engineering design and rehabilitation requirements.**

Every effort should be made to avoid potential adverse impacts, and such efforts should be demonstrated prior to accepting mitigation as an option.

To minimize the impacts of river crossings, the following standards should be implemented:

- Engineering design should follow best management practices, including the following:
  - Provide the minimum *roadway* width necessary to service intended needs and adjacent land uses. An effect of a highly connected *street* system is an increase in *impervious surfaces*. Therefore, it is beneficial to narrow *streets*, which can decrease the amount of impervious paving.
  - Wide *streets* and slope embankments can result in the need to disturb a significant length of the *watercourse*. By narrowing *street* and shoulder widths at *watercourse* crossings and by considering steeper embankments or clear span bridges, the total length of disturbed channel may be reduced.
  - Use more habitat-friendly forms of river training such as bio-engineering to mimic natural armouring, instead of riprap and concrete. Replicate historical natural bank stabilization, rather than hard surfaces.
  - A clear span bridge is usually the preferred type of crossing because it typically causes less impact to *watercourse* and flood plain functions.
  - When combining utility crossings with bridges, any corrosion problems due to leaks or electric currents should be anticipated and prevented.
  - Bridge spans that either eliminate or minimize the disturbance of the *watercourse* bed and shore are preferable.
  - Recreation access to the *watercourse* and approach ramps should be included, as appropriate.
  - Where significant conflicts are expected, priority should be given to the protection of wildlife habitat and corridors (ecologically sensitive areas) over all other uses.
- Adverse biophysical impacts should be avoided if possible, or minimized if unavoidable.
  - Vegetation impacts should be minimized by crossing the stream corridor at a right angle and keeping the *right-of-way* as narrow as possible.
  - Designing for acoustic, visual and safety factors is important.
    - Sound barriers block the view and turn crossings into visual canyons; however, they may be needed to reduce salt spray and/or disruptions to wildlife habitat and corridors.

- ° Concrete is very noisy but physical buffers and rubberized surfaces help.
- ° Wet surfaces increase traffic noise, especially with low clouds that reflect sound back to the ground.

- Water from bridge and approach runoff needs primary and secondary treatment. Best management practices such as stormwater ponds, storm receptors, and constructed *wetlands* should be used in the vicinity of the crossing to treat *street* drainage and runoff from bridge decks to meet federal, provincial and municipal requirements as well as the objectives and criteria in water and *watershed* management plans.
- Shadowing from crossings can alter the seasonal and daily sunlight patterns on water and land and change biological functions, structure and viability. These impacts may be addressed by narrowing the *right-of-way*, using grated bridge decking where appropriate, or dividing the *roadway* into two with an open segment in between.
- The natural hydraulics of the *watercourse* must be respected and accommodated.
  - Bridge crossings should be sized to accommodate the maximum flood flow.
  - Adequate clearance must be provided between the high-water flood level and the lowest part of the bridge structure, to allow unobstructed passage of debris.
  - The placement of and hydraulic impacts due to bridge abutments should consider existing impediments and recreation river traffic because of the dangers to boaters during different water levels.
  - Bridge abutments, piers and footings should be located outside the bank-full channel. An arched construction that spans the channel may be preferable. For bridge elements located in the flood plain, the orientation and surfaces of the structures should be hydraulically smooth and designed in a manner to allow a gradual contraction of flow from the natural channel and flood plain through the crossing, and expansion of the flow downstream of the crossing.
  - Bridge length should be established to allow proper conveyance of the probable maximum flood flow. The length of the bridge should be increased to eliminate the potential for scour of the abutments and piers, to provide access under the crossing for pedestrian paths, and to preserve wildlife migration corridors and riparian vegetation.
  - The footprint of crossings and their associated facilities should be minimized to reduce impacts or interruptions to natural groundwater flows within the alluvial aquifer.

**Principle 5: Co-operation between multiple jurisdictions based on long term planning and mutual agreement on objectives and uses.**

- Integrate proposed *watercourse* crossings with relevant plans and policies such as local *watershed* management plans (e.g., Bow River, Elbow River, Nose Creek), the Provincial Water for Life Strategy and Land Use Framework, the *Calgary Metropolitan Plan*, and the City's Wetland Conservation Plan.
- Aim to exceed the current minimum requirements established by regulatory agencies, in anticipation of more stringent regulations as our increasing population puts more pressure on shared resources and natural capital.
- Contact agencies responsible for fisheries, terrestrial species, hydraulics, alluvial aquifers, flood plain management, *wetlands* etc. to ensure that all requirements and initiatives will be co-ordinated.

- Pre-screening of locations should include long term goals of multiple jurisdictions (municipal, regional, provincial, federal) to optimize each individual crossing and minimize the number of crossings.

**Principle 6: Effective policies, regulations, guidelines and enforcement.**

Proper planning and design of *watercourse* crossings must be governed and supported by environmentally responsible legislation. Some relevant examples of local regulations, guidelines, policies etc. are listed below:

- The Department of Fisheries and Oceans Canada (DFO) typically requires a site-specific analysis for major *watercourse* crossings, which would, at a minimum, include the following details: fish habitat, hydraulics, timing of the project (for spawning and mitigation), construction activities and sequencing.
- The City of Calgary biophysical components include flora, fauna, terrestrial, avian, amphibians, insects and *hydrology*.
- Alberta's Wetland Policy and Calgary's *Wetland* Conservation Plan include a 'no net loss' principle, with a prioritized approach: avoid, mitigate, compensate.
- The City of Calgary's Wetland Conservation Plan includes a minimum 3:1 replacement ratio on the basis of affected wildlife habitat and other functionalities.

**Principle 7: Public consultation.**

The City should consult the public, impacted communities and businesses on the planning, design and construction of any new river crossings. The consultation process should address the environmental, social, fiscal, safety and mobility impacts of the proposed crossing.

# APPENDIX C – Glossary of terms

**accessibility**

Ease of access/egress to any location by walking, cycling, transit, and private vehicles, or for commercial vehicles.

***active modes***

Non motorized travel, primarily walking and cycling but also includes roller-blading and movements with mobility devices.

***Activity Centre***

All areas defined as Major *Activity Centres*, Community *Activity Centres* or Neighbourhood *Activity Centres* in the MDP, and as shown on the MDP Urban Structure Map.

***asset management program***

A process that guides the gaining of assets, along with their use and disposal in order to make the most of the assets and their potential throughout the life of the assets. While doing this, it also manages and maintains any costs and risks associated with the assets.

***built form***

The engineered surroundings that provide the setting for human activity and includes buildings, *streets* and structures (including infrastructure).

***Bus Rapid Transit* (BRT)**

A type of limited stop bus service that relies on technology to speed up the service. It can operate on exclusive transit ways, high occupancy vehicle lanes and any type of *road* or *street*. A BRT line combines intelligent transportation systems technology, priority for transit, rapid and convenient fare collection and integration with land use policy, in order to upgrade bus system performance substantially.

***Calgary Metropolitan Plan***

A regional plan to guide long-term growth and development for members of the *Calgary Regional Partnership*.

***Calgary Regional Partnership* (CRP)**

An association of municipalities in the Calgary Region – from Crossfield in the north to Nanton in the south, and from Banff in the west, to Wheatland County in the east, with Calgary at its Centre - that are working together to develop an integrated regional land use and transportation plan.

***canopy* cover**

The area covered by tree and forest foliage

***capacity***

The volume of vehicles the *roadway* was designed to carry in a unit of time, such as an hour. Can also be applied to transit or bicycle/pedestrian pathways.

***complete community***

A community that is fully developed and meets the needs of local residents through an entire lifetime. *Complete communities* include a full range of housing, commerce, recreational, institutional and public spaces. A *complete community* provides a physical and social environment where residents and visitors can live, learn, work and play.

***Complete Street***

A *street* that moves people, by foot, bike, bus and car; provides places where people can live, work, shop and play; supports the natural environment; facilitates movement of trucks and service vehicles, and supports our economy.

***congestion***

A condition lasting 15 minutes or longer where travel demand exceeds the design *capacity* of a transportation facility.

***Corridor***

All areas defined as Urban *Corridors* or Neighbourhood *Corridors* in the MDP, and as shown on the MDP Urban Structure Map.

***Crime Prevention Through Environmental Design* (CPTED)**

The proper design and effective use of the built environment, which may lead to a reduction in the fear and incidence of crime and an improvement in quality of life.

***cycle track***

Dedicated space for bicycles built into *street right-of-way*. They are physically separated from both vehicle travel lanes and sidewalks to improve safety and efficiency for all modes of transportation.

***deep utility***

Stormwater, sanitary and water pipes.

***ecosystem***

A dynamic system of plants, animals and other organisms, together with the non-living components of the environment, that functions as an interdependent unit.

***green infrastructure***

An interconnected network of natural green and engineered green elements applicable at multiple scales in the land use and mobility framework. Natural green elements include the conservation and integration of traditional green elements such as trees, *wetlands*, riparian areas and parks. Engineered green elements include systems and technologies designed to mimic ecological functions or to reduce impacts on ecological systems. Examples include **green alleys, green buildings and green *roadways* and bridges**.

***greenhouse gas emissions***

Gases in the atmosphere that absorb and emit radiation within the thermal infrared range.

***hydrology***

The study of the movement, distribution and quality of water throughout the Earth; *hydrology* thus addresses both the hydrologic cycle and water resources.

***impervious surfaces***

Mainly artificial structures, such as building roofs, *roadway* pavements, sidewalks and parking lots, that cannot be easily penetrated by water, thereby resulting in runoff.

***intensification***

The development of a property, site or area at a higher density than currently exists. *Intensification* can be achieved through *redevelopment*, development of vacant/underutilized lots, the conversion of existing buildings, or through infill development in previously developed areas.

***intensity***

A measure of the concentration of people and jobs within a given area calculated by totalling the number of people either living or working in a given area.

***intermodal* facilities**

Places that accommodate connections between transportation modes. Typically refers to break of bulk locations between rail and air and truck.

***life-cycle cost***

The sum of all recurring and one-time (non-recurring) costs over the full life span or a specified period of a good, service, structure or system. It includes purchase price, installation cost, operating costs, maintenance and upgrade costs and remaining (residual or salvage) value at the end of ownership or of its useful life.

***Light Rail Transit* (LRT)**

Electrically powered rail cars, operating in sets of three to five cars per train, operating on protected *rights-of-way*, adjacent to or in the medians of *roadways* or rail *rights-of-way*. Generally at grade, with some sections operating in mixed traffic and/or tunnels or on elevated bridge structures.

***logistics***

The management of the flow of goods, information and other resources, including energy and people, between the point of origin and the point of consumption in order to meet the requirements of consumers.

***Low Impact Development* (LID)**

An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs.

***mixed use* development**

The development of land, a building or a structure with two or more different uses, such as residential, office and retail. Mixed-use can occur vertically within a building, or horizontally on a site.

**Mobility Assessment Plan (MAP)**

Framework for assessing the multi-modal transportation impacts of new developments. Replaces Transportation Impact Assessment (TIA).

***mode split* or *modal split***

The proportion of total person trips using each of the various modes of transportation. The proportion using any one mode is its modal share.

***native biodiversity***

Species of flora and fauna that are indigenous to a specific area.

***park and ride lots***

Parking lots located at LRT stations or bus stops that allow automobile users to park their private vehicles, access and transfer to and from public transportation service in a convenient manner.

***parking facilities***

Any surface used to provide parking for vehicles, whether inside part of or all of a building, or outside either off-*street* or within the *roadway right-of-way*.

***pedestrian-oriented***

An environment designed to make travel on foot convenient, attractive and comfortable for various ages and abilities. Considerations include directness of the route, interest along the route, safety, amount of *street* activity, separation of pedestrians and traffic, *street* furniture, surface material, sidewalk width, prevailing wind direction, intersection treatment, curb cuts, ramps and landscaping.

***Primary Transit threshold***

A minimum *intensity* of people or jobs per gross developable hectare that is required within walking distance of a transit station or stop to support service levels of the Primary Transit Network.

***public realm***

The space between and within buildings that are publicly accessible, including *streets*, squares, parks and open spaces. These areas and settings support or facilitate public life and social interaction.

***redevelopment***

The creation of new units, uses or lots on previously developed land in existing communities.

***right-of-way* (ROW)**

Publicly owned land containing *roads* and *streets* and/or utilities.

***road***

*Roadways* that are designed to move large volumes of vehicular traffic (private vehicles, commercial vehicles and occasionally transit) at higher speeds over long distances.

***roadway***

A generic term that encompasses all types of *roads* and *streets*.

***sense of place***

A strong identity and character that is felt by local inhabitants and visitors. Factors that help to create a "strong *sense of place*" include natural and cultural features, *built form* and architecture, mobility to and within the place and the people who frequent that place. Areas with a good *sense of place* often have elements that are appealing to the five senses (sight, smell, touch, taste, sound) and generally encourage people to linger longer and enjoy the atmosphere.

***shallow utility***

Gas, electrical, telephone and television cable services.

***street***

*Roadways* that are designed to accommodate all modes of transportation (to varying degrees depending on the specific type of *street*). They also contribute to *sense of place*, and typically provide more *streetscape* elements than *roads*.

***streetcars***

Urban rail vehicles operating a low speeds (e.g. 10 to 25 km/h) in mixed traffic, with closely spaced stops (e.g., every 200 metres).

***streetscape***

All the elements that make up the physical environment of a *street* and define its character. This includes paving, trees, lighting, building type, style setback, pedestrian, cycle and transit amenities, *street* furniture, etc.

***sustainability***

Meeting the needs of the present without compromising the ability of future generations to meet their own needs. It includes environmental, economic and social *sustainability*. *Sustainability* is defined by the 11 *Sustainability* Principles for Land Use and Mobility, approved by Calgary City Council on Jan. 8, 2007.

***Transit-oriented Development* (TOD)**

A compact, mixed-use community within walking distance of a transit stop, that mixes residential, retail, office, open space and public uses in a way that makes it convenient to travel on foot or by public transportation instead of by car.

***transit-oriented, transit-friendly* or *transit-supportive***

The elements of urban form and design that make transit more accessible and efficient. These range from land use elements, (e.g., locating higher *intensity* housing and commercial uses along transit routes) to design (e.g., *street* layout that allows efficient bus routing). It also encompasses pedestrian-friendly features, as most transit riders begin and end their rides as pedestrians.

***transit priority measures***

Strategies that improve transit operating speeds and transit travel time reliability in mixed traffic, such as traffic signal priority or queue jumps.

***typology***

*Typology* defines the key geographic areas within the urban boundary that share common characteristics. *Typologies* establish the strategic framework within which more detailed land use designations and policies can be established. Integral to each *typology* and the city as a whole are the "Road and *Street* Palette" and transit services which are integrated with the land use pattern or *typologies*.

***universal design***

*Universal design* is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

***urban forest***

All the trees and associated vegetative understory in the city, including trees and shrubs intentionally planted, naturally occurring or accidentally seeded within the city limits.

***walkable***

See "*pedestrian-oriented*."

***watercourse***

A natural or artificial channel through which water flows.

***watershed***

Include groundwater, springs, *wetlands,* ponds, streams and lakes as well as all land that drains into these linked aquatic systems. *Watersheds* reflect both the natural characteristics of their geography and the impacts of human activities within them.

***wayfinding***

A term used to describe how people respond to the built environment to orient themselves. Elements that contribute to *wayfinding* include reference points such as signage, natural areas or parks, landmark buildings, bridges, distinctive lighting, public art, etc.

***wetlands***

A (Calgary) *wetland* is a waterbody and its bed and shores, that is naturally occurring or disturbed and is located within the Foothills Fescue and Foothills Parkland Natural Regions within the city of Calgary – see *wetland* conservation plan (as per the *Wetland* Conservation Plan).

# APPENDIX D – Transportation maps

Map 1 – Primary Cycling Network

Map 2 – Primary Transit Network

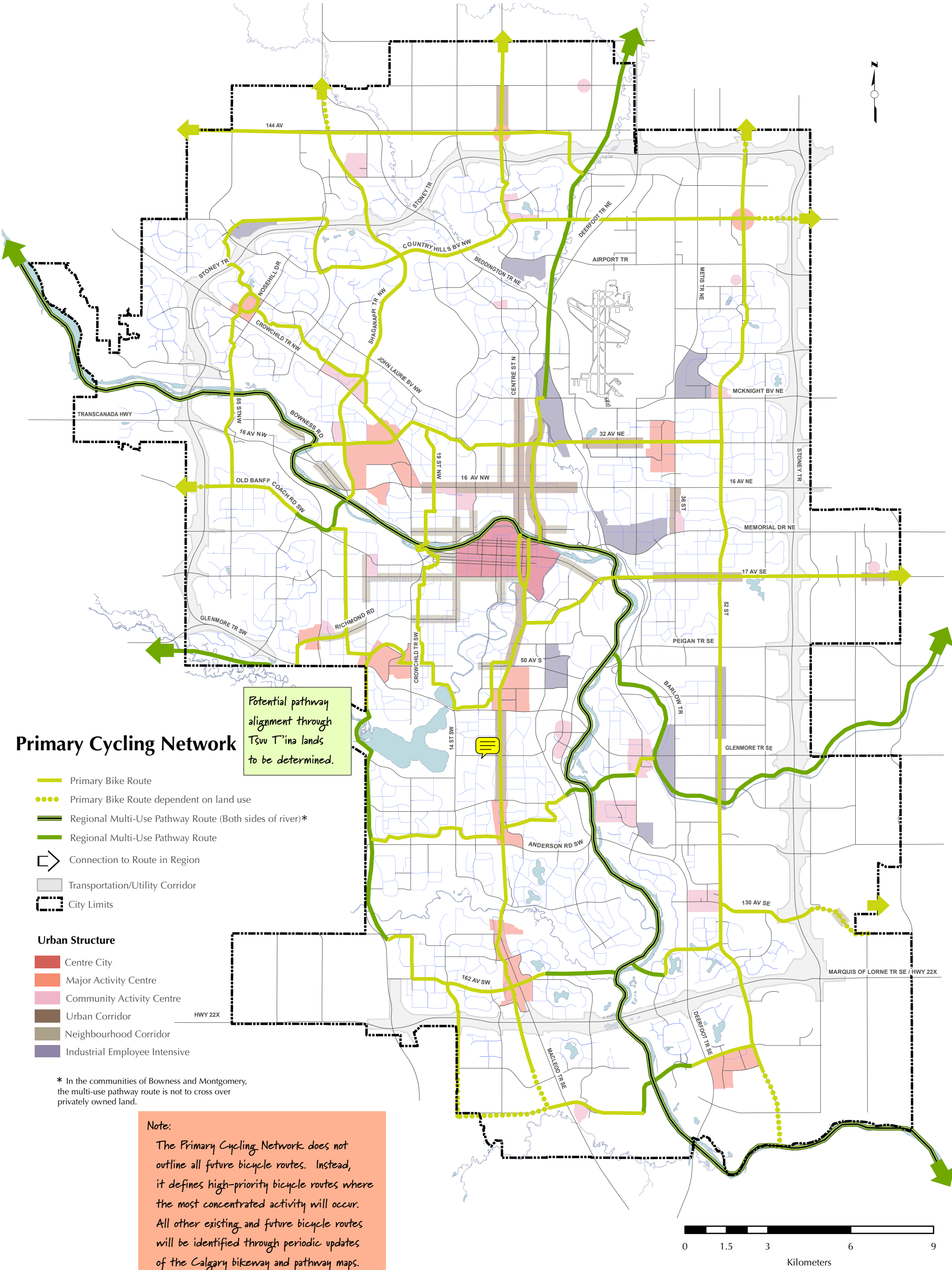
Map 3 – Downtown Transit Network

Map 4 – Regional Transit Concept Map

Map 5 – Primary Goods Movement Network

Map 6 – Primary HOV Network

Map 7 – *Road* and *Street* Network




# Primary Cycling Network

- Primary Bike Route
- Primary Bike Route dependent on land use
- Regional Multi-Use Pathway Route (Both sides of river)*
- Regional Multi-Use Pathway Route
- Connection to Route in Region
- Transportation/Utility Corridor
- City Limits

**Urban Structure**

- Centre City
- Major Activity Centre
- Community Activity Centre
- Urban Corridor
- Neighbourhood Corridor
- Industrial Employee Intensive

* In the communities of Bowness and Montgomery, the multi-use pathway route is not to cross over privately owned land.

Note:

The Primary Cycling Network does not outline all future bicycle routes. Instead, it defines high-priority bicycle routes where the most concentrated activity will occur. All other existing and future bicycle routes will be identified through periodic updates of the Calgary bikeway and pathway maps.

This map represents a conceptual land use structure and transportation networks for the city as a whole. No representation is made herein that a particular site use or City investment, as represented on this map, will be made. Site specific assessments, including environmental contamination, private land ownership, as well as the future financial capacities of the City of Calgary must be considered before any land use or City investment decisions are made.

1

# Primary Cycling Network

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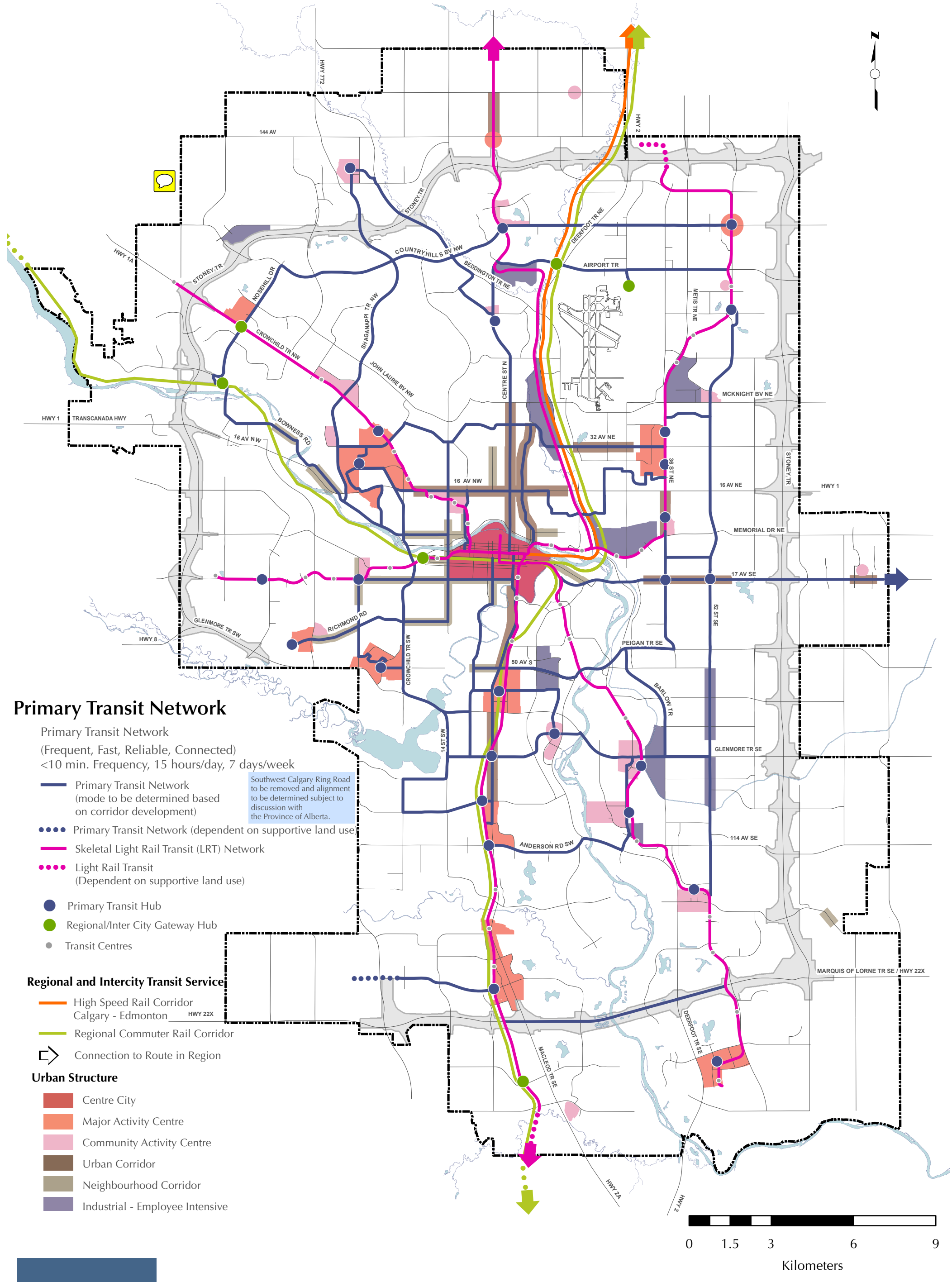


# Primary Transit Network

Primary Transit Network
(Frequent, Fast, Reliable, Connected)
<10 min. Frequency, 15 hours/day, 7 days/week

- Primary Transit Network (mode to be determined based on corridor development)

Southwest Calgary Ring Road to be removed and alignment to be determined subject to discussion with the Province of Alberta.

- Primary Transit Network (dependent on supportive land use)
- Skeletal Light Rail Transit (LRT) Network
- Light Rail Transit (Dependent on supportive land use)
- Primary Transit Hub
- Regional/Inter City Gateway Hub
- Transit Centres

**Regional and Intercity Transit Service**

- High Speed Rail Corridor Calgary - Edmonton (HWY 22X)
- Regional Commuter Rail Corridor
- Connection to Route in Region

**Urban Structure**

- Centre City
- Major Activity Centre
- Community Activity Centre
- Urban Corridor
- Neighbourhood Corridor
- Industrial - Employee Intensive

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2

# Primary Transit Network

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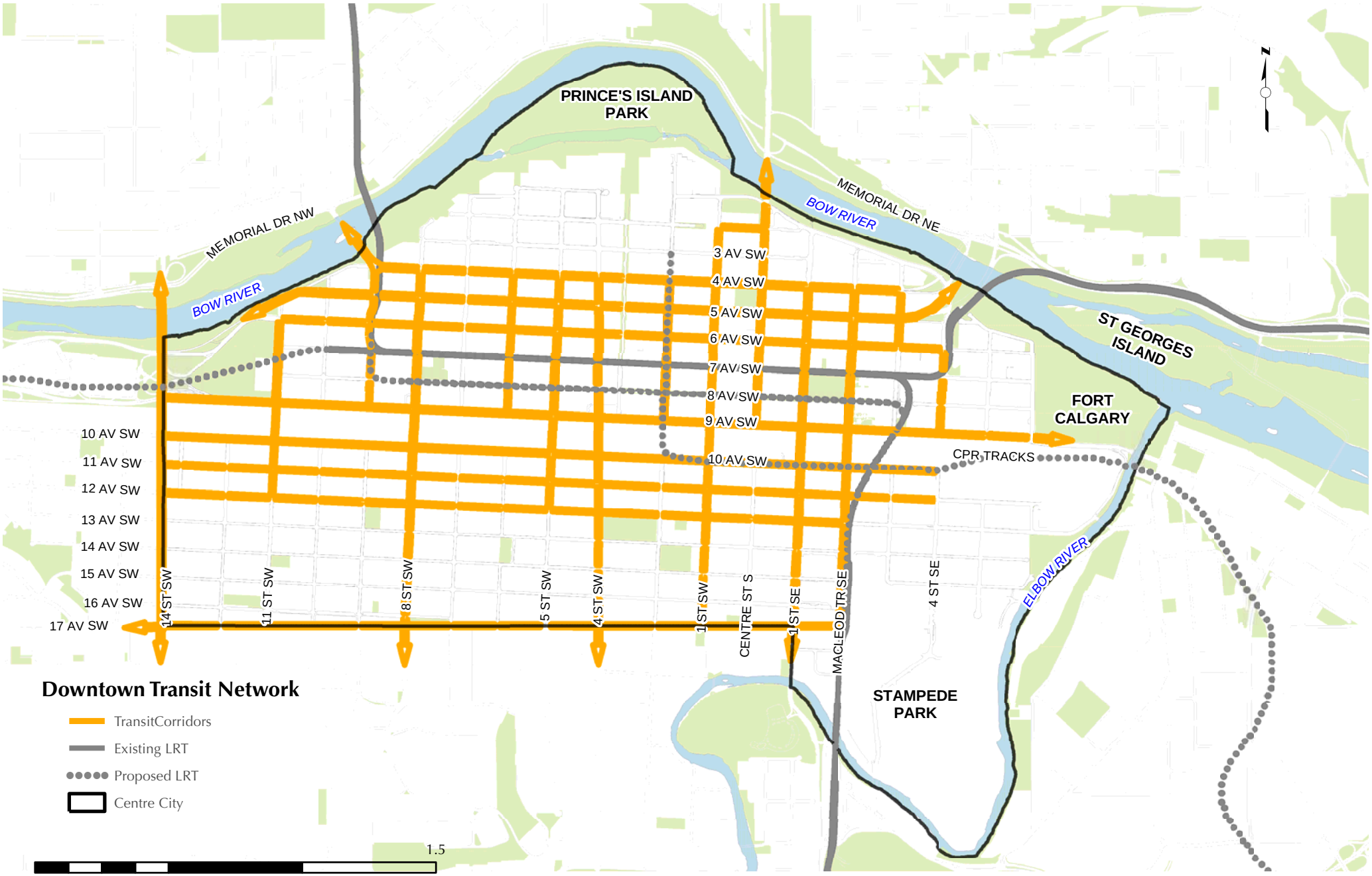


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3

# Downtown Transit Network

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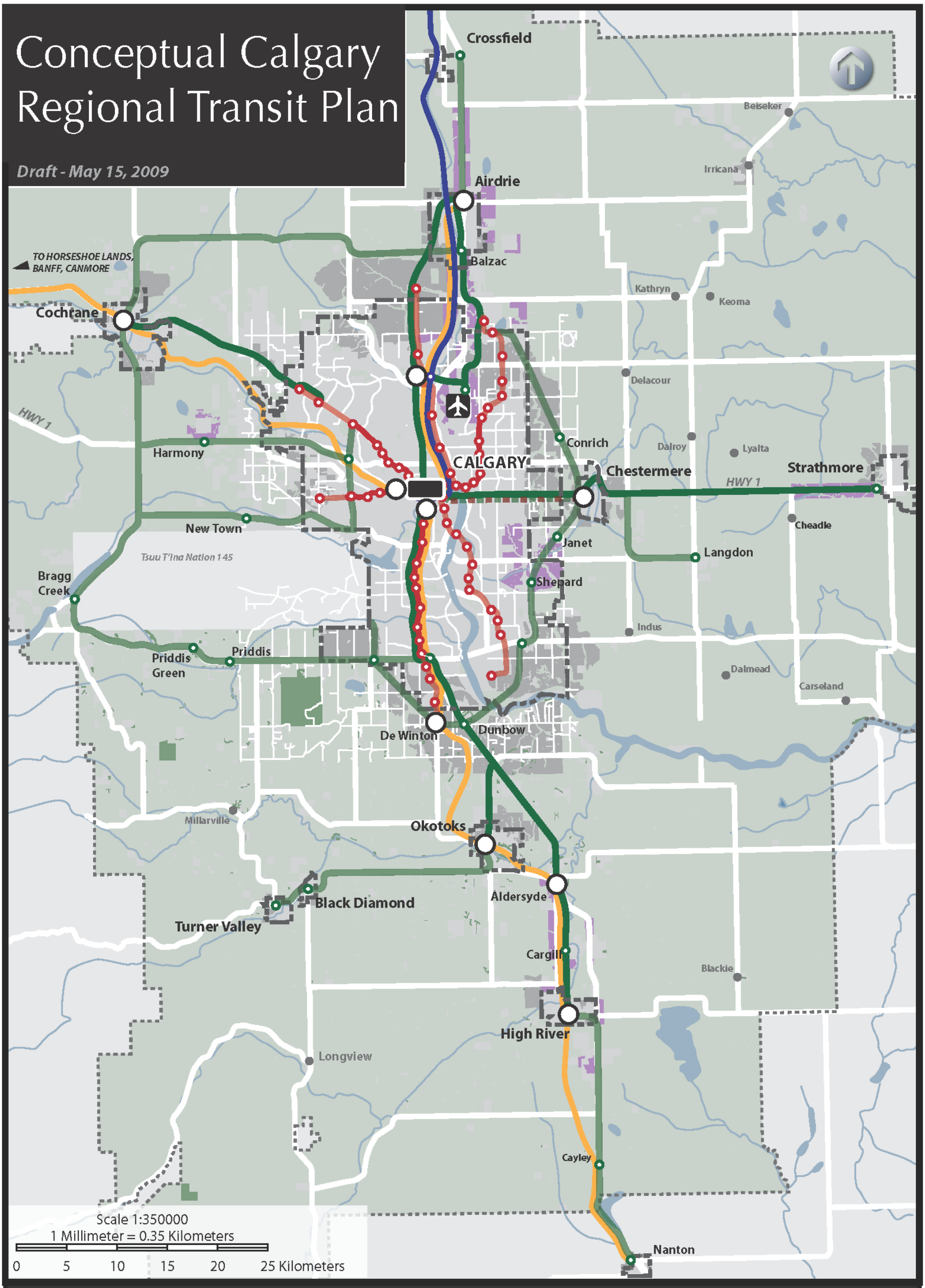
# Conceptual Calgary Regional Transit Plan

*Draft - May 15, 2009*




Existing LRT
Future LRT
Commuter Rail Line
Initial BRT Services
Future BRT or Express Routes
Future Alberta High-Speed Rail
Future BRT or LRT

LRT Station
BRT Station
Future High-Speed Rail Station
Regional / Inter City Gateway Hub
Centre City
Calgary International Airport

Compact Urban Node
Environmental Reserve/ Natural Open Space
Agriculture
Industrial Development

**Stations would be located to optimize connections between modes and catchment areas of population/employment and still maintain travel times and reliability.*

CALGARY REGIONAL PARTNERSHIP | AECOM

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4

# Conceptual Calgary Regional Transit Plan

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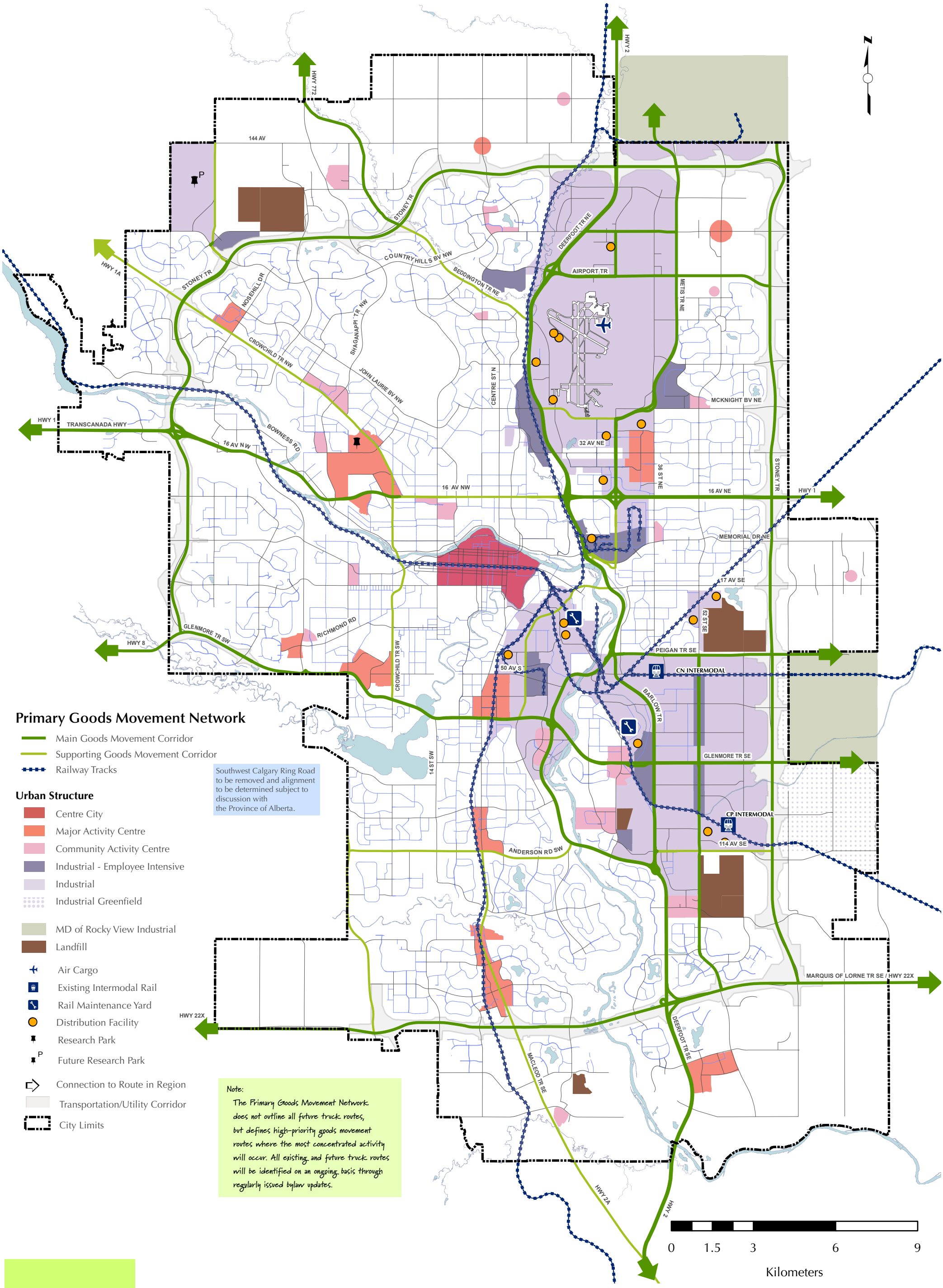


## Primary Goods Movement Network

- Main Goods Movement Corridor
- Supporting Goods Movement Corridor
- Railway Tracks

Southwest Calgary Ring Road to be removed and alignment to be determined subject to discussion with the Province of Alberta.

### Urban Structure

- Centre City
- Major Activity Centre
- Community Activity Centre
- Industrial - Employee Intensive
- Industrial
- Industrial Greenfield
- MD of Rocky View Industrial
- Landfill
- Air Cargo
- Existing Intermodal Rail
- Rail Maintenance Yard
- Distribution Facility
- Research Park
- Future Research Park
- Connection to Route in Region
- Transportation/Utility Corridor
- City Limits

Note:
The Primary Goods Movement Network does not outline all future truck routes, but defines high-priority goods movement routes where the most concentrated activity will occur. All existing and future truck routes will be identified on an ongoing basis through regularly issued bylaw updates.

5

# Primary Goods Movement Network

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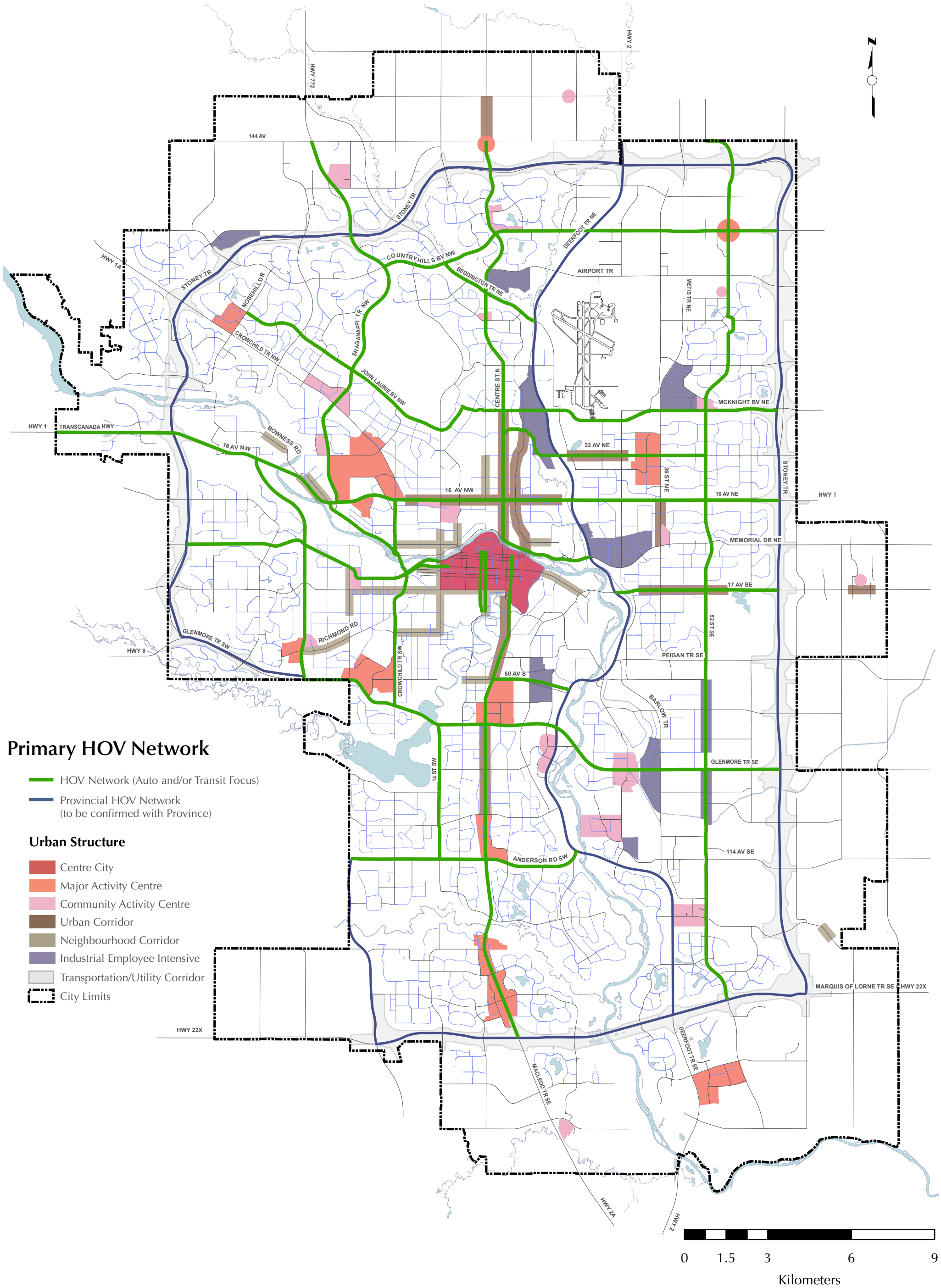


## Primary HOV Network

- HOV Network (Auto and/or Transit Focus)
- Provincial HOV Network (to be confirmed with Province)

### Urban Structure

- Centre City
- Major Activity Centre
- Community Activity Centre
- Urban Corridor
- Neighbourhood Corridor
- Industrial Employee Intensive
- Transportation/Utility Corridor
- City Limits

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6

# Primary HOV Network

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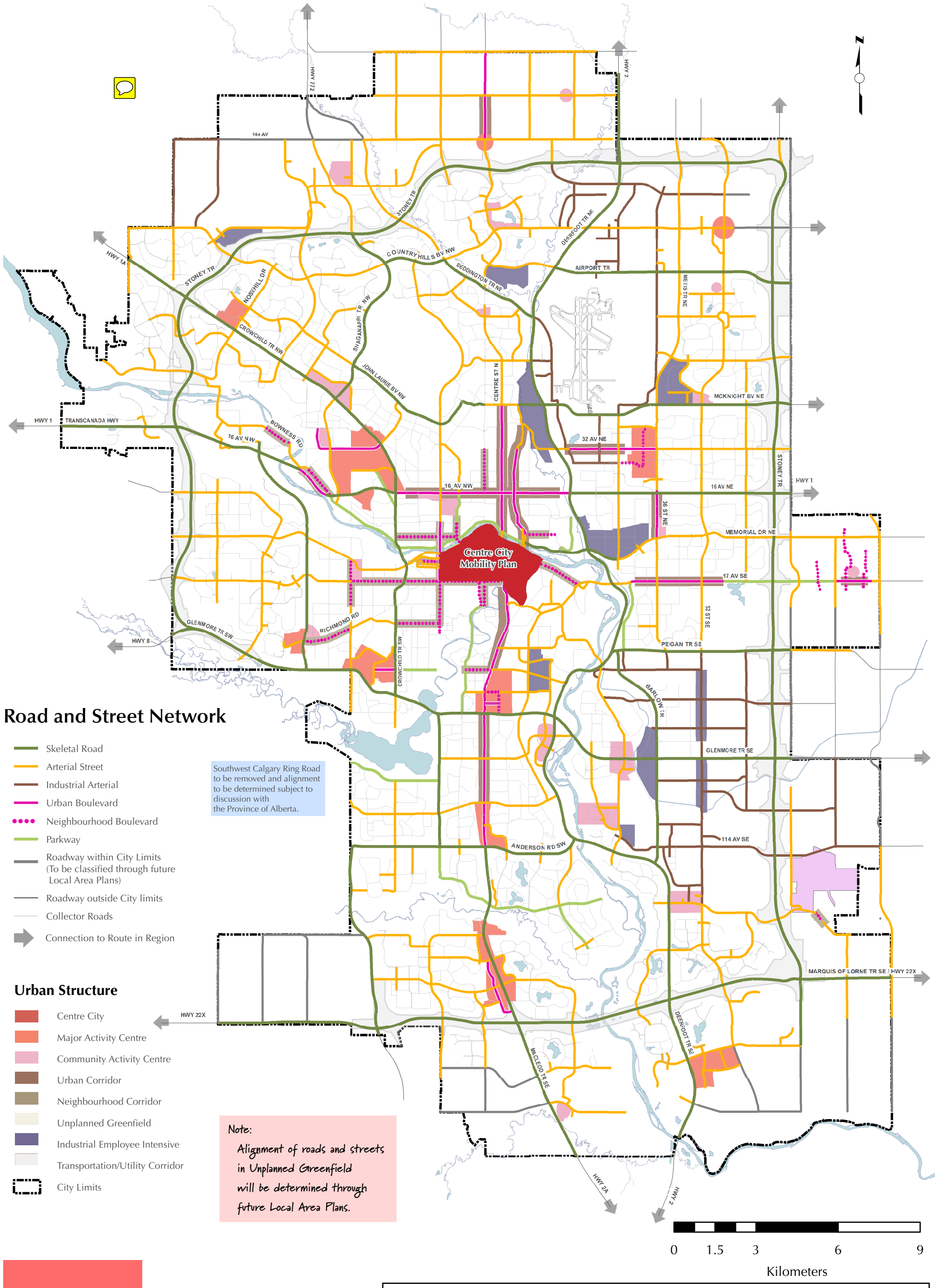


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7

# Road and Street Network

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