Capital Region High Occupancy Vehicle / Transit Priority Study
An Edmonton Metropolitan Region Intermunicipal Transportation Study

Capital Region Board

September 2016
# Table of Contents

Letter of Transmittal
Signed Certification
Executive Summary

## Executive Summary

1. Introduction .................................................................................................................. 10
   1.1 Study Background ................................................................................................... 10
   1.2 Intermunicipal Transit Network Plan (ITNP) ......................................................... 10
   1.3 Integrated Regional Transportation Master Plan (IRTMP) .................................... 11
   1.4 IRTMP Prioritization Update .................................................................................. 12
   1.5 LRT Plans .............................................................................................................. 13
   1.6 Stakeholder Consultation ....................................................................................... 14

2. HOV and TPM Definitions .......................................................................................... 15
   2.1 High Occupancy Vehicle (HOV) Systems ............................................................. 15
   2.2 Transit Priority Measures (TPMs) ......................................................................... 17

3. Overview of HOV and TPMs ...................................................................................... 19

4. Environmental Scan .................................................................................................... 40
   4.1 Vancouver / Lower Mainland .............................................................................. 40
   4.2 Ottawa / Gatineau (National Capital Region) ....................................................... 42
   4.3 Seattle / Tacoma .................................................................................................... 45
   4.4 San Jose / Santa Clara .......................................................................................... 47
   4.5 Minneapolis / St. Paul .......................................................................................... 50
   4.6 Greater Toronto ..................................................................................................... 52
   4.7 Summary of Environmental Scan ......................................................................... 52

5. Evaluation Framework ............................................................................................... 55
   5.1 Background ............................................................................................................ 55
   5.2 Best Practices in Evaluation and Prioritization ..................................................... 55
       5.2.1 CRB IRTMP Prioritization Review ................................................................ 56
       5.2.2 Brisbane (Australia) HOV Network Study ..................................................... 57
       5.2.3 Snohomish County (WA) Community Transit Arterial System HOV Study .. 59
       5.2.4 Los Angeles County HOV System Integration Plan ..................................... 60
       5.2.5 Operational Design Guidelines for HOV Lanes on Ontario Freeways ......... 60
   5.3 Recommended Evaluation Framework .................................................................. 61
6. **Corridor HOV / TPM Opportunities** .......................................................... 64
   6.1 Study Corridors ......................................................................................... 64
   6.2 Summary of Corridor Information ............................................................ 66
   6.3 Conceptual Alternatives .......................................................................... 69
   6.3.1 Highway 2 (QE2 Highway) ................................................................. 69
   6.3.2 Baseline Road / 98 Avenue ................................................................. 69
   6.3.3 Wye Road / Sherwood Park Freeway .................................................. 71
   6.3.4 Highway 15 ......................................................................................... 71
   6.3.5 Highway 28 / 97 Street NW ................................................................. 72
   6.3.6 Highway 16 and 16A (West) ................................................................. 73
   6.3.7 Highway 16 (East) ............................................................................. 74
   6.4 Evaluation of Alternatives ...................................................................... 74

7. **Recommendations** .................................................................................. 78
   7.1 Conclusions re: HOV / TPM in Capital Region ...................................... 78
   7.2 Summary of Corridor Recommendations .............................................. 80
   7.3 Pilot Project ............................................................................................ 82

Appendices

Appendix A: Stakeholder Consultation
Appendix B: Case Study Background Information
Appendix C: Corridor Information
Appendix D: Traffic Observations
Executive Summary

Study Background

The HOV / Transit Priority Study follows directly from the Capital Region Growth Plan (CRGP) and its component Intermunicipal Transit Network Plan (ITNP), in which transit priority measures were identified as potentially useful and cost-effective tools to expedite and optimize transit service operations in the Edmonton area. The ITNP highlighted transit-friendly features such as bus lanes, high occupancy vehicle (HOV) lanes, bus-on-shoulder operations, dedicated bus ramps to highways, transit priority signals, transit queue jumps, bus priority access to Park & Ride lots, and transit exchanges.

Subsequently, the Integrated Regional Transportation Master Plan (IRTMP) established policies and priorities which served to support the ITNP’s focus on transit priority. The purpose of this study is to strengthen the knowledge base amongst Regional stakeholders to allow the interest in HOV and Transit Priority Measures (TPMs) to move ahead with confidence. Specifically, the study is to:

- Define HOV and TPMs as they apply to the Capital Region and in accordance with state-of-the-art practices;
- Create a “menu” of HOV and transit priority strategies and types;
- Create an evaluation framework for consideration of such HOV/TPMs in the Capital Region based on relevant experience from analogous North American centres;
- Apply the evaluation process to previously-identified or new priority corridors;
- Prepare recommendations and conclusions as to the feasibility and merits of HOV/TPMs in the Capital Region context, and identify an appropriate pilot project corridor; and
- Engage key stakeholders in governments and transit service providers in the study process.

Stakeholder Engagement

The study built on the collaborative structure of the Capital Region Board (CRB) and the contacts with relevant agencies and stakeholders, to ensure that a broad array of views were heard and that stakeholders could understand the implications of the study to their own organizations. This was done through several mechanisms:

- review of comments and input provided by stakeholders to precedent CRB studies and reports
- telephone interviews with two dozen senior transportation and planning staff, elected officials, transit operators, and CRB Transit Committee members
- Presentations to and open discussion with the CRB Transit Committee
- Workshop with Transit Committee and selected guests

Menu of HOV and TPM Options

For the Edmonton Region, the recommended definition of “HOV” and hence “High Occupancy Vehicle Facility” is:

- HOV facilities are transportation infrastructure (lanes, roads, ramps, links, parking spaces, traffic signals) restricted to use by motor vehicles carrying at least a specified minimum number of occupants; this includes buses of all types
The recommended definition of “TPM” and hence “Transit Priority Infrastructure” is:
- TPM facilities are transportation infrastructure (lanes, roads, ramps, links, traffic signals) restricted to use by authorized transit vehicles

The menu of HOV and TPM options is vast, with worldwide examples of almost every conceivable type of application. Edmonton itself has several TPMs in use already, although there are no HOV facilities in the region. The study considers the applicability of a set of basic priority measures to the Edmonton Region major road network (with consideration given to the type of corridor – freeway, high-standard arterial, urban arterial, or spot treatment):

- Bus-Only Lane
- Bus-Only Shoulder
- Bus-Only Ramp
- Transit Queue Jump
- Transit Signal Priority
- HOV Lane
- HOV-Only Ramp
- HOV Queue Jump

The study documents typical planning principles, design features, and examples of operational use, to ground the concepts as considered in this study in a practical, realistic sense.

**Best Practices**

To help set the context for the CRB’s consideration of HOV and TPM opportunities, several projects and programs elsewhere in North America can be cited as relevant. In looking at similar-sized urban areas with a long record of operating a variety of HOV and TPM types on standalone high-standard arterial or expressway corridors, the following stand out:

- **Vancouver / Lower Mainland:**
  Diverse set of design solutions implemented on a corridor-by-corridor basis including transit queue jumps at constrained water crossing locations and using a busway as transition to elevated transit rail line

- **Ottawa / Gatineau:**
  Regional commitment to overarching bus-based rapid transit leading to high transit mode share using excellent bus-on-shoulder facilities, commuter lot integration with transit services, and other transit priority measures

- **Seattle / Tacoma:**
  Comprehensive, region-wide, multijurisdictional transportation investment strategy has created a rich and diverse system that offers multiple transit and auto options to most travellers

- **San Jose / Santa Clara:**
  Bus volumes were not high enough to warrant bus-only lanes; however when HOV lanes were implemented instead they were designed to support bus operations give buses an advantage that way
- Minneapolis / St. Paul:
  Creation of an interagency task force with the specific mandate of expediting bus movement on all highways in the region with a funding commitment allowed bus-on-shoulder to quickly become an established

- Greater Toronto:
  A diverse mix of measures implemented and planned are not supported by an effective multijurisdictional planning and operational framework

These are not the only locations which can provide insight to the Edmonton area, but they do illustrate the full range of operational conditions and will suffice in that regard.

**Study Corridor Characteristics**

Ten-year priority corridors for transit priority from the IRTMP (Sept. 2011) are highlighted in the following map. The segments that are subject to the current HOV/Transit Priority Study are:

- Highway 2 (QE2 Highway) from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW
- Baseline Road / 98 Avenue from Highway 21 to 85 St NW
- Wye Road / Sherwood Park Freeway from Highway 21 to 83 St NW
- Highway 15 from Fort Saskatchewan to Clareview LRT Station (137 Ave NW)
- Highway 28 / 97 St NW from Township Road 544 to 118 Ave NW
- Highway 16 and 16A
  - West from Stony Plain (Highway 779) to 97 St NW
  - East from Highway 21 to 97 St NW
**HOV / TPM Opportunities and Evaluation**

A range of conceptual HOV / TPM opportunities were identified along the study corridors. The corridors with more urban configurations tended to have more potential for localized improvements such as queue jumps and transit signal priorities. Suburban corridors with multiple lanes provided the opportunity for HOV or reserved bus lanes. Opportunities for Park & Ride facilities were identified at locations that supported commuter bus routes.

Each of the HOV/TMP opportunities was evaluated based on the following criteria:
- Travel Time Savings
- Person Throughput
- Bus operations
- Impact on Traffic Operations
- Strategic Planning
- Usage / Enforceability
- Cost Effectiveness

**Conclusions**

This study is intended to help demonstrate the merit of HOV and TPMs within a multimodal regional transportation context, and highlight the ways in which a variety of physical and operational treatments in specific corridors can work with bus operations, employer-based Transportation Demand Management initiatives, and governmental policy directions to promote and support the most efficient and effective use of limited transportation infrastructure. Government authorities are encouraged to continue to work to embed such thinking in official planning documents and practices.

**HOV / TPM in the Bigger Picture**

In terms of the overall impact on transit use, mode choice, and economic competitiveness of implementing HOV / TPMs in selected intermunicipal corridors, the numbers suggest a minor-to-moderate positive impact. Simply put, the number of people using these particular corridors during peak periods as a proportion of the entire Edmonton Region multimodal transportation demand is relatively small, and the fraction of those corridor users who will be affected by and benefit from the suggested measures is also a minority. Although current transit riders and carpoolers would benefit from minor improvements in their commute time, the investment in priority measures will not change their already-established mode choice; it is primarily aimed at attracting today's auto users and shaping the travel habits of a generation of future commuters.

Governmental investment in road infrastructure to date has also kept reasonable pace with demand, such that the Edmonton region does not face crippling large-scale congestion problems. Certainly, some corridors and locations experience traffic delays during peak periods, and this affects cars, buses, and carpools equally. But the recent economic downturn actually creates an opportunity to implement HOV / TPMs with less disruption than during busier periods of the recent past, and history demonstrates that the region will indeed become more congested as the recovery continues.

**A Commitment**

In this context, investment in HOV / TPM to support intermunicipal transit in the Edmonton Region may be seen as an entirely reasonable thing to do, to increase system operational flexibility, to increase the capacity of constrained corridors to carry people under changing and evolving circumstances for years to come, to undo the fixed tie between “traffic” demand and road capacity, to target investments in areas that will benefit the most people, and to point to where trends in other aspects of society are already going. If a commitment to further investment in HOV /
TPM is not made at this time, opportunities will be missed (e.g. widening roads for general traffic purposes rather than HOV) and the ultimate need to shift towards more transit and private rideshare use (per the Regional Plan) will not go away – it will just become more difficult to achieve as corridors become more physically constrained, as general traffic demand grows, and one more generation enters the commuting world with an assumption that driving alone is the default.

Pilot Project – Corridor Recommendations

Recommendations were made for each of the corridors evaluated. These ranged from simple bus queue jumps to conversion of lanes to HOV 2+ lanes and providing new Park & Ride lots. It is recognized that all of the proposed initiatives will require additional planning, design, and operational study, along with institutional and stakeholder buy-in. These are intended to be relatively simple, low-cost, near-term, achievable projects that can set the table for future more extensive interventions. It is assumed that basic day-to-day initiatives such as signal timing coordination, transit signal priority, effective signage and geometric design will continue to be carried out by the appropriate authorities.

Of the six corridors in the study area, Highway 2 (QE2) is the strongest candidate for a pilot project based on the following factors:

- Stakeholders indicated that this corridor is deserving of HOV / transit priority treatment owing to its connection to Edmonton International Airport.
- Although the industrial / commercial park at Nisku has lost jobs in recent years, communities along the corridor in southern Edmonton and Leduc County are projected to add significant population and employment over the next decade.
- The existing highway lends itself well to median-lane HOV conversion.
- The corridor sees traffic at all times of day and a fair bit of reverse commuting. Reviewing Park & Ride lot opportunities and developing Park & Ride lot operation at both ends of the corridor would facilitate transit use in ways that are impossible now.
- The effect of travel time savings for buses, carpools, and airport-related vehicles could serve as a template for building HOV and transit demand in other corridors around the region.
- The scale of the project is large enough to establish some visibility for HOV within the Capital Region, to build support for similar initiatives elsewhere in the Region.
- The project has relatively low capital cost and little risk; if HOV lanes prove to be a problem, they can be managed through tweaking eligibility criteria and hours of operation, and if necessary can revert to general traffic use.
- Previous high levels of congestion on Highway 2 have dissipated with recent economic conditions; the current era presents a unique opportunity to implement low-cost converted HOV lanes without significantly impacting existing (lower-volume) traffic while being in a position to function well if/when demand returns in the future.
- An HOV facility would reach every potential market segment (scheduled public transit, reverse commuting, park & ride users, rural-to-city commuters, private carpooling, private shuttle bus and taxi services) and provide a rich situation for performance monitoring and analysis, as input to future HOV / TPM initiatives in the region.

Alberta Transportation, as the agency responsible for Highway 2, will be the key stakeholder in this initiative. The concept needs additional more detailed study to move towards implementation.

In addition to the Highway 2 initiative, this study highlights the potential role Park & Ride lots can play when strategically located in high-volume corridors, by providing a focus for intercepting external trips, facilitating private ridesharing, and supporting intermunicipal transit use. All of these results help build transit / HOV support in a
corridor, even prior to or in the absence of dedicated linear facilities. In many cases, informal Park & Ride lots are already on the ground. Accordingly, it is recommended that a Park & Ride lot strategy be developed and pilot projects selected within that; each of the corridors highlighted in this study demonstrate opportunities for such lots.
1. Introduction

1.1 Study Background

The HOV / Transit Priority Study follows directly from the Capital Region Growth Plan (CRGP) and its component Intermunicipal Transit Network Plan (ITNP), in which transit priority measures were identified as potentially useful and cost-effective tools to expedite and optimize transit service operations in the Edmonton area. The ITNP highlighted transit-friendly features such as bus lanes, high occupancy vehicle (HOV) lanes, bus-on-shoulder operations, dedicated bus ramps to highways, transit priority signals, transit queue jumps, bus priority access to Park & Ride lots, and transit exchanges.

Subsequently, the Integrated Regional Transportation Master Plan (IRTMP) established policies and priorities which served to support the ITNP’s focus on transit priority. However, this work has become stalled in the absence of a common vocabulary and understanding of what HOV and transit priority measures (TPMs) are, how they can be used, their costs and benefits, and where they might be applicable to the Capital Region. The purpose of this study, therefore, is to strengthen the knowledge base amongst Regional stakeholders to allow the interest in HOV and TPMs to move ahead with confidence. Specifically, the study is to:

- Define HOV and TPMs as they apply to the Capital Region and in accordance with state-of-the-art practices;
- Create a “menu” of HOV and transit priority strategies and types;
- Create an evaluation framework for consideration of such HOV/TPMs in the Capital Region based on relevant experience from analogous North American centres;
- Apply the evaluation process to previously-identified or new priority corridors;
- Prepare recommendations and conclusions as to the feasibility and merits of HOV/TPMs in the Capital Region context, and identify an appropriate pilot project corridor; and
- Engage key stakeholders in governments and transit service providers in the study process.

This report documents all of the above and serves as the final report for this study.

The study was undertaken by AECOM Canada Ltd. staff under the Project Management and technical direction of Stephen Schijns, P. Eng., reporting to Neal Sarnecki, Manager of Regional Projects for the Capital Region Board (CRB).

1.2 Intermunicipal Transit Network Plan (ITNP)

The CRB was established in 2008 and one of its first tasks was to develop and implement a Growth Plan, incorporating a public transit network, for the Capital Region. The ITNP, published in 2009, established the Regional Transit Plan. Among its guiding principles were several that are directly relevant to the current study, such as:

- Provide non-stop or limited-stop intermunicipal bus service;
• Provide TPMs on provincial highways and interchanges;
• Provide TPMs, where needed, on intermunicipal bus corridors within municipalities; and
• Avoid roadway investments that compete with transit.

The ITNP went on to note that “identify(ing) and implement(ing), where appropriate, specific TPMs along intermunicipal corridors” was among the initiatives and projects that the Regional Transit Committee could consider as “quick wins”.

While the ITNP focused on transit service and did not assess capital investments on roads and highways, it did recognize that potential value lay in the use of such improvements to leverage the benefits of the Transit Plan. As examples of such investments, the following TPMs were noted:

• Bus / HOV lanes
• Bus-on-Shoulder operation
• Bus-only ramps and accesses (e.g. at Park & Ride facilities)
• Transit queue jumps at signals
• Transit Signal Priority (TSP)

It was noted that highway planning and design standards would need to be revised to accommodate a wide variety of transit-friendly features on intermunicipal highways and roadways.

The Performance Objective most affected by the TPM concept is Reliability and Speed, as measured by a minimum 85 percent on-time departures and arrivals rate, and maintaining or improving operating speed. Using TPMs is seen as a method to counteract the effects of population and congestion growth over time.

1.3 Integrated Regional Transportation Master Plan (IRTMP)

The IRTMP, published in 2011, built on the ITNP in terms of establishing Principles and Policies that support HOV and TPM implementation, within the broader context of a Master Plan. For example, under Section 3.2, *Increased Transportation Choices*, the principle that “The region’s transportation system shall develop and strengthen transit facilities and services to provide a viable alternative to private automobile travel” is strengthened by the following policies:

• The region’s transportation system will support and enable a significantly stronger role for public transit in the form of bus services, Light Rail Transit expansion and support facilities such as Park & Ride facilities and transit centres.
• The region’s roadway system should include a variety of transit supportive measures such as designated transit lanes, high-occupancy vehicle (HOV) lanes, bus on shoulder operations, transit queue jumps and other transit priority systems.
• Planning for inclusion of transit facilities on regional roadways should become standard practice by CRB member municipalities and the Provincial government.

The IRTMP discusses transit priority on regional roads, noting that “convenient and effective mobility by public transit requires that transit service be competitive with its main rival, the private automobile... In the case of bus service, it is important to provide surface bus operations with facilities on roadways that ensure that transit service can operate in a manner that is unimpeded by roadway congestion or collision events... In order to maintain the
ability of bus services to travel to their destinations efficiently on regional corridors, a number of these corridors have been designated as ‘Transit Priority’ corridors which should be supplemented with transit priority features as, when, and where appropriate.”

Transit priority corridors are defined in Figure 5 of the IRTMP, as illustrated below:

In the IRTMP’s Ten-Year Priority listing, the following corridors were highlighted for transit priority:

- Queen Elizabeth Highway (QE2) from 65 Avenue in Leduc to Ellerslie Road SW
- Baseline Road / 101 Avenue NW / Terrace Road NW / 98 Avenue NW
- Wye Road / Sherwood Park Freeway / 82 Avenue NW (Whyte Avenue)

These corridors are among those investigated in greater detail in the current study.

1.4 IRTMP Prioritization Update

The IRTMP’s programs and project priorities were reviewed and updated by the CRB in 2015, with a focus on shorter-term opportunities to begin implementing important initiatives. A rigorous multi-factor analysis and evaluation process was used to screen and prioritize all of the initiatives on the table.
Among the numerous physical and capital projects reviewed, the current HOV/TPM study was the highest-ranked initiative, for the reasons that “congested highway sections impede transit effectiveness and reliability; Capital Region Growth Plan (CRGP) mode shift policy implementation”.

This point reiterated the policy support for this study and recognition of its value, as has been stated by the CRB almost since its initiation in 2008. Consequently, funding was allocated by the CRB and the current study was initiated in late 2015.

1.5 LRT Plans

The backbone of mass transit in Edmonton is the existing and planned Light Rail Transit (LRT) system. The existing segments of the Capital Line (Clareview to Century Park) and Metro Line (NAIT to Century Park) are to be added to substantially in the coming years, per the City of Edmonton’s plans (below).
1.6 Stakeholder Consultation

This study incorporated a broad stakeholder consultation process, detailed in Appendix A and summarized here. Stakeholders representing provincial and municipal governments, transit authorities, and elected offices with an interest in transportation in the Capital Region were engaged through phone interviews. Several interviewees joined the CRB Transit Committee for a workshop dealing with the subject in greater depth. Information on the HOV and transit priority was provided prior to the interviews and at the workshop to elicit input from the stakeholders.

The following summarizes recurring themes that emerged from conversations with stakeholders. Detailed summaries of individual comments are provided in Appendix A.2.

General

a. There was a consensus that the region is growing, but transit and road construction is lagging behind this growth. Every stakeholder acknowledged the need to address transportation problems now.

b. Very little push-back on the suitability of the corridors selected for review in the study, although several stakeholders were surprised that Highway 2 between St. Albert and Edmonton was not included. Whitemud Road was also mentioned as a candidate for study.

c. Consensus that HOV / transit lanes are a good idea, but preferably if roadways have three lanes in each direction.

d. Most stakeholders looked favourably on transit priority measures, but cautioned to use queue jumps and transit priority signals sparingly, as they can negatively affect cross-street traffic.

e. The main barrier to implementing TPMs on these corridors is not so much resistance on the part of engineers and planners, but lack of funding and sometimes wavering political support.

f. CRB should look at long-range LRT plans and future travel demand before making recommendations about HOV and transit priority.

g. Many stakeholders reported a need for more park & ride lots that eclipses the need for HOV or TPMs.

Considerable additional input was provided on corridor-specific issues, opportunities, and alternatives. This input is reflected in the corridor discussions in Section 5 below.
2. HOV and TPM Definitions

2.1 High Occupancy Vehicle (HOV) Systems

The basic principle of HOV lanes is to create transportation facilities in which a preferred travel mode (i.e. multi-occupant vehicles such as buses and carpools) is granted priority (in terms of speed and reliability) over less-preferred modes (i.e. single-occupant vehicles). This is intended to increase the person-carrying capacity of roadways during peak periods as well as to influence travel choices and result in a shift towards more efficient modes of travel.

In the CRGP and the ITNP, “HOV Lanes” are defined as “Exclusive traffic lanes designed for vehicles that carry a prescribed minimum number of passengers (2 to 3)”. To be more precise, we note that the definition should refer to vehicle occupants, rather than passengers (who may be taken to be additional to, rather than inclusive of, the vehicle’s driver).

While this is a functional definition, in practice, the permitted uses of HOV lanes can vary according to local direction, policy, and traffic by-laws:

- Many HOV lanes operate part time (e.g. peak periods only) rather than full time (24 hours per day); the lane would then be available to general traffic or parking during non-HOV periods.
- Some HOV lanes permit non-HOV use, such as single-occupant taxis or motorcycles.
- Most HOV lanes can be used by emergency vehicles (police, fire, ambulance) without restriction.
- HOV facilities may be used to encourage use of other vehicle types, such as electric or hybrid powered vehicles, regardless of occupancy.
- Buses are generally permitted to use an HOV lane regardless of occupancy, although this may be restricted to authorized public transit, rather than including private shuttles, school buses, etc.
- On curbside arterial HOV lanes, bicycles are permitted in the lane (since their requirement to travel adjacent to the curb trumps any occupancy restriction on that lane).
- Curbside arterial HOV lanes normally permit right-turning vehicles (regardless of occupancy) to use the lane within a defined distance of a driveway or intersection.
- HOV facilities occupancy thresholds may vary by time of day, in order to manage lane usage – i.e. HOV 3+ during the peak hour peak direction, and HOV 2+ at other times.
- “High Occupancy Toll” or HOT lanes allow toll-paying non-HOVs to use spare capacity in the HOV lane (alternatively, HOVs can use a toll facility at a free or discounted rate).

These rules are a mix of practical (e.g. right-turn access to/from cross streets) and political (e.g. policy support for electric vehicles), resulting in operating rules that are specific to each jurisdiction. The rules should be consistent and coordinated within that jurisdiction.
The rules for a particular facility are conveyed to users by way of overhead signs, roadside signs, and pavement markings, and must be backstopped by a robust legal framework and commitment to enforcement. HOV facilities may take a variety of forms, as outlined in Section 3.

HOV lanes are only part of an “HOV System”, which may combine other facilities (e.g. Park & Ride lots, carpool parking lots, HOV-only ramps and connections, queue jump lanes), programs (e.g. employer-based rideshare incentives, preferential parking spaces for carpools, parking fee or toll price discounts for HOVs, etc.), and policies (developing an interconnected network of HOV lanes) to create a region-wide approach to managing travel mode choice.

An HOV lane on a particular corridor, in and of itself, may be limited in its ability to impact a significant proportion of a region’s travel patterns. A common rule of thumb is that a 5-minute travel time savings or benefit is the minimum required for an HOV lane to begin to influence mode choice (i.e. to incentivize single-occupant motorists to shift to buses or carpools). In other words, a single queue jump may help bus operators stay on schedule and will be appreciated by passengers, but it is unlikely to trigger drivers to shift to bus use. On the other hand, a series of queue jumps along the length of a corridor or a lane that allows buses to bypass 10 or 15 minutes of congested general traffic lanes will be effective at attracting new riders. A network of connected HOV lanes that stretches across a city will be more effective than an isolated road or corridor that serves only one part of a commuting journey.

**Recommendation for CRB:** Based on international best practice and the application of HOV principles to the Edmonton Metropolitan Region’s transportation system, the recommended definition of “HOV” and hence “HOV Facility” is as follows:

- HOV facilities are transportation infrastructure (lanes, roads, ramps, links, parking spaces, traffic signals) restricted to use by motor vehicles carrying at least a specified minimum number of occupants
  - In the Edmonton Metropolitan Region, the basic number of occupants shall be two; this may be adjusted on a case- or site-specific basis to three or more for operational reasons

- HOV facilities will have an appropriate time restriction on their use by HOVs.
  - Time restrictions will be on a case- or site-specific basis, and will generally either be Monday to Friday during peak periods (specific hours are subject to local conditions) or 24 hours per day, 7 days per week.

- Non-HOVs shall be permitted to use HOV facilities if and as directed by legislation, which is to address the following:
  - Emergency Vehicles will be permitted to use HOV facilities while on duty, regardless of the number of vehicle occupants.
  - Public and private buses of all types will be permitted to use HOV facilities, regardless of the number of bus occupants.
  - Taxis, motorcycles, electric vehicles, and other special vehicle types will not be categorized separately from general HOVs; they must have the eligible number of occupants while in the HOV facilities.
  - Motor vehicles that need to enter or cross an HOV facility in order to turn or connect from one road or driveway to another, will be permitted to use the HOV facility to do so regardless of the number of vehicle occupants, as long as the movement is done in a safe manner and as expeditiously as possible.
  - Bicycles will be permitted to use arterial road curb lanes, regardless of HOV designation.

Where HOV facilities connect with or relate to one another, every effort should be made to apply consistent rules to each (subject to operational or safety constraints).
2.2 Transit Priority Measures (TPMs)

From the CRGP glossary:

- **Transit Priority Measures (TPMs)** are measures taken to reduce the travel time by buses and to get around traffic congestion. Measures could include exclusive bus lanes, advance traffic lights to jump the queue, and remote traffic light control.

Specific types of TPMs are also defined:

- **Queue Jumps** are physical measures provided at significant intersections to permit transit vehicles to proceed first through the intersection. This could include an exclusive bus lane in advance of the intersection and an advance “transit” light allowing the bus to proceed first before the rest of the vehicles.

- **Signal Priority** is a traffic light that permits a transit bus to proceed through the intersection before regular traffic has a green light.

A TPM is essentially a subset of HOV priority, with the usage of the facility being limited to specified transit vehicles (usually public transit buses only, excluding private or other services such as intercity buses, hotel or airport shuttles, or employer shuttles). An HOV lane, for example, could look and function identically to a bus lane, apart from the difference in permitted vehicles. On the other hand, TPMs – their use being limited to specific operators and trained professional drivers – can in some ways be more site-specific or unusual in their designs if necessary.

One example of a self-enforcing TPM is a Bus trap, which is a road segment specifically designed for buses only; it usually creates a short cut to allow more efficient bus operations while preventing cars from doing the same. Cars that travel down these roads risk damage due to the design of the road. There are currently two bus trap locations in Edmonton:

- 132 Avenue and 34 Street
- 134 Avenue and 40 Street

**Recommendation for CRB:** Based on international best practice and the application of transit priority principles to the Edmonton Metropolitan Region’s transportation system, the recommended definition of “TPM” and hence “Transit Priority Infrastructure” is as follows:

- TPM facilities are transportation infrastructure (lanes, roads, ramps, links, traffic signals) restricted to use by authorized transit vehicles
  - Authorized transit vehicles will be limited to scheduled public transit buses operating in the Edmonton Metropolitan Region (regardless of occupancy)
  - On-duty supervisory / maintenance vehicles of the authorized public transit agency are also permitted to use TPM infrastructure if and as necessary

- TPMs will have an appropriate time restriction on their use.
  - Time restrictions will be on a case- or site-specific basis, and will generally either be Monday to Friday during peak periods (specific hours are subject to local conditions) or 24 hours per day, 7 days per week.

- Non-public transit vehicles shall be permitted to use TPM facilities if and as directed by legislation, which is to address the following:
- Emergency Vehicles will be permitted to use TPM facilities while on duty.
- Non-public transit buses will be considered for use of specific TPMs on a case-by-case basis, subject to the authority of the transportation agency responsible for the TPM.
- Motor vehicles that need to enter or cross a TPM facility in order to turn or connect from one road or driveway to another, will be permitted to use the TPM facility to do so, as long as the movement is done in a safe manner and as expeditiously as possible.
- Bicycles will be permitted to use arterial road curb lanes, regardless of TPM designation.

Where TPM facilities connect with or relate to one another, every effort should be made to apply consistent rules to each (subject to operational or safety constraints).
3. **Overview of HOV and TPMs**

The “universe” of potential HOV and TPM designs is vast. For the purposes of the current overview study, our interest is in those that are: a) proven designs in use, b) relevant to the specific types of corridors and functions under study in the Capital Region, and c) appropriate to the level of demand and potential usage in the study corridors. We are particularly interested in facilities that are beneficial to intermunicipal public transit operations; this does not rule out HOV lanes per se, but focuses the discussion on ways in which HOV facilities could be used for transit purposes.

The current overview study encompasses the following contexts in which HOV and TPMs could be considered:

- Urban Arterial (Road, Street); e.g. 97 Street in Edmonton
- High-Standard (Signalized) Arterial (Expressway); e.g. QE2 Highway from 23 Ave NW to 82 Ave NW
- Controlled Access Highway (Freeway); e.g. QE2 Highway from Leduc to 23 Ave NW
- Access to/from site-specific locations
  - Park & Ride lots
  - LRT terminals
  - Bus hubs

In general terms, the following HOV/TPM options are suited to the contexts as tabulated below:

<table>
<thead>
<tr>
<th>HOV / TPM Treatment</th>
<th>Urban Arterial</th>
<th>High-Standard Arterial</th>
<th>Controlled Access Highway</th>
<th>Site-Specific Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transit Priority Measure / Bus-Only Treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus-Only Lane</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bus-Only Shoulder</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus-Only Ramp</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transit Queue Jump</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Transit Signal Priority</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>High Occupancy Vehicle (Including Buses) Treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOV Lane</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOV-Only Ramp</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>HOV Queue Jump</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

It should be noted that it is often the case that geometric or operational solutions that improve conditions for *all* traffic can yield the desired benefits for transit as well (e.g. introducing road tolling, or removing a bottleneck or a congested intersection by introducing a roundabout, a continuous flow interchange design, a reversible lane, or a new road link). General traffic improvements are not shown in the table above but they can be considered any time that an HOV or TMP initiative is under study.

We also recognize that TPMs are often only or primarily relevant during weekday peak periods (and sometimes only one peak period) so a focus on shared or dynamic use of space and existing infrastructure, rather than building transit-specific 24/7 infrastructure, is often an effective option. Similarly, plans should consider that operating conditions and transit needs may vary over time – an HOV lane can be used to establish the principle of transit priority, while demand grows and the facility evolves into a busway or LRT line at some future date.
No matter what the physical solution is, it will always benefit from good design that respects Alberta’s roadway geometric design, signage, and signal standards. Designing for self-enforcement (through use of restricted zones, strong signage, pavement markings, coloured pavement, etc.) is far more effective than putting up a “buses only” sign and hoping for on-the-ground police enforcement.

One example of a self-enforcing TPM is a Bus trap, which is a road segment specifically designed for buses only; it usually creates a short cut to allow more efficient bus operations. Cars that travel down these roads risk damage due to the design of the road. There are currently two bus trap locations in Edmonton:

- 132 Avenue and 34 Street
- 134 Avenue and 40 Street

The tables that follow present a summary of each HOV/TPM treatment identified above, including usage, applicability, design features, relevant examples, and illustrations. These tables illustrate schematic or typical situations, and do not claim to be a comprehensive menu of all such treatments.
Measure #1: Bus Lane on Urban Arterial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus-Only Lane (BOL) / Reserved Bus Lane (RBL) / Business Access Transit Lane (BAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Urban Arterial (4-lane or 6-lane road with signalized intersections)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, turning vehicles</td>
</tr>
<tr>
<td></td>
<td>(Optional: taxis, motorcycles, bicycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction)</td>
</tr>
<tr>
<td></td>
<td>Curbside (the vast majority of cases), Left Lane, Contraflow, Tidal Flow</td>
</tr>
</tbody>
</table>

**Illustration**

- Absolute minimum 12 bus/h; desirable minimum 20 bus/h (lane should carry at least as many people in buses as the adjacent general traffic lane)
- Higher bus volumes desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions
- Conflict between through buses and turning vehicles must be managed
- Bus bays not generally necessary
- Integrate physical treatment with transit signal priority (ideally with far side stops)
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact. Peak period lane can be used for parking in off-peaks, but removal of parked vehicles, couriers, delivery trucks, etc. is critical.

** Relevant Example(s) **
- 97 Street between 118-137 Avenue SB
- 97 Street between 125-135 Avenue NB
- Jasper Avenue between 109 Street and 120 Street
- Stony Plain Road and 102 Avenue
- 109 Street

** Additional Notes **
In the last two decades, only two notable bus lanes have been added in Edmonton: one along Fox Drive to South Campus Station, and one on the permanent detour of downtown buses along 102 Ave. There are five other places in Edmonton with bus lanes: 100 St, 104 St, 109 St, 97 St, Jasper Ave (Oliver), and Stony Plain Rd. There are dedicated busways on 104 St, 114 Ave, and 132 Ave.
Measure #2: Bus Lane on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus-Only Lane (BOL) / Reserved Bus Lane (RBL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>High-Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, turning vehicles (Optional: taxis, motorcycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Illustration" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria / Design Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Absolute minimum 12 bus/h; desirable minimum 20 bus/h (lane should carry at least as many people in buses as the adjacent general traffic lane)</td>
</tr>
<tr>
<td>• Higher bus volumes desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions</td>
</tr>
<tr>
<td>• Conflict between through buses and turning vehicles must be managed</td>
</tr>
<tr>
<td>• Bus bays or off-line bus stops needed unless bus service is express only</td>
</tr>
<tr>
<td>• Integrate physical treatment with transit signal priority (ideally with far side stops)</td>
</tr>
<tr>
<td>• Signage and pavement marking key to functionality and acceptance</td>
</tr>
<tr>
<td>• Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane or conversion of a shoulder. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Queensway, Highway 174, Ottawa</td>
</tr>
<tr>
<td>• Highway 7, York Region, Greater Toronto</td>
</tr>
<tr>
<td>• Kingston Road, Highway 2, Durham Region, Ontario</td>
</tr>
<tr>
<td>• Marine Drive, Vancouver</td>
</tr>
</tbody>
</table>
### Measure #3: Bus Lane on Controlled Access Highway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus-Only Lane (BOL) / Reserved Bus Lane (RBL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Controlled Access Highway (4-lane or 6-lane road; all access via interchange ramps; speed limit &gt; 80 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, entering/exiting vehicles (Optional: taxis, motorcycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Most commonly the right lane; left lane use is rare</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Bus Lane on Controlled Access Highway" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria / Design Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Frequent bus service</td>
</tr>
<tr>
<td>• Higher bus volumes desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions</td>
</tr>
<tr>
<td>• If in right lane, conflict between buses and entering/exiting vehicles must be managed</td>
</tr>
<tr>
<td>• Bus station/terminal off highway to pick-up and drop-off riders</td>
</tr>
<tr>
<td>• Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered</td>
</tr>
<tr>
<td>• Typically increases bus speeds, and hence, reliability</td>
</tr>
<tr>
<td>• Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Highway 417, Ottawa</td>
</tr>
<tr>
<td>• I-395, Northern Virginia</td>
</tr>
<tr>
<td>• I-10, Los Angeles</td>
</tr>
<tr>
<td>• Highway 101, San Mateo, California</td>
</tr>
</tbody>
</table>
Measure #4: Bus Shoulder on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus Bypass Shoulder (BBS) / Bus on Shoulder (BOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>High Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, turning vehicles (Optional: taxis, motorcycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Shoulder or curbside</td>
</tr>
</tbody>
</table>

**Illustration**

- Frequent bus service
- Most applications are accommodated on reinforced shoulders, so lower motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions
- Conflict between through buses and turning vehicles must be managed
- Bus bays or bus station/terminal off roadway to pick-up and drop-off riders
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Implementation through conversion or construction of a paved shoulder

**Relevant Example(s)**
- Steeles Avenue West / Mississauga Road, Brampton, Ontario
- Highway 99, British Columbia
### Measure #5: Bus Shoulder on Controlled Access Highway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus Bypass Shoulder (BBS) / Bus on Shoulder (BOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Controlled Access Highway (4-lane or 6-lane road; little to no intermediate access; speed limit &gt; 80 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, entering / exiting (merging) vehicles (Optional: taxis, motorcycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Shoulder or curbside</td>
</tr>
</tbody>
</table>

#### Illustration
![Diagram of bus shoulder on controlled access highway](image)

#### Criteria / Design Features
- Frequent bus service
- Most applications are accommodated on reinforced shoulders, so lower motorist perception of "empty lane syndrome" and wasted space / unnecessary impact on general traffic conditions
- Conflict between through buses and entering/exiting vehicles must be managed
- Bus bays or bus station/terminal off roadway to pick-up and drop-off riders
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Typically increases bus speeds, and hence, reliability
- Implementation through conversion / reconstruction of shoulder
- Bus usage typically restricted to authorized transit agencies and trained drivers (i.e. not school buses, hotel shuttles, tour coaches, etc.)
- Bus speed can be unrestricted, limited to a defined speed, or limited to 20 km/h over the speed of general traffic
- Typically limited to peak periods / congestion, not 24/7 use, as shoulder is retained for its primary purpose (breakdowns) at all times.

#### Relevant Example(s)
- "Classic" peak period bus-on-shoulder facilities, such as those on freeways in Minneapolis (right side) and Toronto's Don Valley Parkway (left side) or on an arterial such as US 29 near Washington, DC
- "Permanent" shoulder bus lanes, such as on Highway 403 in Mississauga or Regional Road 174 (Queensway) in Ottawa
- Dynamic use of shoulders to increase peak period capacity (with or without HOV or Bus Lanes) such as I-66 in Virginia or I-35W in Minneapolis
- Highway 252 (Minneapolis/ St. Paul Area)
Measure #6: Bus Ramp on Controlled Access Highway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Controlled Access Highway Ramp (1 or more lane facility; no intermediate access in most cases; speed limit varies, but typically &lt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles (Optional: taxis)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7)</td>
</tr>
</tbody>
</table>

**Illustration**

![Illustration of a Bus Ramp on Controlled Access Highway](image)

**Criteria / Design Features**

- Transit signals
- Frequent bus service
- Typically improves access, reduces delays, and increases reliability
- Implementation usually through the addition of a facility

**Relevant Example(s)**

- Government Street transit ramps to and from Highway 1, Vancouver area
- Northern Busway, Auckland, New Zealand
- South East Busway, Brisbane, Australia
- Eglinton Avenue West to Highway 427, Toronto (below)
### Measure #7: Bus Ramp at Site-Specific Location

<table>
<thead>
<tr>
<th>Measure</th>
<th>Bus Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Ramp at site-specific location (1 or more lane facility; speed limit varies)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles (Optional: taxis, bicycles)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7)</td>
</tr>
</tbody>
</table>

#### Illustration
![Illustration of Bus Ramp at Site-Specific Location](image)

<table>
<thead>
<tr>
<th>Criteria / Design Features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Transit signals</td>
<td></td>
</tr>
<tr>
<td>- Frequent bus service</td>
<td></td>
</tr>
<tr>
<td>- Signage is key to functionality and acceptance</td>
<td></td>
</tr>
<tr>
<td>- Typically improves access, reduces delays, and increases reliability</td>
<td></td>
</tr>
<tr>
<td>- Implementation usually through the addition of a facility</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Example(s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- 132 Avenue and 34 Street, Edmonton</td>
<td></td>
</tr>
<tr>
<td>- 134 Avenue and 40 Street, Edmonton</td>
<td></td>
</tr>
<tr>
<td>- Connors Rd and 98 Ave, Edmonton (see photo below)</td>
<td></td>
</tr>
<tr>
<td>- O'Keefe Street to Buranda Bus Station, South East Busway, Brisbane, Australia</td>
<td></td>
</tr>
</tbody>
</table>
Measure #8: Transit Queue Jump Lane on Urban Arterial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Queue Jump Lane (QJL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Urban Arterial (4-lane or 6-lane road with signalized intersections)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, turning vehicles</td>
</tr>
</tbody>
</table>
| Applicability | Full-time (24/7)  
Curbside (the vast majority of cases) |

### Illustration

- Transit signals
- Frequent bus service
- Typically reduces conflicts with other vehicles at intersections and delays, increases reliability, and improves travel time
- Implementation usually through the addition of a facility

### Relevant Example(s)

- 86th Street and 84th Street at 5th Avenue, New York City
- Various intersections on Queen Street, Brampton (Queen Street East / Bramalea Road)
Measure #9: Transit Queue Jump Lane on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Queue Jump Lane (QJL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context</strong></td>
<td>High Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>Authorized public transit buses, emergency services vehicles</td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
<td>Full-time (24/7)</td>
</tr>
<tr>
<td></td>
<td>Curbside (the vast majority of cases)</td>
</tr>
</tbody>
</table>

**Illustration**

![Illustration of Transit Queue Jump Lane](image)

**Criteria / Design Features**

- Transit signals
- Frequent bus service
- Typically reduces conflicts with other vehicles at intersections and delays, increases reliability, and improves travel time
- Implementation usually through the addition of a facility

**Relevant Example(s)**

- Viva BRT, Highway 7, York Region, Ontario
- Island Highway, Victoria, BC
Measure #10: Transit Queue Jump Lane at Site-Specific Location

<table>
<thead>
<tr>
<th>Measure</th>
<th>Queue Jump Lane (QJL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Queue Jump Lane at site-specific location (at least 1-2 lanes; speed limit varies)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles, turning vehicles</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7)</td>
</tr>
<tr>
<td></td>
<td>Curbside (the vast majority of cases)</td>
</tr>
</tbody>
</table>

**Illustration**

- Transit signals
- Frequent bus service
- Typically reduces conflicts with other vehicles and delays, and increases reliability; Improves travel time
- Implementation usually through the addition of a facility

**Relevant Example(s)**
- 97th Street / Okanagan Highway at Westside Road Exit, Kelowna, B.C.
- South East Busway / Pacific Motorway, Queensland, Australia
Measure #11: Transit Signal Priority on Urban Arterial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Transit Signal Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Urban Arterial (4-lane or 6-lane road with signalized intersections, and special signals for transit vehicles)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Curbside, left lane</td>
</tr>
</tbody>
</table>

**Illustration**

- ~400 m from last intersection
- \( \text{BUS} \) \( \rightarrow \) \( \text{ONLY} \) \( \downarrow \) \( \downarrow \) \( \downarrow \) \( \rightarrow \) \( \text{BUS} \) \( \rightarrow \) \( \text{ONLY} \)

**Criteria / Design Features**

- Transit signals
- Frequent bus service
- Typically reduces conflicts with other vehicles and delays, increases reliability, and improves travel time
- Implementation usually through the addition of transit signal priority technology

**Relevant Example(s)**

- Calgary: northbound and southbound on 10 Street at 16 Avenue NW, and northbound on 52 Street at Marlborough Drive NE. A blue signal, typically above the pedestrian signal, will come on until the traffic light reverts to its normal schedule.
- Queen Street, Brampton
- Euclid Avenue, Cleveland
Measure #12: Transit Signal Priority on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>Transit Signal Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>High-Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; special signals for transit vehicles; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Authorized public transit buses, emergency services vehicles</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Curbside, left lane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria / Design Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit signals</td>
</tr>
<tr>
<td>Frequent bus service</td>
</tr>
<tr>
<td>Typically reduces conflicts with other vehicles and delays, increases reliability, and improves travel time</td>
</tr>
<tr>
<td>Implementation usually through the addition of transit signal priority technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkdale Boulevard at Kensington Road, Calgary</td>
</tr>
</tbody>
</table>
**Measure #13: HOV Lane on Urban Arterial**

<table>
<thead>
<tr>
<th>Measure</th>
<th>High Occupancy Vehicle (HOV) Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Urban Arterial (4-lane or 6-lane road with signalized intersections)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying two or more occupants, authorized public transit buses, emergency services vehicles, turning vehicles (if curbside). Optional: taxis, motorcycles, bicycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Curbside, left lane, or occasionally in a contraflow configuration</td>
</tr>
</tbody>
</table>

**Illustration**

- Designate so lane is not underutilized (consider 2+ rather than 3+ in some cases)
- Higher usage is desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)
- Conflict between through traffic and merging or turning vehicles must be managed
- Strategically positioned carpool lots could encourage use of the HOV lane
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact. Peak period lane can be used for parking in off-peaks, but removal of parked vehicles, couriers, delivery trucks, etc. is critical.

**Criteria / Design Features**

- Right curb HOV 3+, Dundas Street, Mississauga
- Left lane HOV 2+, Santa Fe Drive, Denver
- Middle reversible HOV lane (Centre Street, Calgary)
- Contraflow HOV lane, Kalanianaole Highway, Honolulu
### Measure #14: HOV Lane on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>High Occupancy Vehicle (HOV) Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>High-Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying 2 or more occupants, including authorized public transit buses, emergency services vehicles, turning vehicles (if curbside)</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Curbside, left lane</td>
</tr>
</tbody>
</table>

### Illustration

- Designate so lane is not underutilized (consider 2+ rather than 3+ in some cases)
- Higher usage is desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)
- Conflict between through traffic and merging/turning vehicles must be managed
- Strategically positioned carpool lots could encourage use of the HOV lane
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane or conversion of a shoulder. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact.

### Relevant Example(s)
- Barnet Highway / Inlet Drive / Hastings Street, Vancouver area
- Santa Clara County expressways, California
# Measure #15: HOV Lane on Controlled Access Highway

<table>
<thead>
<tr>
<th>Measure</th>
<th>High Occupancy Vehicle (HOV) Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Controlled Access Highway (4-lane or 6-lane road; access via interchange ramps; speed limit &gt; 80 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying 2 or more occupants, including authorized public transit buses, emergency services vehicles, and entering/exiting vehicles. Optional: taxis, motorcycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction) Median (typically) or outside lane (rarely)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustration</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Criteria / Design Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Designate so lane is not underutilized (consider 2+ rather than 3+ in some cases)</td>
</tr>
<tr>
<td>- Higher usage is desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions</td>
</tr>
<tr>
<td>- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)</td>
</tr>
<tr>
<td>- Conflict between through traffic and entering/exiting vehicles must be managed</td>
</tr>
<tr>
<td>- Strategically positioned carpool lots could encourage use of the HOV lane</td>
</tr>
<tr>
<td>- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered</td>
</tr>
<tr>
<td>- Implementation usually through conversion of pre-existing general traffic lane, but sometimes through the addition of a lane or conversion of a shoulder. Conversion of existing lane must be approached cautiously to avoid unacceptably large traffic operations impact.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Highways 403 and 404, Brampton and Mississauga, ON</td>
</tr>
<tr>
<td>- Trans-Canada Highway, Surrey, BC</td>
</tr>
</tbody>
</table>
### Measure #16: HOV Ramp on Controlled Access Highway

<table>
<thead>
<tr>
<th>Measure</th>
<th>High Occupancy Vehicle (HOV) Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Controlled Access Highway Ramp (1-lane road; no intermediate access in most cases; speed limit varies)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying two or more occupants, including authorized public transit buses, emergency services vehicles, and entering/exiting vehicles. Optional: taxis, motorcycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction)</td>
</tr>
</tbody>
</table>

#### Illustration

![Diagram of HOV Ramp on Controlled Access Highway](image)

#### Criteria / Design Features
- Designate so lane is not underutilized (consider 2+ rather than 3+ in some cases)
- Higher usage is desirable to prevent motorist perception of “empty lane syndrome” and wasted space / unnecessary impact on general traffic conditions
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)
- Conflict between adjacent/crossing traffic must be managed
- Signage and pavement marking key to functionality and acceptance; coloured pavement in some locations can be considered
- Implementation usually through the addition of a facility

#### Relevant Example(s)
- Direct freeway-to-freeway ramps, Texas
- Direct freeway-to-arterial ramps, Los Angeles
- Highway 404 HOV ramp to Highway 401, Toronto
Measure #17: HOV Ramp at Site-Specific Location

<table>
<thead>
<tr>
<th>Measure</th>
<th>High Occupancy Vehicle (HOV) Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Ramp at site-specific location (1-lane or more facility; no intermediate access in most cases; speed limit varies)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying 2 or more occupants, including authorized public transit buses, emergency services vehicles, and entering/exiting vehicles. Optional: taxis, motorcycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) or part-time (weekday peak hours / peak direction)</td>
</tr>
</tbody>
</table>

**Illustration**

![HOV Ramp Diagram](image)

**Criteria / Design Features**
- Conflict between adjacent or crossing traffic must be managed
- Signage is key to functionality and acceptance
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)
- Typically improves access, reduces delays, and increases reliability
- Implementation usually through the addition of a facility

**Relevant Example(s)**
- HOV direct-access ramps, Eastgate Park & Ride, Bellevue, WA (Seattle area)
- Reversible HOV / transit-only ramp, Mark Center, I-395 & Seminary Road, Alexandria, VA
- HOV / HOT access ramps to Park & Ride facilities, I-45, Houston
Measure #18: HOV Queue Jump Lane on Urban Arterial

<table>
<thead>
<tr>
<th>Measure</th>
<th>HOV Queue Jump Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Urban Arterial (4-lane or 6-lane road with signalized intersections)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying two or more occupants, including authorized public transit buses, emergency services vehicles, turning vehicles. Optional: taxis, motorcycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) Curbside</td>
</tr>
</tbody>
</table>

### Illustration

- Dedicated signals
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / General Traffic Lane peak period person-moving ratio should be greater than 1)
- Reduces conflicts with other vehicles at intersections and delays, increases reliability, and improves travel time
- Implementation usually through the addition of a facility
- Enforcement / compliance is a key challenge

### Relevant Example(s)

- Although conceptually similar to a bus-only queue jump lane, HOV-only queue jump lanes have been rarely put into operation.
# Measure #19: HOV Queue Jump Lane on High-Standard Arterial / Urban Expressway

<table>
<thead>
<tr>
<th>Measure</th>
<th>HOV Queue Jump Lane (2+ or 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>High-Standard Arterial (4-lane or 6-lane road with widely spaced signalized intersections; little to no intermediate access; speed limit &gt; 60 km/h)</td>
</tr>
<tr>
<td>Usage</td>
<td>Vehicles carrying two or more occupants, including authorized public transit buses, emergency services vehicles, turning vehicles. Optional: taxis, motorcycles.</td>
</tr>
<tr>
<td>Applicability</td>
<td>Full-time (24/7) Curbside (the vast majority of cases)</td>
</tr>
</tbody>
</table>

**Illustration**

![Illustration of HOV Queue Jump Lane](image)

**Criteria / Design Features**

- Dedicated signals
- HOV lane should carry at least as many people as the adjacent general purpose traffic lane (HOV / GPL should be greater than 1)
- Typically reduces conflicts with other vehicles at intersections and delays, increases reliability, and improves travel time
- Implementation usually through the addition of a facility
- Site-specific installation normally part of a corridor-long or network HOV plan

**Relevant Example(s)**

- Although conceptually similar to a bus-only queue jump lane, HOV-only queue jump lanes have been rarely put into operation.
4. Environmental Scan

To help set the context for the CRB’s consideration of HOV and TPM opportunities, several projects and programs elsewhere in North America can be cited as relevant. In looking at similar-sized urban areas with a long record of operating a variety of HOV and TPM types on standalone high-standard arterial or expressway corridors, the following stand out:

- Vancouver / Lower Mainland
- Ottawa / Gatineau
- Seattle / Tacoma
- San Jose / Santa Clara
- Minneapolis / St. Paul
- Greater Toronto

These are not the only locations which can provide insight to the Edmonton area, but they do illustrate the full range of operational conditions and will suffice in that regard. It is recognized that Edmonton does already have a selection of TPMs, most notably the peak-period bus lanes on 97 Street NW.

4.1 Vancouver / Lower Mainland

Metro Vancouver, in the lower mainland of British Columbia, comprises 21 municipalities covering an area of approximately 2,900 square kilometres, with a population of approximately 2.5 million. The region has an extensive set of HOV facilities, which has been planned and implemented by municipalities in cooperation with TransLink, the regional transportation authority since 1999, and in some cases, the BC Ministry of Transportation and Infrastructure since the early 1980s. These HOV facilities are concentrated in the Cities of Vancouver, Richmond, Port Coquitlam, Coquitlam, Burnaby, Langley, the District of Delta, and Langley Township. In general, they have been implemented by widening roads and highways, and in some cases, modifying and reallocating road rights-of-way (e.g., removal of parking, such as along the Willingdon Avenue corridor in Burnaby).

HOV facilities have been introduced to achieve improved travel times and reliability for HOVs, including buses, in order to increase Metro Vancouver’s transit ridership and modal share to/from downtown Vancouver, and between the central employment and higher density hubs.

The creation of HOV lanes on arterials and highways has been supported since the 1970s through several strategic and investment plans, municipal official land use and transportation master plans, TransLink, the Greater Vancouver Regional District, and the Ministry of Transportation. Notable documents include the Greater Vancouver Regional District’s Livable Region Strategic Plan (1996), the Provincial Transportation Plan – Going Places: Transportation for British Columbians (1995), and TransLink’s Moving Forward: Improving Metro Vancouver’s Transportation Network (2011). Transport 2021 (1993) provided further detail on a proposed policy for HOV lanes, and recommended that HOV lanes be implemented along the following six major corridors:

- Barnet Highway / Hastings Street – Northeast Sector to Boundary Road (Implemented)
- Lougheed Highway (Highway 7) to Trans-Canada Highway (Implemented)
- Trans-Canada Highway / Grandview Highway – Cape Horn interchange to Clark Drive (Implemented)
- Trans-Canada Highway – 200 Street to Cape Horn interchange (Implemented)
- Across the Fraser River at or in the vicinity of Golden Ears Bridge (Golden Ears Highway) between Maple Ridge and Surrey (Implemented)
- Across the North Arm of the Fraser River at or in the vicinity of the Alex Fraser Bridge – Queensborough Bridge

It is of key importance that Transport 2021 recommends that HOV facilities be created from existing traffic lanes or parking lanes wherever possible, and that the creation of HOV facilities may include a time penalty for other road users. It is also proposed that road space be allocated based on people-carrying capacity rather than vehicle-carrying capacity, and that governments should take into account the number of passengers per vehicle, rather than simply the number of seats when allocating road space.

Today, the movement towards new HOV lanes and TPMs has slowed, and is considered on a project-by-project basis with the Ministry of Transportation, e.g., with the further improvements to:

- Highway 1 (the only provincial highway in Metro Vancouver) between 200 Street and the City of Abbotsford, just outside Metro Vancouver
- The proposed new Massey Bridge in the City of Richmond to replace the outdated Massey Tunnel under the Fraser River, including one exclusive bus lane on the new bridge in each direction (completion in 2023); and
- Along Highway 99, southerly between Richmond and South Surrey, to duplicate shoulder bus lanes along various sections of Highway 99 between South Surrey and Vancouver.

The map below shows the general location of existing HOV facilities along arterials and highways in Metro Vancouver. Additional details of each are provided in Appendix B.
In spring 2016, AECOM contacted relevant TransLink staff to gather further insight into existing transit priority measures (TPMs). A summary of commentary is provided in Appendix B.

### 4.2 Ottawa / Gatineau (National Capital Region)

The National Capital Region of Ottawa, Ontario and Gatineau, Quebec is home to 1.3 million people in an area of 6,300 square kilometres, and thought to have the most successful network of dedicated and on-street busways in Canada. This success is especially noteworthy because the network is not just intercity in nature, but interprovincial, and it involves two transit agencies (OC Transpo in Ottawa and STO in Gatineau) with somewhat different markets and approaches. There are a variety of other TPMs in use, including reversible arterial HOV lanes.
(on the Champlain Bridge), median freeway HOV lanes (Highway 17), arterial bus / taxi lanes (Slater and Albert Streets), and direct bus access ramps from park & ride lots to an expressway.

Along with Minneapolis and the Toronto area, Ottawa has some of the leading examples of Bus-on-Shoulder (BOS), also known as Bus Bypass Shoulder (BBS) applications. The concept enables buses to travel along the shoulders of freeways and major arterial streets during peak periods, in an attempt to bypass congestion in adjacent general purpose traffic lanes. BOS/BBS lanes generally do not accommodate other high-occupancy vehicles (HOVs). The concept has been implemented in several urban areas and has been noted to operate successfully.

BOS/BBS in Ottawa provides a continuous transit priority strategy along Highway 174 (also known as Ottawa Road 174) and Highway 417. No other vehicles, including HOVs, are allowed to use the BOS/BBS. Highway 174 is a 4-lane freeway which serves the eastern suburbs of Orleans and Cumberland in Ottawa. Due to congestion and geographical restrictions (greenbelt areas), decision-makers noted the need for transit priority measures on Highway 174, as a precursor to a future transitway, and as a low-cost, easily implemented option.

BOS/BBS was implemented as a TPM on Highway 174 between Blair Road and Place d’Orleans (a distance of approximately 9 km), in 1992. The population of Orleans has increased substantially since then. BOS/BBS was implemented by reconstructing, widening, and strengthening the existing shoulders to accommodate the change. A solid white lane marking denotes the separation between the 3.5 m wide BOS/BBS and the adjacent general purpose lane (see photo, right). The minimum acceptable BOS/BBS lane width in Ontario is 3.5 m; however, 3.75 m wide lanes are used in most areas in the Toronto area.

A 1 m-wide unpaved shoulder on the other side of the BOS/BBS, between the BOS/BBS and the guardrail, is provided as a safety offset; the operating protocol is for buses to merge in to general traffic if a vehicle is stopped on the shoulder.

Frequent signage is also displayed along the BOS/BBS to inform and remind other drivers along the highway. Municipal buses sometimes use the BOS/BBS outside of peak hours. It should be noted that private intercity buses are not allowed to use the BOS/BBS. Peak hour bus volumes on Highway 174 are estimated to be approximately 100 buses per hour.

The operation on Highway 174 is unique and effective, as some bus passengers waiting to transfer from local buses at stops at interchanges (not visible from the highway) are able to inform the en route bus that they are at the stop by pressing a call button. When the button is activated, the next bus travelling in the appropriate direction along the respective corridor is notified via a discreet sign on the highway shoulder, to inform the bus that it should exit the highway to collect these passengers along its route. This transition between buses leaving and re-entering the highway is smooth due to appropriate infrastructure design. When no one is at the stations waiting for a bus (i.e., the call button has not been activated), the bus does not need to detour from the highway; instead, it can continue on its route without stopping.
The operational success of the BOS/BBS concept on Highway 174 led to the consideration of a similar treatment on Highway 417. Highway 417 is a 6-lane facility in Ontario connecting Montreal with Ottawa and the backbone of the transportation system in the National Capital Region. Bus priority was implemented by widening the highway to create reserved bus lanes (RBL) between Eagleson Road and Moodie Drive (a distance of approximately 4 km).

The difference between RBL and BOS/BBS is that RBL has a full shoulder (2.5 m) adjacent to it, which makes them highway lanes. Unlike a BBS, a disabled vehicle is not permitted to stop in the RBL. Peak-hour, peak-direction bus volumes on Highway 417 are estimated to be approximately 60 buses per hour; as the photo (above) illustrates, buses move into general traffic lanes in order to bypass intermediate interchange ramps.

Freeway BOS/BBS and RBL treatments have proven to be a safe and effective means of insulating bus passengers from endemic highway congestion in Ottawa. Many benefits are associated with the BOS/BBS concept, some of which are described as follows:

- Vehicle operating speeds along general purpose lanes can vary widely, and are largely dependent on weather and traffic conditions. Bus operating speeds using BOS/BBS tend to be more predictable, and travel time is more reliable.
- On both Highways 174 and 417, buses using BOS/BBS are allowed to operate up to the posted speed (100 km/h), and therefore have the ability to operate at substantially higher speeds than slower-moving vehicles in the adjacent general purpose traffic lanes. This is unusual; BOS operations in most other cities have speed limitations (e.g. 20 km/h faster than general traffic).
- Through simple variable message signs, bus operators are able to know whether passengers are waiting to be picked up at intermediate stops, and are able to bypass certain stops to avoid potential delays if no one has activated the call button.
- Operating cost savings associated with BOS/BBS have been observed to be in the order of approximately $600K annually.
- Emergency response vehicles can also make use of the wide paved shoulder. Buses can merge into general traffic to allow emergency vehicles to pass. Bus operators can also be alerted by dispatch, in advance of an emergency or other situation that requires them to change lanes.
- BOS/BBS operators are professionally trained.
- BOS/BBS operates within the existing right-of-way, so it is not costly to implement when compared to other transit initiatives.

In March/April 2016, AECOM contacted City of Ottawa staff to gather further insight into existing BOS/BBS operations on Highways 174 and 417. A summary of commentary is provided in Appendix B.
4.3 Seattle / Tacoma

About 230 km south of Vancouver is the Seattle / Tacoma metropolitan area, a region of nearly 4 million people. The area boasts an extensive network of HOV lanes, light rail and streetcar systems, transit-only lanes, Park & Ride lots, and vanpooling and carpooling schemes. As with the Ottawa / Gatineau and Vancouver regions, the Seattle / Tacoma area is large and multijurisdictional, but much of the transportation network is overseen by the Washington State Department of Transportation (WSDOT).

The location of HOV and express toll facilities in the Seattle / Tacoma area are shown in the map below.

Source: http://www.wsdot.wa.gov/HOV/Map.htm
Puget Sound freeway HOV lanes have proven to be highly efficient. They move about one third of the people on the freeways in only 18 percent of the vehicles, and carry approximately 52 percent more people per lane than other freeway lanes during the main commuting hours and directions (2006 data). For this reason, WSDOT has invested heavily in the development, maintenance, and expansion of HOV freeway lanes.

Some relevant infrastructure in Washington includes high-occupancy toll (HOT) lanes and Business Access and Transit (BAT) lanes.

**High Occupancy Toll Lanes / Express Toll Lane Facilities**

As 2+ HOV lanes have become congested in the Seattle / Tacoma area, it has not been feasible to change the carpool definition to 3+ HOV lanes due to potential impacts of underutilization and, therefore, heavier congestion. So instead, WSDOT has been piloting HOT lanes / express toll lane facilities. These terms are interchangeable, but the newer, sometimes multi-lane facilities are more commonly referred to as express toll lanes. The SR 167 HOT lane pilot project was implemented along a formerly underutilized HOV corridor with positive results. The first stage of I-405 express toll lanes opened in Fall 2015 and has since then, produced mixed reactions. While express toll lanes save time and are more reliable for HOVs, transit, and toll customers, they were also associated with negative impacts (some general purpose lane users are not willing to pay to use express toll lanes, since general purpose lane capacity was reduced to accommodate the change). WSDOT hopes to address this issue through future enhancements.

**Business Access / Transit Lanes**

In recent years, curb lanes along sections of SR 99 (Aurora Avenue North) have been converted to BAT lanes. These lanes are reserved for buses, vehicles intending to turn right at the next intersection (or beforehand, at a business access), and vehicles merging left after entering a BAT lane from an intersecting road or business access, during peak hours. BAT lanes only allow buses to continue straight through the intersection to safely make far-side bus stops. During off-peak hours, BAT lanes can be used by all traffic, and on-street parking is allowed.

During peak hours, BAT lanes have been noted to improve traffic operations and reduce travel times for all modes. As a result, Seattle is considering implementing similar lanes along more of its streets. The figure below shows a bus in a BAT lane with associated signage.

---

1 Source: http://www.wsdot.wa.gov/HOV/2007survey.htm
Seattle BAT Lanes

Source: City of Seattle <http://www.seattle.gov/transportation/docs/btg/BAT%20graphic.pdf>

In March/April 2016, AECOM contacted WSDOT staff to gather further insight into existing TPMs used in the City. A summary of commentary is provided in Appendix B.

4.4 San Jose / Santa Clara

Santa Clara County is located in California at the south end of San Francisco Bay. It covers an area of approximately 3,380 square km, and the 2010 census reported a population of almost 1.8 million. San Jose, the County seat, is the 10th most populous city in the U.S., and Santa Clara is one of the most affluent counties in the country\(^2\). The map below shows the location of San Jose and major highways in Santa Clara County.

The San Francisco Bay area features an extensive freeway HOV lane network, but unique to the Santa Clara area are HOV lanes on high-standard signalized urban expressways, which are somewhat analogous to major roads in the Edmonton area. In 1982, the first HOV lane was implemented along San Tomas Expressway. There are now HOV lanes on five of Santa Clara County’s eight expressways:

1. Capitol Expressway (14 km)
2. Central Expressway (16 km)
3. Lawrence Expressway (14 km)
4. Montague Expressway (10 km)
5. San Tomas Expressway (14 km)

In addition to HOV infrastructure, other related improvements have included adding electronic signage, moving HOV lanes off the shoulders, and expanding operating hours. Bicycles are accommodated on all expressways, and a recently developed pedestrian facilities plan recommended continuous sidewalks to provide access to transit stops and to land uses abutting the expressways.

---

The figure below shows a portion of Santa Clara County’s San Tomas Expressway, a 6- to 8-lane high-standard arterial in which HOVs occupy the right lane (as noted by the diamond symbol on the pavement).

The map below shows the general alignments and locations of Santa Clara County’s expressways in relation to each other, as well as other main transportation corridors within the County. The graphic also provides a representation of 2013 level of service along the expressways.

Fact sheets providing additional information, including potential future improvements of each of the listed expressways, are included in Appendix B. Further details regarding future plans for various expressways within Santa Clara County can be accessed via www.expressways.info.
In March/April 2016, AECOM contacted Santa Clara County staff to gather further insight into the operations of HOV lanes along the expressways. A summary of commentary is provided in Appendix B.

### 4.5 Minneapolis / St. Paul

With a topography and climate similar to that of Edmonton, the Minneapolis / St. Paul region is home to around 3.8 million people and a major economic centre of the American Midwest, covering more than 2,600 square km. In 1992, Metro Transit and the Minnesota Department of Transportation (MnDOT) made the decision to allow buses to travel on the shoulders of area highways, instead of sitting in mixed traffic.

Since that time, the Twin Cities has become known for its pioneering of bus-on-shoulder operations; in the first 18
years of the program, the region added 475 km of bus shoulders. Although the maximum speed for buses using the shoulders is only 56 km/h, one study concluded that travel time savings was as much as 9 minutes for buses using the shoulder. A survey of bus operators and riders revealed that they perceive travel time savings as well.\(^5\)

One of the often-cited disadvantages of bus-on-shoulder operations is that it could be more dangerous than buses running in mixed traffic on highways. However, MnDOT reported that in a 10-year study of crash data, only 20 incidents occurred involving bus-on-shoulder operations, and all of them resulted only in property damage.\(^6\)

The map below shows current and planned bus-only shoulders in the Twin Cities, as of 2014.

---


\(^6\) Ibid.
4.6 Greater Toronto

The Greater Toronto Area is the most populous metropolitan area in Canada with over 6 million people living in 5 municipalities covering an area of more than 7,100 square kilometres. The Greater Toronto Area provides a wide range of examples of TMPs in operation:

- Bus-on-Shoulder operations on both Highway 403 in Mississauga (outside shoulder) and the Don Valley Parkway in Toronto (median shoulder)
- Median busways on major arterial roads in York Region (Highway 7, Davis Drive, Yonge Street)
- Bus queue jumps on suburban arterials (Queen Street, Brampton)
- Park & Ride lots served by intermunicipal transit (Highway 407 in Halton Region, etc.)
- Carpool Parking Lots to allow commuters to form carpools at convenient locations (numerous interchanges along Highway 400, Highway 401, and the QEW)
- HOV lanes on major municipal arterial roads (e.g. HOV 3+ on Dundas Street West and Eglinton Avenue East, Toronto, and HOV 2+ on Dufferin Street in York Region)
- HOV 2+ lanes on major freeways (Highways 403, 404, and QEW)
- Dedicated bus-only roadways (York University busway in Toronto, Mississauga Transitway)

These facilities have not been implemented in a consistent, coordinated manner and rules can vary between jurisdictions (e.g. HOV lanes are 2+ in York Region and 3+ in Toronto). Interestingly, there is a lengthy segment of Highway 403 that features both median HOV 2+ lanes and outside Bus-on-Shoulder operation. The Province has recently permitted electric vehicles to use freeway HOV lanes regardless of occupancy, as an example of how TMPs can sometimes be used to further other transportation goals.

It is worth noting that the Ottawa, Minneapolis, and Toronto examples described above all feature winter weather conditions comparable to those experienced in Edmonton.

4.7 Summary of Environmental Scan

The following table compiles key "lessons learned" from other jurisdictions as they might apply to the Edmonton Metropolitan Region. It brings together the summarized material from Sections 4.1-4.6, interviews and research from Appendix B, and supplemental file material from previous studies.
<table>
<thead>
<tr>
<th>Area</th>
<th>HOV / TPM Applications*</th>
<th>Best Practices</th>
<th>Lessons Learned</th>
<th>Decision-Making</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver / Lower Mainland</td>
<td>Arterial HOV lanes Freeway HOV lanes Freeway bus-on-shoulder Queue jumps</td>
<td>Transit queue jumps are in place at many of the most constrained water crossings, to create reliable trips and in some cases substantial travel time savings. No. 3 Road in Richmond evolved quickly from general traffic to arterial busway to elevated LRT line, demonstrating the role that bus lanes can have in setting the table for subsequent LRT investment.</td>
<td>Similar to Edmonton, in that HOV / TPM investment is done on a corridor-by-corridor basis to respond to specific needs rather than as part of a master network plan. The diversity of design solutions demonstrates the flexibility and expediency of many HOV / TPM strategies. Engagement of external stakeholders (e.g. Insurance Corporation of BC, Jack Bell (private) vanpooling, UBC, etc.) to help fund and operate HOV / TPM enlarges the circle of commitment.</td>
<td>A complex web of decision-making and funding agencies is present, although in recent years there has been an effort to strengthen the role of TransLink as a single master planning organization. It is responsible for the integrated regional master transportation plan. It also has dedicated funding so it can build and operate transit infrastructure without relying on municipalities to do so. And as a provincially-mandated agency it can work closely with the Highways ministry to synchronize plans and policies. Its multimodal perspective (roads, bikes, buses, LRT, commuter rail) requires a prioritization program for investment decisions.</td>
<td>TransLink coordinates and funds major capital projects on its Major Road Network, which comprises most major regional arteries not owned by the provincial government. TransLink allocates funding to each municipality for transit improvements, such as transit priority signals, queue-jump lanes, and bus lanes. TransLink contributes up to half of the costs of municipal capital projects, while the Province funds highway-related projects directly.</td>
</tr>
<tr>
<td>Ottawa / Gatineau</td>
<td>Arterial HOV lanes Freeway HOV lanes Freeway bus-on-shoulder Queue jumps Commuter parking lots</td>
<td>Some of the best bus-on-shoulder facilities in the world, with good geometry, high speed limits, direct links with Commuter lots, effective systems for intermediate stops, and high bus and passenger volumes. Integration of Commuter lots with transit services is exemplary, with good location at the edge of the city, direct links to road spine, frequent two-way all-day service (including express buses), and high quality facilities.</td>
<td>A longstanding and overarching commitment to bus-based rapid transit throughout the region has led to some of the highest transit mode shares of any comparable centre in North America. Bus priority has come at the expense of HOV / ridesharing, as it is viewed through a competitive lens. HOV systems are underdeveloped on the Ontario side as a consequence, whereas HOV plays a much stronger role in Gatineau (Quebec). Bus priority is well-known, accepted, supported, and embedded in the region’s transportation practices.</td>
<td>The Transportation Master Plan in the 1970s established the bus-only transitway system as Ottawa’s base transportation strategy, with supportive land use policies and a classic radial structure. Bus priority extends the Transitway functionality to other road corridors. Recent updates and policy shifts have introduced LRT in key corridors. Single level of municipal government provides transportation infrastructure and services (i.e. road improvements and bus operations), so all funding and operating decisions are addressed internally. Similar to the Edmonton Alberta situation, provincial decisions on highway expansion and operations are influenced, but not controlled, by the City; some inconsistencies result from different policies. There is little mechanism for Gatineau (Quebec) and Ottawa (Ontario) to coordinate or collaborate on HOV / TPM, leading to more differences.</td>
<td>Highways: Provinces (Ontario, Quebec) Parkways and interprovincial bridges: National Capital Commission Municipal Roads and municipal transit lines and services: Ottawa, Gatineau</td>
</tr>
<tr>
<td>Seattle / Tacoma</td>
<td>Arterial HOV 2+3+ lanes Freeway HOV 2+ lanes Commuter parking lots</td>
<td>Significant commitment to regional-scale HOV network development created HOV lanes across the regional freeway network over a 30-year period. Selected use of High Occupancy Tolls. Diverse range of design treatments. HOV network forms framework for extensive Park &amp; Ride system, express bus services, and one of North America’s most substantial regional</td>
<td>Comprehensive, region-wide, multijurisdictional transportation investment strategy has created a rich and diverse system that offers multiple transit and auto options to motorists. HOV, transit, and toll systems can be managed by responsible agencies to attract users and shape travel patterns more effectively than a “hands off” general traffic system. Wide range of designs and broad application means that all residents and</td>
<td>Most investment in HOV / TPM infrastructure has been at the State level; Washington State Department of Transportation has policies that actively support and reflect municipal growth and transportation strategies. WSDot can control all aspects of the freeway network. WSDOT works closely with transit agencies on policy, design, and operation. Local transit agencies work with local jurisdictions to plan and implement arterial TPMs, with a variety of funding</td>
<td>Federal, State, and Municipal funds all contribute to the transportation infrastructure and services of the Sea-Tac region. There are several federal funding programs targeting transit, and municipal funds are often secured by way of a voter referendum. Many employers are engaged in Travel Demand Management programs, and some (e.g. Microsoft) fund their own</td>
</tr>
</tbody>
</table>
## Capital Region HOV / Transit Priority Study

<table>
<thead>
<tr>
<th>Area</th>
<th>HOV / TPM Applications*</th>
<th>Best Practices</th>
<th>Lessons Learned</th>
<th>Decision-Making</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Toronto</td>
<td>Arterial HOV 2+ lanes Freeway HOV / HOT (toll) lanes Arterial Median Busways Transitways Arterial bus lanes Arterial bus queue jumps Commuter parking lots</td>
<td>Freeway HOV lanes were the subject of an extensive design development program and are being rolled out in the course of a multi-decade freeway expansion program. HOV lanes are currently being tested as a platform for tolling (High Occupancy Toll lanes). Bus-on-shoulder lanes are also state-of-the-art designs. Extensive municipal arterial HOV lanes were implemented but have stagnated without political commitment; recent focus is on arterial bus lanes. Extensive network of CommuterLots caters to both carpoolers and, in selected corridors, bus users.</td>
<td>Diverse mix of measures is not supported by an effective multijurisdictional planning and operational framework. Network discontinuities and operational inconsistencies result, hampering the overall effectiveness of the investment to date. As more facilities are built, a critical mass will be established for greater impact on mode choice. Longstanding facilities are seen to evolve over time (HOV or Bus lanes to LRT or Subway).</td>
<td>Each transportation agency (Ministry of Transportation, Metrolinx, Regions, Cities) makes their own funding decisions according to their priorities; there is no effective overall regional Master Plan and little coordination between jurisdictions. Each project is therefore justified on its own merits in terms of cost-effectiveness, transit benefit, and/or strategic role. York Region creates HOV lanes on arterials as a matter of course when they are widened, while Toronto avoids lane conversions on its mature road network. The Province also has a long-term plan to roll out HOV lanes as freeways are widened. The Province also influences municipal actions by directly funding major rapid transit infrastructure.</td>
<td>Highways: Province Municipal Roads and municipal transit lines and services: Municipalities Intermunicipal bus and train service (including major new intramunicipal LRT and Subway investments): Metrolinx (provincial agency).</td>
</tr>
<tr>
<td>San Jose / Santa Clara</td>
<td>Arterial HOV lanes on urban expressways Commuter parking lots Freeway HOV / HOT (toll) lanes</td>
<td>68 km of dedicated HOV 2+ lanes on a network of interconnected high standard arterials provides buses and carpools with reliable priority over general traffic in major corridors.</td>
<td>Bus volumes were not high enough to warrant bus-only lanes; HOV lanes were implemented instead and buses gained the necessary advantage that way. HOV lanes were designed to support bus operations (i.e. right lane rather than median). Roads were widened or reconfigured rather than have general traffic lanes restricted to HOV use.</td>
<td>Prior to 1995, Santa Clara County and the transit authority belonged to a unified organization. Subsequently, Santa Clara County and the Valley Transportation Authority (VTA) separated; however, they still collaborate on relevant expressway improvements. HOV lanes were implemented in an attempt to reduce congestion and increase transit usage.</td>
<td>The expressways are the funding responsibility of Santa Clara County.</td>
</tr>
<tr>
<td>Minneapolis / St. Paul</td>
<td>Freeway bus-on-shoulder operation, rolled out quickly at minimal cost. Seven bus operators are authorized to use the shoulders. Freeway HOV lanes terminate directly in large multi-storey parking structures, connected by elevated walkways with many downtown buildings. Lane pricing manages HOV lane demand on I-35.</td>
<td>Extensive implementation of bus-on-shoulder operation.</td>
<td>Creation of an interagency task force with a specific mandate – to expedite bus movement on all highways in the region – and a funding commitment allowed bus-on-shoulder to quickly become an established part of the Twin Cities transportation picture (on the ground, not just in plans). Consequential public awareness translates into support for other TPMs. Winter (snow) operations of bus-on-shoulder facilities remains an unresolved problem, but initial concerns about safety have proven to be moot.</td>
<td>MnDoT created “Team Transit” in the 1990s as a device to focus State attention on transit priority and to foster collaboration with municipalities and transit operators. MnDoT worked closely with Metro Transit to establish the bus-on-shoulder concept and set its operating rules. Team Transit came about as MnDoT’s attempt to expedite buses past critical congested nodes in the freeway network and Metro Transit’s effort to arrest dropping ridership. Initial bus-on-shoulder applications were successful, so agencies were emboldened to push for more.</td>
<td>MnDoT pays for bus-on-shoulder construction; Metro Transit pays for associated Park &amp; Ride lots. MnDoT worked BOS into other construction projects where possible to minimize net capital cost. The bus-only infrastructure makes bus services eligible for federal funds which are used to operate extra bus service. Federal Congestion Management Air Quality funding is directed to Park &amp; Ride facilities.</td>
</tr>
</tbody>
</table>

* listing refers only to the types of measures referred to here, and does not imply a complete list of all HOV and TPMs in a region.
5. Evaluation Framework

5.1 Background

When looking at a set of alternative HOV or TPM opportunities in an intermunicipal corridor, consideration must be given to various perspectives and factors so that the pros, cons, and tradeoffs that go into a recommendation are understood. In this study, the thrust is not to define a single recommended plan for each (or any) corridor; rather, it is to demonstrate the viability (or not) of a reasonable range of alternative transit priority measures.

With viability established, the broader regional-scale picture of a transit priority strategy can emerge. Within that strategy, a recommendation for a single specific near-term pilot project can be made. Also, with viability established, future more detailed corridor planning studies can focus on defining the optimum HOV / TPM application from among the viable options.

It is noted that the IRTMP’s study corridors are intended to solve corridor-specific problems and not necessarily interact with each other as part of a connected network; the evaluation can therefore focus on standalone corridor performance rather than on building a larger-scale network. A connected network would yield benefits in terms of carpooling (HOV) (i.e. increased travel time savings, greater potential demand) but connectivity is much less important for intermunicipal transit, which tends to operate in single specific radial corridors only.

Given this, the evaluation framework should focus on understanding Needs, Opportunities, and Applications:

1) Understanding the needs (What is the transit / carpool demand? Where is it coming from / going to? Where are the congestion hot spots?);
2) Setting out the opportunities that relate to those needs (A mix of opportunism, creativity, knowledge of feasible / applicable HOV/TPMs, and realistic assessment of the corridor); and
3) Assessing those opportunities by evaluating their performance under useful comparative factors (focusing on factors and criteria that tease out the differences between options and realistically considering their ability to meet identified needs).

Step 1 is set out in Section 6, based on local knowledge, transportation data, road plans, and stakeholder input. Step 2 follows in Section 7, developing a set of conceptual alternatives in each corridor based on the information in Section 6 combined with an understanding of the universe of HOV / TPM options available together with additional stakeholder input as to realistic alternatives.

For the third step, the evaluation process in Section 7.2, we can base the Capital Region process on successful similar HOV/TMP prioritization exercises elsewhere.

5.2 Best Practices in Evaluation and Prioritization

There are many ways to evaluate and prioritize transportation alternatives; this Section outlines several multi-factor approaches as background to the recommended strategy.
5.2.1 CRB IRTMP Prioritization Review

The CRB’s August 2015 document, Integrated Regional Transportation Master Plan Prioritization of Regional Transportation Projects, provides a recent local example of evaluation and prioritization of a diverse range of transportation initiatives.

The report summarizes the process used for the regional transportation project prioritization:

1) Reviewed and updated the Ten Year Roadway and Transit Priorities Project Lists
   - Project must be part of IRTMP Roadway or Transit Network
   - Roadway projects needed to be “regionally significant”
   - Defined project status
2) Defined Evaluation Criteria
   - Specific criteria that related to the IRTMP and CRGP.
3) Determined Weighting of Evaluation Criteria (Using Pair-wise Analysis)
4) Each project was scored against the agreed upon criteria and their weights
5) Determined project urgency; high, medium or low
6) Adjusted project scoring
   - Assigned numerical value to project urgency
   - Applied project urgency rating to project score to arrive at adjusted score
7) Prioritized Regional Projects by project status category
   - Sorted project list by adjusted score to arrive at project ranking

One example of the Evaluation Criteria is:

1) Integration with the Capital Region’s Growth Plan (First Guiding Policy Theme of the IRTMP) - How well does the project support the CRB Growth Plan with imminent growth and development in Priority Growth Areas (PGAs)?

A sub-category of this Criterion is ii) Maximize Use of Existing Infrastructure. A project would be scored in this category as follows:

- The Project Improves an Existing Link - Score 1 if link exists currently; score 0 otherwise
- The Project Increases Efficiencies in Person Carrying Capacity - Score 1 if HOV/Transit Priority lane, LRT or Park & Ride. Score 0 otherwise.

There were 17 such scoring measures. The criteria weighting was the product of a comprehensive stakeholder engagement process, and reflects the top priorities of a broad range of Edmonton-area decision-makers:

<table>
<thead>
<tr>
<th>Criterion</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supports the Region’s Economy</td>
<td>26 %</td>
</tr>
<tr>
<td>2. Maximize Use of Existing Infrastructure</td>
<td>24 %</td>
</tr>
<tr>
<td>3. Provides Viable Alternatives to the Private Automobile</td>
<td>17 %</td>
</tr>
<tr>
<td>4. Supports Growth in Priority Growth Areas (PGA’s)</td>
<td>15 %</td>
</tr>
<tr>
<td>5. Supports Multi-Modal Transportation Facilities</td>
<td>11 %</td>
</tr>
<tr>
<td>6. Coordination Between Jurisdictions / Agreement in Place</td>
<td>6 %</td>
</tr>
<tr>
<td>7. Project Reduces Environmental Degradation</td>
<td>4 %</td>
</tr>
</tbody>
</table>

Following completion of project scoring in Step 4, the list of projects was subjected to an additional round of scoring to reflect the urgency of each project. The project urgency rating was assigned a value: high = 3; medium = 2; low =
1. Each project’s weighted score was then multiplied by the project urgency rating to arrive at an adjusted score for each project. Projects could then be ranked by adjusted score, from highest to lowest (and could be subdivided and ranked within categories of readiness: strategic, functional plan and prelim engineering/design.

It is evident from the evaluation criteria that this process is aimed at prioritizing a diverse group of projects across the region rather than at assessing alternative treatments within a single corridor. It is useful, however, to continue to refer to the CRB’s stated policies and principles when assessing alternatives. The weight that the stakeholders placed on the various criteria is instructive; the emphasis on maximizing use of existing infrastructure, for example, is highly supportive of lane conversions over road widening. The current HOV / TMP study needs to function at a greater level of detail and be more focused on the specific study objectives.

### 5.2.2 Brisbane (Australia) HOV Network Study

This regional-scale network study in Brisbane, undertaken in 1999-2000 (similar to studies in Calgary and the Toronto area) looked at a full range of alternatives HOV treatments across several dozen road segments totalling 200 km.

A four-step approach to network development was taken:  
1. Assess all route options; select most promising routes;  
2. Assess reasonable HOV priority measures for each promising route;  
3. Reassess combination of routes and priority measures to generate a network concept and overall strategy; and  
4. Review options for each route segment and develop preferred alternative as input to overall network.

The approach was to focus on a few key indicators to group or stratify the candidates, then to apply a broader range of factors to the resultant top performers. Selected initial screening criteria were:
- number of buses  
- number of lanes  
- traffic congestion  
- opportunities; and  
- planning context

Presentation of this information allowed the multi-agency study committee to compare routes and identify approximately 200 km of Brisbane roadways along 20 corridors to carry forward for assessment at a planning level of detail. Although some freeway segments were involved, the study focused on arterial issues. HOV concepts were developed for each corridor, then analyzed in greater detail using a multi-factor scoring/weighting approach.

Despite the inherent limitations of assigning scores to the numerous qualitative factors involved in the HOV field, this approach was the only feasible method of properly comparing some sixty road segments and options under ten factors, while simultaneously considering bus vs HOV 3+ vs HOV 2+ applications. It also allowed relatively easy spreadsheet analysis of alternative weights and scores, and could be re-used for other roads not included in the study.

The measures used in the analysis were shaped by the availability of data, the ease of application, and the ability to communicate the results. Ratings under the ten factors were developed for each plan. Two slightly different alternative weighting allocations were used to reflect different views of the relative importance of certain factors:
<table>
<thead>
<tr>
<th>Factor</th>
<th>Criterion</th>
<th>Weight (%)</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 HOV Travel Time</td>
<td>annual person-hours of time savings at intersections</td>
<td>15</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Person Throughput</td>
<td>ratio of persons in HOV/Bus lane to adjacent general purpose</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Bus Operations</td>
<td>qualitative ability of buses to effectively use HOV lane / TPM</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4 Cost-Effectiveness</td>
<td>index of annual net travel time savings x 100 / capital cost</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5 Traffic Operations</td>
<td>impact of treatment on general traffic LOS and turning moves</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6 Safety &amp; Bicycles</td>
<td>qualitative assessment of impact on ped and bike safety</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>7 Network Impact</td>
<td>coordination with other corridors, P&amp;R lots, etc.</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8 Enforceability</td>
<td>enough usage to avoid violations due to empty lane syndrome</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>9 Context</td>
<td>impact on parking, businesses, property, streetscaping</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>10 HOV Travel Time</td>
<td>conflicting movements and intersection delays</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 HOV Travel Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 100 100

Scoring was done by assigning a score on a scale of 0 to 10 for each factor. The score is relative, not absolute. The “best reasonable outcome” under each factor is assigned a score of 10; the “least desirable outcome” is assigned 0; and thresholds are defined for intermediate results.

For several factors, only a single measure was used, from among several possible measures. The selected measure was based on the quality of the available data and on the relevance of that measure to the factor being considered. A typical example is HOV Travel Time Savings, calculated and scored on the basis of annual person-hours of time savings in stopped delay at intersections (net, including disbenefits to non-HOVs):

- 0: net annual person-hours of travel time savings = -50,000 (i.e. HOV alternative increases total delay).
- 2: no net travel time savings.
- 4: net annual person-hours of travel time savings = 50,000.
- 6: net annual person-hours of travel time savings = 100,000.
- 8: net annual person-hours of travel time savings = 150,000.
- 10: net annual person-hours of travel time savings = 200,000+.

Cost-effectiveness was indicated by a comparison of capital cost with travel time savings (i.e. an index), rather than by use of a “proper” quantitative cost-benefit analysis.

The resulting data tables identified the “Best Solution” for short-listed HOV routes, and showed the scores assigned to each alternative under each factor. Multiplied by the factor weights, a total score (maximum 100) was generated. Mapping the results formed the basis for subsequent refinement of the network strategy; it was not simply a matter of implementing projects in ranked order.

Using this information to prioritize or sequence various HOV projects required considerable consultation and professional judgement. General principles (in a financially constrained environment) were identified as:

- Focus on selected corridors where substantial travel time benefits can be generated;
- Focus on freeways, which have the greater market impact and visibility (compared to arterials);
- Develop supporting / feeder routes to established HOV corridors before implementing isolated standalone facilities; and
- Use low-cost facilities to move quickly towards a “critical mass” of HOV facilities, which will help generate the necessary support for completing the more difficult or costly elements of the network.

A subsequent corridor-by-corridor “reality check” provided additional detail on site-specific issues and the corridor plan. This is where ancillary (off-line) facilities such as Park & Ride lots come in to focus.
Within corridors, it was seen as reasonable to begin with spot treatments and queue-jumps as a stage towards continuous priority lanes. In a constrained corridor, inbound a.m. peak direction travel is generally the first priority for HOV treatment, with the reverse p.m. peak treatment deferred if necessary.

The Brisbane approach was data-heavy but comprehensive. Its structure is flexible, allowing additional HOV proposals to be introduced, dealing simultaneously with freeway and arterial opportunities, using both quantitative and qualitative measures, and being adjustable in terms of the factors, criteria, and measures used. For example, if identifying near-term opportunities and priorities were to be a critical factor, the relevant measures could be adjusted and the weighting relating to timing could be increased. The strategy of applying different levels of detail to the screening process allowed “fatal flaws” to be identified early on and a focus maintained on the most viable candidates.

### 5.2.3 Snohomish County (WA) Community Transit Arterial System HOV Study

In the Community Transit Arterial System HOV Study (Parsons Brinckerhoff, 1993) carried out for Snohomish County (a suburban part of the Seattle area in Washington State, U.S.), a long list of candidate corridors (comprising most of the major roads – arterials and freeways – in the county) was identified by the study team, then consideration of the applicability and effectiveness of a full range of priority measures was done for each route. This process incorporated the “do nothing”, HOV 2+, HOV 3+, Bus Lane, and spot treatment options all together.

A typical table used for one route or route segment follows (with one column of typical scores shown):

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Measure of Effectiveness</th>
<th>Recommended?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HOV Travel Time Savings</td>
<td>Capacity</td>
</tr>
<tr>
<td>No Action</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Signal Priority: 2+</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Signal Priority: 3+</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Signal Priority: Bus</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Continuous HOV Lane: 2+</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Continuous HOV Lane: 3+</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Continuous HOV Lane: Bus</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bus Queue Jump / Special Phasing</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Double Turn Lanes / One HOV Only</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Convert General Purpose Lane</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

For each corridor or route segment, each alternative treatment was measured against each Measure of Effectiveness, on a five-point scale from 0 = Least Effective to 5 = Most Effective. Recommendations to carry forward or set aside the alternative were made on that basis.

This approach has the value of ensuring that all reasonable options are at least identified and considered for each route segment. The corridor-focused approach (rather than a connected network plan) is applicable to the Edmonton situation. The scoring of each MoE is not entirely transparent but it at least establishes a consistent
method to assess varied situations.

It may be pointed out that pre-screening some of the alternatives for feasibility first would simplify the evaluation. Another aspect complicating the Snohomish County procedure is that a mix of issues are present – Convert General Purpose Lane is a subset of Continuous HOV Lane, for instance, and it makes a big difference if the lane is an added lane, conversion of an existing lane, or designation of a new lane that was otherwise intended for general traffic. There is also no weighting by effectiveness – e.g. HOV 2+ lanes may operate (and score) just as well as HOV 3+ lanes yet impact many more people.

5.2.4 Los Angeles County HOV System Integration Plan

As reported in the HOV Systems Manual (National Cooperative Highway Research Program Report 414, Transportation Research Board, 1998), the Los Angeles County Metropolitan Transportation Agency sponsored, in 1995-96, the development of a county-wide HOV system plan. In consultation with a broad panel of stakeholders and agencies, the County reviewed the State’s planned HOV network (30% of which was in operation at that point) with a view to identifying a cost-effective approach for implementing the remainder. The outstanding segments and facilities were evaluated with respect to their contribution to regional criteria for mobility, cost-effectiveness, and environmental impact in the short, medium, and long terms.

Specific evaluation criteria included:
- HOV travel time savings;
- HOV demand;
- General purpose lane impacts;
- System continuity;
- Design compatibility;
- Cost;
- Cost-effectiveness;
- Environmental impacts;
- Enforcement; and
- Segment phasing.

The results helped define priorities and sequencing for HOV projects in the Los Angeles area. This is another example of grounding priorities in region-wide planning principles. It introduces temporal analysis, recognizing that opportunities may differ depending on their time frame. The methodology is flexible enough to be used for other projects that may emerge as future proposals, and wide-ranging enough that all the key issues can be considered.

5.2.5 Operational Design Guidelines for HOV Lanes on Ontario Freeways

This summary document for the Ministry of Transportation of Ontario drew on U.S. experience to that point (1993) to guide Ontario practitioners in planning and designing freeway HOV facilities. It provides a long list of potential evaluation factors for feasible concept alternatives, grouped under categories and indicators as shown:
- Physical requirements / feasibility
  - Engineering / design issues
  - Access to key origin / destination nodes
- Transportation Service
  - HOV demand
  - Long term / areawide transportation strategy
  - HOV support programs / facilities
Specific criteria were also identified under each category. The above categories and indicators are typical for concept-level transportation plans of all types, and, with an appropriate rating guide and weighting plan, could be used as the basis for evaluating and prioritizing HOV and TPM options.

5.3 Recommended Evaluation Framework

In reflecting on the above evaluation strategies, several key factors emerge:

- Multi-factor analysis that considers a full range of issues, opportunities, and impacts is appropriate. Some form of scoring and weighting is useful to allow comparison of a wide variety of options in a range of contexts.
- The depth of evaluation and level of precision reflects the quantity and quality of analytic data available; it can be costly and time-consuming to generate such useful transportation data. In the current study, the scope and budget is limited, so high-level indicative measures are used, and “shortcuts” such as the use of Google Traffic graphics eliminate the need to compile and analyze a lot of raw data.
- The current study uses the evaluation of alternatives as a screening tool to establish feasibility of a range of HOV and/or TPM treatments in each corridor. Further corridor-specific planning and design work will be needed to select a specific strategy for each corridor.
- The evaluation process needs to have some comparative analytic measures in order to prioritize each of the corridors and define a preferred pilot project.
- The evaluation process should not be entirely numeric-based and data-driven; stakeholder perspectives and qualitative input is critical to establishing viability and prioritization.
- The analysis and evaluation criteria must be rooted in regional planning policies, to ensure consistency of vision as CRB’s principles are applied to specific problems and opportunities.
- The evaluation framework is to be flexible and replicable, to allow corridors / proposals not covered in the current study to be assessed in a consistent manner at some future time.

The recommended evaluation framework is to apply the following factors, which are comprehensive, reflect the level of analytic information available, and are focused on HOV/TPM viability.
Table 5.1: Evaluation Factors and Criteria

<table>
<thead>
<tr>
<th>Factor</th>
<th>Representative Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time Savings</td>
<td>Potential person-hours of time savings for carpoolers and bus passengers</td>
</tr>
<tr>
<td>Person Throughput</td>
<td>Ratio of persons in HOV / bus lane to adjacent general purpose lane</td>
</tr>
<tr>
<td>Bus Operations</td>
<td>Ability of buses to effectively benefit from HOV lane / TPM</td>
</tr>
<tr>
<td>Traffic Operations</td>
<td>Impact of treatment on general traffic LOS and turning moves</td>
</tr>
<tr>
<td>Strategic Planning</td>
<td>Coordination with other corridors; future / planned improvements; impact on surrounding community / environment</td>
</tr>
<tr>
<td>Usage / Enforceability</td>
<td>Enough usage to avoid violations due to “empty lane syndrome”</td>
</tr>
<tr>
<td>Cost-Effectiveness</td>
<td>Construction cost, feasibility, and value considerations</td>
</tr>
</tbody>
</table>

This list of factors is similar to the ones used in Brisbane (see above) but the following items are deleted or modified:

- Safety & Bicycles – assume safety is inherent in the design of any infrastructure, and that cycling is a minor issue in most intermunicipal corridors that can be dealt with at subsequent design stages.
- Network Impact – not critical to the radial corridor-specific investigation in the Edmonton Region; considered in the Strategic Planning factor
- Enforceability – absorbed in Usage factor
- Context – absorbed in the Strategic Planning factor
- HOV Travel Time Reliability – reflected in the Bus Operations factor
- Strategic Planning – a new factor, to capture the specific policy and community context in the region

Given the overview-level quality of the analytic data available, a detailed scoring approach is not recommended; quantification would overstate the level of accuracy of the analysis. Without scores, weighting of the factors is inappropriate. In any case, for the purposes of the current exercise, each of the key factors is an important consideration in screening for viability.

The measurement / rating guide for each criterion is a simple three-level view:

a) negative or poor performance
b) neutral or moderate performance
c) positive or good performance

Guidance under each measure is outlined in Table 5.2 below. Where the guidance refers to HOVs, it is understood that buses are included. The guidance relies on a combination of analytic material (Section 5), stakeholder input, and professional judgement. As more analytic information is developed during subsequent corridor planning studies, the table can be expanded to cover more factors, additional criteria, and more quantitative measures of performance that will support a scoring / weighting evaluation approach if desired.

The measures use commonly understood planning and design characteristics where necessary; for example, it is known that a typical freeway lane typically carries in the range 1,800 – 2,000 vehicles per hour per lane at peak times, that a full municipal bus carries 40 – 50 passengers, that two-person carpools typically occupy 10 % - 15 % of the traffic flow during peak periods, and so on. Assumptions are made in the definition of alternatives as to the extent of new construction work required; where such information is not available, it is noted in the evaluation and the results reflect the uncertainty. For the sake of evaluation, it is assumed that all eligible users make use of the alternative; even though that is typically not the case in reality, it is not likely to affect the conclusions of the evaluation at this level of detail.
Table 5.2: Evaluation Factors and Rating Guide

<table>
<thead>
<tr>
<th>Factor</th>
<th>Representative Criterion</th>
<th>Performance Rating Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time Savings</td>
<td>Potential person-hours of time savings</td>
<td>Negative / Poor: Ineffective at creating a net HOV advantage; unreliable or inconsistent performance; Neutral / Moderate: Minor positive impact on HOV performance; some concerns with consistency under varying conditions. Positive / Good: Reliable performance; realistic potential to create significant travel time advantage (&gt;5’) for HOVs</td>
</tr>
<tr>
<td>Person Throughput</td>
<td>Ratio of persons in HOV / bus lane to adjacent general purpose lane</td>
<td>Negative / Poor: minimal carpool demand with vehicle ratio &lt;0.5; typically fewer than 3 bus/h; Neutral / Moderate: Potential for facility to have a usage ratio of 0.5 – 1.0 over most or all of its length; Positive / Good: Throughput ratio of 1.0 or more over the length of the facility</td>
</tr>
<tr>
<td>Bus Operations</td>
<td>Ability of buses to effectively benefit from HOV lane / TPM</td>
<td>Negative / Poor: Out-of-way travel, weaving across traffic, difficult access to facility, short piece; Neutral / Moderate: Potential improvement in bus speed and reliability, but subject to risk; Positive / Good: Noticeable improvement in speed and reliability over current situation</td>
</tr>
<tr>
<td>Traffic Operations</td>
<td>Impact of treatment on general traffic LOS and turning moves</td>
<td>Negative / Poor: Reduced capacity; increased congestion and delay due to HOV/TPM; Neutral / Moderate: Minimal to minor negative impact (e.g. limited to peak periods) on general traffic, with ability to use alternate routes; Positive / Good: Neutral to positive impact on general traffic conditions</td>
</tr>
<tr>
<td>Strategic Planning</td>
<td>Coordination with other corridors; future / planned improvements; impact on surrounding community / environment</td>
<td>Negative / Poor: Isolated piece with no regional significance; out of sync with current roads program; significant negative impact on surrounding community; Neutral / Moderate: Moderately effective piece that can evolve with expansion / growth / connectivity; negative impacts countered by positive strategic role; Positive / Good: Serves strong employment areas supportive of TDM; fits within current expansion plans; strong potential for extension / linkage; positive environmental impacts</td>
</tr>
<tr>
<td>Usage / Enforce-ability</td>
<td>Enough usage to avoid violations due to “empty lane syndrome”</td>
<td>Negative / Poor: Low volume of users and/or an unseparated facility design; Neutral / Moderate: Moderate level of use that may require targeted enforcement; Positive / Good: High level of use by eligible vehicles and/or physically separated facility that is self-enforcing</td>
</tr>
<tr>
<td>Cost-Effectiveness</td>
<td>Construction cost, feasibility, and value considerations</td>
<td>Negative / Poor: Relatively high capital cost (e.g. road widening or structures); not easily phased. Paired with low usage; Neutral / Moderate: Moderate cost (i.e. between low-cost signage and high-cost road expansion); adequate usage makes investment worthwhile; Positive / Good: Relatively low capital cost (e.g. adaptation of existing infrastructure); readily implemented in stages. Married to strong demand / use</td>
</tr>
</tbody>
</table>
6. Corridor HOV / TPM Opportunities

6.1 Study Corridors

Ten-year priority corridors for transit priority from the IRTMP (Sept. 2011) are highlighted in the following map and summarized in the subsequent table. More detailed description of the corridors is in Appendix C. The six segments that are subject to the current HOV/Transit Priority Study are:

- Highway 2 (QE2 Highway) from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW
- Baseline Road / 98 Avenue from Highway 21 to 85 St NW
- Wye Road / Sherwood Park Freeway from Highway 21 to 83 St NW
- Highway 15 from Fort Saskatchewan to Clareview LRT Station (137 Ave NW)
- Highway 28 / 97 St NW from Township Road 544 to 118 Ave NW
- Highway 16 and 16A
  - West from Stony Plain (Highway 779) to 97 St NW
  - East from Highway 21 to 97 St NW

It should be noted that these radial corridors do not intersect one another and are considered to function independently; although some motorists may use more than one corridor in a particular trip, the corridor transit services do not overlap.

The traffic observations for each corridor are drawn from Google Maps Traffic, both “typical” as reported by Google Maps, and checked / confirmed by the study team viewing “live” traffic mapping on representative dates in March and April 2016. All of the traffic observations for each corridor are mapped in Appendix D.

Transit service tabulations are drawn from current (2016) printed and on-line schedules and route maps for public transit services in the Edmonton area. Most public transit services operate peak-period, peak-direction for commuters and are operated by Edmonton Transit Service (ETS), Strathcona County Transit (SCT), or Leduc Transit. A few smaller transit operators also run fixed-route services near the corridors, but they are primarily local circulators. Private transit services such as airport, hotel, and employment shuttles are not mapped here, but are recognized in the analysis.
6.2 Summary of Corridor Information

The following table summarizes and draws on the input and information gathered in the previous steps, to form a basis for moving forward with alternative solutions to the identified problems. Further information on the corridors is in Appendix C.
## Table 6.1: Summary of Analysis

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Physical Condition</th>
<th>Traffic Congestion</th>
<th>Transit</th>
<th>Planned Changes</th>
<th>Stakeholder Perspective</th>
<th>Notes / Opportunities</th>
<th>HDV / TPM Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway 2 (OE2 Highway) from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW</td>
<td>2-lane divided freeway, 23 Ave is a high-standard 4-lane divided arterial area with signalized intersections.</td>
<td>No significant congestion observed in study segment on Hwy 2.</td>
<td>4 bus/h/dir in peaks; additional private / airport shuttle services (Calgary – Edmonton) services.</td>
<td>Fourth SB lane to Nisku, between 41 Ave and Hwy 19 in the next 2 or 3 years.</td>
<td>Development is coming and concerned about congestion; want to see more frequent and reliable transit service.</td>
<td>Strong opportunity for Park &amp; Ride lots served by transit to build ridership for more service. With limited public transit in the corridor, bus facilities should be open to all buses including shuttles and private services. HDV facilities support carpooling and airport-related taxis and vans. With little congestion, there is no rationale at present for dedicated continuous priority lanes but widening presents key opportunity to establish TPM principle on Hwy 2.</td>
<td>Strategic corridor to plan for demand growth in public and private shared-ride travel. Look to create set of formal Park &amp; Ride lots at either end of study segment, served by transit. May use direct ramps / queue jumps to allow efficient two-way service by buses. Lots would need enforcement to avoid use as airport park &amp; fly facilities. Implement HOV lanes as Hwy 2 is widened in segments.</td>
</tr>
<tr>
<td>Baseline / 98 Ave from Highway 21 to 85 St NW</td>
<td>6-lane divided arterial east of 50 St; 4-lane urban arterial west of 50 St.</td>
<td>AM traffic increases at 98A Ave to 84 St, 49 St to Terrace Rd, and east to 216. PM traffic at 98A Ave to 79 St, 84 St to Terrace Rd, and at 216.</td>
<td>Up to 12 bus/h/dir. Local services by ETS, commuter services by Strathcona Co.</td>
<td>Nothing in near / medium term, but potential for bus use in corridor to be largely superseded by the future implementation of a Sherwood Park LRT route.</td>
<td>Traffic congestion has worsened in recent years; priority measures would be helpful in busy corridor.</td>
<td>New Bethel Park &amp; Ride facility offers a good eastern option for transit in corridor. At other end of corridor, the 84 St / 98 Ave roundabout offers a queue jump challenge. Numerous intersections in between. Not enough buses to warrant continuous bus lanes but HOV priority could be viable. Peak period focus more appropriate than 24/7 treatment.</td>
<td>Investigate potential for median HOV lanes (peak period peak direction vs 24/7?) east of 50 St. Look for queue jumps west of 50 St. Given the choice, Baseline / 98 appears to have greater HDV/TPM potential than Wye / Sherwood Park</td>
</tr>
<tr>
<td>Wye Road / Sherwood Park Freeway from Highway 21 to 83 St NW</td>
<td>6-lane divided arterial; 4-lane freeway.</td>
<td>AM: considerable traffic increase between 83 St and 71 St, both EB and WB. PM: build-up at Hwy 2 &amp; 216 interchange, west of 216.</td>
<td>6 to 8 bus/h/dir in peaks. Local services by ETS, commuter services by Strathcona Co.</td>
<td>Province to widen Sherwood Park Freeway to 6 lanes as far west as 34 St. The portion of Sherwood Park Freeway crossing the Henday reduced to 4 lanes between the on/off ramps.</td>
<td>Congestion on Sherwood Park Freeway has become worse, but improvements were recently installed. Transit would benefit from HOV / bus lanes.</td>
<td>Strongest corridor for existing transit service. Long stretch of six-lane arterial indicates possibility for HOV lanes; relatively few intermediate bus stops points to possible median location rather than curbside priority lanes.</td>
<td>Interesting opportunity for priority measures, given the variety of conditions along the corridor. May be difficult to establish a single continuous HOV lane, but HOV / bus queue jumps at intersections could be effective. Consider conversion of lanes to HOV in 6-lane segments.</td>
</tr>
<tr>
<td>Highway 15 from Ft Saskatchewan to Clareview LRT Station (137 Ave NW)</td>
<td>2-lane undivided highway; high-standard 4-lane divided highway, and 4-lane divided arterial.</td>
<td>AM congestion NB near Hwy 37 and between Meridian &amp; 28A. PM congestion SB near Hwy 37 from 89 Ave and between Meridian &amp; 28A.</td>
<td>2 bus/h/dir in peaks; additional employment shuttles.</td>
<td>Intersection improvements at 18 St and at Hwy 28A. Potential widening to 6 lanes between Henday and 137 Ave, in 4 or 5 years.</td>
<td>Often used for reverse commuting. Delays are mainly due to crashes or weather.</td>
<td>Long trip on a single route to a major industrial employment area that operates on shifts points to significant opportunity for Park &amp; Ride lots near Ring Road. Opportunity to coordinate with intersection improvements and future widening plans.</td>
<td>Two-lane route with choke points suggests queue jump lanes or reversible HOV lane, supplemented with Park &amp; Ride lots. HDV would work for private shuttles and employee carpools, and sync with employer-based TDM efforts.</td>
</tr>
<tr>
<td>Highway 28 / 97 St NW from Township Road S44 to 118 Ave NW</td>
<td>Hwy 28 is a 3-lane highway; 6-lane divided arterial; and a 7-lane undivided arterial w/ reversible centre lane. 97 St is 4 lanes.</td>
<td>AM: congestion in some segments. PM: more traffic between 127 Ave and 137 Ave, and between 107A Ave and 118 Ave.</td>
<td>16 local routes on a number of overlapping segments. Between 17 and 24 bus/h/dir in peaks.</td>
<td>No projects in the study area along this corridor.</td>
<td>Congestion occurs only within Edmonton city limits. No objection to HOV or TPMs, but there is more interest in Park &amp; Ride lots.</td>
<td>Existing bus lanes are effective; improve design to make them even better, and consider extending northerly; little bus demand north of ring road, but Park &amp; Ride lots may work to support transit and carpooling. Consider converting bus lanes to HOV use – requires operational testing but would expand impact of priority on 97.</td>
<td>Check as to whether bus lanes can operate as HOV lanes (24/7 vs peaks). Extend successful priority lanes. Augment with Park &amp; Ride lots to the north.</td>
</tr>
<tr>
<td>Hwy 16 (West) from Stony Plain (Highway 779) to 97 St NW</td>
<td>Hwy 16 varies: 4-lane and 6-lane freeway, and 6-lane arterial.</td>
<td>Most EB congestion is between 121 St and St Albert Trail, and WB between 149 St and St Albert Trail; both peaks.</td>
<td>Commuter service: 2 bus/h/dir in peaks.</td>
<td>Parts of Yellowhead Trail are only 2 lanes each direction, with heavy truck traffic.</td>
<td>Consider leaving Hwy 16 to heavy truck traffic while focusing on parallel16A for commuter transit. Hwy 16 could support HOV queue jumps and segments of HOV lane but limited bus volume (2 bus/h/dir) indicates inadequate HOV volume to warrant significant investment.</td>
<td>Immediate opportunities are to establish HOV queue jumps at signalized intersections on Hwy 16 in Edmonton, potentially linked together into a segment of HOV lane in the 6-lane segment east of Anthony Henday Dr.</td>
<td></td>
</tr>
<tr>
<td>Hwy 16 (East) from Highway 21 to 97 St NW</td>
<td>4-lane divided freeway east of 62 St; 6-lane arterial west of 62 St.</td>
<td>Some slow traffic near Port Rd, both peaks.</td>
<td>Recently upgraded in east segment; ultimately planned to go to freeway throughout.</td>
<td>No bus demand means focus is on HOV only.</td>
<td>Monitor operational performance to understand longer-term HOV lane potential. Little need in near term.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3 Conceptual Alternatives

This Section draws from the analytic information presented in Section 5 to set out a range of conceptual HOV / TPM alternatives appropriate to each of the study corridors. An evaluation of the various alternatives follows.

6.3.1 Highway 2 (QE2 Highway)

Hwy 2 is a 6-lane freeway and 23 Ave is a high-standard 4-lane divided arterial with signalized intersections. Although traffic congestion at this time is not significant enough to warrant HOV lanes, the Highway 2 is expected to grow and add jobs and housing in the coming years. Further, Highway 2 will be widened to four lanes in the southbound lane to Nisku within the next five years. As such, an opportunity may present itself to add an HOV lane from 23 Ave to the airport after new development and the roadway expansion occurs. HOV lanes should be implemented as Highway 2 is widened in segments. HOV would be most effective in this corridor if it supported airport-related vans and taxis.

In the interim, stakeholders in the communities south of Edmonton report that more Park & Ride lots would be helpful for commuters, along with more frequent transit service. A strong opportunity exists for Park & Ride lots served by transit to build ridership for more service. With limited public transit in the corridor at this time, bus facilities should be open to all buses including shuttles and private services.

A set of Park & Ride lots could be created at either end of study segment, served by transit. Direct ramps between the lots and Highway 2 would save time for buses. Queue jumps would also allow efficient two-way service by buses. Lots would need enforcement to discourage use as airport Park & Fly facilities.

Alternatives to be considered for Highway 2:

- Median HOV 2+ lanes, 23 Avenue to EIA, open to all buses and airport shuttles, 24/7 operation
- Park & Ride lots, one at each end of the corridor
- Direct ramps to/from Park & Ride lots and Highway 2
- Queue jumps for buses at signalized intersections in the corridor

6.3.2 Baseline Road / 98 Avenue

High bus volume, express buses, and six-lane arterial configuration suggest an opportunity for HOV lanes in the Baseline Road corridor between Highway 21 and 50 St NW. Rather than widening, the focus would be on reallocating road space to priority vehicles. Layout options worth investigating include:

- Peak period vs. all-day
- Peak direction lane vs. two-way in peaks
- Curb lane vs. median location
- Bus-only vs. HOV 3+ vs. HOV 2+

West of 50 St, 98 Ave becomes a four-lane arterial; so it is more difficult to rationalize converting an existing general purpose lane to a more restrictive case (HOV or bus-only).
There is significant local transit demand at the intersections of Baseline Road with Bremner Drive and Bethel Drive (Bethel Transit Terminal) and with Sherwood Drive, so transit priority measures (e.g. queue jump, bus-only left turn lane) could be considered there. The channelized right turn lanes within the Edmonton segment of the route (e.g. 34 St, 50 St, 75 St) offer classic opportunities for bus queue jumps.

The most viable strategy for Baseline Road is likely to establish a peak period HOV 2+ lane in the median lanes between Highway 21 and 50 Street NW. It may be assumed that the combination of buses (west of Bethel) and private carpools will constitute on the order of 15 percent of all vehicles on the road today, with 20 to 25 percent of the peak hour person-demand; the desire would be to get that proportion over 33 %. To do so, a median 2+ lane has the merit of:

- Two lanes remain available to general traffic
- HOV 2+ offers the broadest possible market penetration
- The corridor is long enough to offer noticeable benefits in travel time reliability and time savings
- Several intersections already ban left turns and other intersections have adequate left turn storage lanes, so HOV operations can proceed with minimal interference from turning vehicles.
- Express / commuter buses make few, if any, intermediate stops, so they don't need to be in the right (curb) lane
- A HOV 3+ lane would be only attractive to less than 5 percent of the current demand, which would trigger disrespect and violation of operating rules due to the “empty lane syndrome”; furthermore, HOV 3+ lanes are more difficult to enforce than 2+ facilities.
- A bus-only lane would only be worth considering west of the Bethel Transit Centre, and even so would support less than 15 buses per hour; it would be difficult to rationalize converting an existing lane to bus use if it were to be used, at best, by one vehicle every four minutes. If a general traffic lane carries 900 vehicles / 1,050 people at capacity, using it for a bus service that has a people-carrying capacity of only half that amount (12 buses per hour x 40 person per bus) would be inappropriate. This is where 300 two-person carpools per hour makes up the shortfall in person-carrying capacity and makes lane conversion a viable plan. If there are 3 x 900 veh/h/lane = 2700 veh/h in the peak direction, 300 HOVs/h is only 11 % of the background volume. Typically, HOV 2+ demand is in the order of 15 %.
- An HOV facility can support Travel Demand Management efforts in Sherwood Park to a greater extent than a bus-only plan can, because it reaches carpoolers and employers as well as bus passengers.
- A weekday peak-period HOV facility would target the times of greatest need while leaving capacity available for optimum operations during off-peak periods and weekends. A 24/7 arterial HOV facility is functionally unnecessary in this corridor at this time. The times of operation can be adjusted according to demand at any point.
- If demand grows to the point that adjustments are required, flexibility remains to tweak the times of HOV operation, the eligibility threshold (including non-HOVs such as taxis, motorcycles, and electric vehicles), the lane extent, and operations at intersections.

Ideally, the HOV lane would be tied to and supported by an active employer-based TDM program, a flexible and free parking lot program (i.e. serving transit access and carpool formation) at either end of the corridor, transit service marketing, an effective design-based and legally supported enforcement program, a retimed and coordinated signal plan that prioritizes movement along the corridor, and a strong pavement marking and signage regime.

Any HOV facility would inherently be supportive of private ridesharing programs. Establishing a priority lane in a busy intermunicipal arterial corridor also allows the government to use it as a test bed for future improvements in transit operations, Intelligent Transportation Systems, signal coordination, automated vehicles, and other policy and technological options that may arise in the future.
West of 50 St, with the reduction to four lanes the focus on 98 Avenue would be on transit priority, although consideration might be given to extending the peak-period/peak-direction HOV lane as either a bus lane or an HOV lane by way of a “tidal flow” operation on 98 Avenue (i.e. three lanes inbound in the morning and three lanes outbound in the afternoon, with one of the three lanes being a priority lane). Parts of the Kalanianaole Highway in Honolulu provide an example of this type of tidal flow/HOV lane operation. A more detailed traffic, operations, and safety review is called for.

Alternatives to be considered for Baseline Road / 98 Avenue:

- Median HOV 2+ lanes, Highway 21 to 50 Street, peak-period/peak-direction operation
- A series of queue jumps at signalized intersections

### 6.3.3 Wye Road / Sherwood Park Freeway

Wye Road is a six-lane divided arterial and Sherwood Park Freeway is a four-lane freeway. The Province plans to widen Sherwood Park Freeway to six lanes as far west as 34 Street. The portion of Sherwood Park Freeway crossing the Anthony Henday ring road is reduced to four lanes between the on/off ramps.

Traffic congestion in the corridor is prevalent both eastbound and westbound. Because much of Sherwood Park Freeway is six lanes, it is a good candidate for HOV lanes, as far east as the Ordze Transit Centre on Ordze Road. The operation of Strathcona County commuter buses would benefit from HOV lanes.

Stakeholders report that bus-on-shoulder operations may be feasible in the corridor between 17 and 50 Streets. Safety impacts would need to be examined before implementation.

Alternatives to be considered for Wye Road / Sherwood Park Freeway include:

- HOV 2+ lanes, 34 Street to Ordze Road, peak-period/peak-direction operation.
- Bus-on-shoulder operations between 17 and 50 Streets.
- Queue jump lane, eastbound into the Park & Ride lot at Ordze Road.
- Queue jumps on 82 Avenue at 71 and 75 Streets. There appears to be sufficient room at these locations.
- Potential use of service roads for transit, west of 75 Street, provided there are no significant impacts to residences and residential traffic along 82 Avenue.

One of the challenges for this corridor is that traffic builds as a result of left-turning vehicles. With the constraint of few left-turn lanes, congestion builds and transit priority measures would be rendered less effective. Left-turn lanes should be considered before implementing TPMs. In addition, westbound vehicles turning right from 82 Avenue onto 75 Street often become backed up, because the turn is not channelized. To be effective here, a queue jump lane would need to be designed to separate buses from right turning vehicles.

### 6.3.4 Highway 15

Highway 15 presents an unusual situation as well as a notable opportunity. It is only two lanes wide and has relatively little public transit use, but it is heavily used by employees travelling from the Edmonton urban area out to the industries in Alberta’s Heartland northeast of Fort Saskatchewan. Despite observations to the contrary by stakeholders interviewed, traffic monitoring shows significant congestion on Highway 15, a slow-moving queue of
up to 7 km northbound to Fort Saskatchewan in the morning peak, along with long stretches of slow traffic in the opposite direction in the PM peak.

A two-lane route with choke points suggests queue jump lanes or a reversible HOV lane. HOV would work for private shuttles and employee carpools, and sync with employer-based TDM efforts; there are not enough public transit buses to validate a bus-only lane or facility. Given the role of employer shuttles in the corridor, it appears unlikely that public bus service will ever increase to the point where bus-only facilities (e.g. bus-on-shoulder operation) are warranted.

Given the length of the commute trip, the congestion in the corridor (that an HOV lane would bypass), the commonality of origins and destinations, and the concentration of trips around shifts all point to a significant opportunity for Park & Ride lots to be of value. Logically they would be located on Highway 15 near Anthony Henday Drive.

Alternatives to be considered for Highway 15 include:

- Park & Ride lots near Anthony Henday Drive to support carpool formation and employer shuttle services.
- Queue jump lane at the approaches to the Highway 37 intersection (widen shoulder to create a peak period HOV-on-shoulder lane at either approach).
- Create a single reversible median lane between Anthony Henday Drive and Fort Saskatchewan, reserved for HOVs during weekday peak periods (outbound in AM, inbound in PM).
- If and when the highway is widened and the bridge twinned, the HOV principle would be an established fact in the corridor and it would be reasonable to create a peak-period median HOV lane in each direction.

The above alternatives could be implemented in stages, so that each recommendation builds off the previous one.

### 6.3.5 Highway 28 / 97 Street NW

This corridor features several different operating conditions. To the north of Anthony Henday Drive, Highway 28 runs through a mostly rural area as a three-lane highway (two southbound lanes); whereas to the south, at 97 St, the corridor features a six-lane divided arterial, and (south of 135 Ave) a seven-lane undivided arterial with a reversible centre lane. South of 118 Ave, 97 St reduces to a four-lane arterial through a residential area that is well served by transit.

There is little bus demand north of the Henday ring road, but Park & Ride lots may work to support transit and carpooling by capturing motorists from exurban areas before they enter Edmonton traffic. Stakeholders reported no objection to HOV or TPMs, but indicated more interest in Park & Ride lots.

The existing bus lanes on 97 Street are effective; but their design can be improved to make them even better, and they could be extended further north. (The bus lanes actually did extend northerly in the 1990s.)

One consideration is the conversion of bus lanes to HOV use. This would require operational testing, but it would expand impact of priority on 97 Street. Another possibility is preserving the bus-only lanes and expanding their operation to 24/7 rather than peak-only.

Much of the congestion in this corridor occurs between 127 Avenue and 137 Avenue, and between 107A Avenue and 118 Avenue. The University of Alberta has modelled signal priority south of 137 Avenue; the results should be obtained to examine possibilities to implement TPMs along with signal priority.
There is potential for TPMs north of 137 Avenue, but stakeholders expressed skepticism about whether there is a need or demand for them.

Alternatives to be considered for Highway 28 and 97 Street include:

- Park & Ride lots on Highway 28.
- Improve design of bus lanes on 97 Street and extend north.
- Expand bus lane operation to 24/7.
- Or: convert bus lanes to HOV operation.
- Signal priority for transit vehicles.

### 6.3.6 Highway 16 and 16A (West)

Highway 16 (Yellowhead Trail) runs east-west across northern Edmonton and alternates between a four-lane and six-lane freeway, and six-lane arterial. 16A, which runs parallel to Highway 16 to the south, is high-standard four- and six-lane arterial.

On the western side of the corridor, most congestion is eastbound between 121 Street and St Albert Trail, and westbound between 149 Street and St Albert Trail; this is observed at signalized intersections (121 St, 124 St, and 127 St) during both AM and PM peak periods.

Plans are to widen and upgrade the arterial segments of Highway 16 to freeway standards, but funding is not yet in place and could take 10 or more years. Alberta Transportation has already done a study of potential improvements.

One approach would be to leave Highway 16 to heavy truck traffic while focusing on 16A for commuter transit. Highway 16A could support HOV queue jumps and segments of HOV lane. However, bus service would need to be expanded (currently only two buses per hour in each direction) before warranting a significant HOV investment. Bus-on-shoulder operation is a possibility on 16A; the variability of traffic means that transit could use shoulders on an as-needed basis.

Stakeholders report the need for a high-functioning 16A and rail overpass at Highway 60 in Acheson. The north-south rail crossing is a key issue in the west end of the corridor, but is out of scope for this HOV/TMP study.

Trucks are currently permitted in all lanes at the approaches to signalized intersections on Hwy 16 (89 St, 107 St, 121 St, 124 St, 127 St, 142 St, and 149 St). Stakeholders note that trucks are very slow and move off the stop bar slowly; although not a TPM per se, excluding trucks from the leftmost through lane could potentially improve traffic and transit movement.

Focusing on Highway 16 (since 16A is not in the current study scope), alternatives to be considered include:

- Widen for HOV lanes in freeway segment (Stony Plain / Spruce Grove – 149 St)
  - Lane conversion would only leave one lane for general traffic and is therefore infeasible
  - Could operate 24/7 or peak period / peak direction only; start with limited hours and extend as needed in the future
- Convert median lanes to HOV 2+ use in six-lane signalized arterial segment only (i.e. 66 St – 149 St)
- Bus-only queue jumps at signalized intersections
- HOV queue jumps at signalized intersections
This is another corridor that can support Park & Ride lots to the west of the congested segments, to provide convenient points to form carpools and, where available, shift to transit. Buses need to provide all-day two-way service in order to effectively serve such lots; until the current limited Hwy 16 bus service expands, Park & Ride lots should be smaller and farther west, focused on carpool formation from among rural/exurban motorists.

### 6.3.7 Highway 16 (East)

As with the western portion of Highway 16, the eastern portion varies between two and three lanes each direction. It is a four-lane lane divided freeway east of 62 Street and a six-lane arterial west of 62 Street.

The highway has recently upgraded in the eastern segment, and the province plans to convert the roadway to a full freeway in the future. Stakeholders reported concerns about congestion and truck traffic, but added that there is little appetite for further changes in the area of recent work.

Currently there is no public transit service in this segment, meaning that the focus is on HOV (carpooling) only. It is recommended that operational performance be monitored to understand the longer-term potential for HOV lanes. While the freeway portion appears to operate well (per Appendix C), the signalized intersection at 66 St suffers from recurring congestion, which indicates that a queue jump for HOVs could be of use pending the reconstruction of the road to freeway standards.

Strathcona County has discussed the addition of bus service on Yellowhead Trail eventually, but traffic is too heavy at present and service would be unreliable. Conversely, however, there would need to be some commitment to introduction of transit service for any TPMs to be considered. In the meantime, carpool parking lots could be introduced at key intersections, with selected sites considered for transit service in the future.

### 6.4 Evaluation of Alternatives

The summary table following applies the evaluation framework and criteria outlined in Section 5 to the analytic data summarized in Section 6.2 and the alternatives developed in Section 6.3.
<table>
<thead>
<tr>
<th>Alternative</th>
<th>Travel Time Savings</th>
<th>Person Throughput</th>
<th>Bus Operations</th>
<th>Impact on Traffic Operations</th>
<th>Strategic Planning</th>
<th>Usage / Enforceability</th>
<th>Cost-Effectiveness</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway 2 (QE2 Highway)</strong> from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park &amp; Ride lots</td>
<td>None</td>
<td>n/a</td>
<td>Potential negative due to out-of-way travel to serve lots</td>
<td>Potential for heavier traffic around P&amp;R lots</td>
<td>Very good; supports and relates to other TDM / bus measures</td>
<td>Good (assuming issue of use by airport travellers is manageable)</td>
<td>Relatively low cost; can be phased in / expanded as needed</td>
<td>If locations and access carefully designed to minimize out-of-way travel for users, P&amp;R lots can be useful in developing transit and carpool demand in support of bus / HOV lanes.</td>
</tr>
<tr>
<td>Reserved Bus Lanes (convert existing median lane in peak periods)</td>
<td>Minimal but reliable</td>
<td>Unlikely to exceed 0.5 ratio due to limited public transit</td>
<td>Bus lanes provide dedicated space for bus operations</td>
<td>Loss of traffic lane may accentuate congestion at peak times</td>
<td>Buses only capture part of shared-ride demand in corridor</td>
<td>Bus-only use is easily enforced but empty lane syndrome is a problem</td>
<td>Low cost of conversion</td>
<td>A less-attractive option than HOV, need more buses to be viable.</td>
</tr>
<tr>
<td>HOV 2+ lanes (convert existing median lane 24/7)</td>
<td>Minor but reliable</td>
<td>Potential ratio ≥ 1 once carpools and airport taxis / shuttles are allowed</td>
<td>HOV lanes provide fast and reliable operating conditions to all HOVs, including buses</td>
<td>Moderate use of converted lane indicates net neutral impact</td>
<td>Provides effective link to airport and employment areas; complements TDM</td>
<td>Moderate usage indicates good enforceability</td>
<td>Low cost of conversion</td>
<td>No foreseeable downsides to HOV operation; would be a low-cost way to enhance transit and improve connections between the airport and the rest of the Edmonton area.</td>
</tr>
<tr>
<td><strong>Baseline / 98 Ave from Highway 21 to 85 St NW</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convert median lanes to HOV 2+ lanes, Highway 21 to 50 Street; peak-period / peak-direction operation</td>
<td>Potential to reach 5 minute threshold for inducing mode shift</td>
<td>Potentially ≥ 1 in parts of the corridor</td>
<td>Improvement over current conditions</td>
<td>No change in non-peak periods; moderate impact in peaks</td>
<td>Enhances Strathcona transit operations; opportunity to test range of HOV options</td>
<td>Moderate, peak-only use;</td>
<td>Low cost of conversion</td>
<td>HOV makes sense for this corridor; begin with peak-only as most transit and much of the traffic is tidal.</td>
</tr>
<tr>
<td>Queue jumps at signalized intersections (bus-only or HOV 2+ or 3+)</td>
<td>Minor individually but potentially significantly as a coordinated series</td>
<td>Less important for queue jumps; good bus use</td>
<td>Buses will gain time and reliability advantage at key locations</td>
<td>Mix of merging, diverging at congested points likely to affect traffic flow</td>
<td>A good first step for transit priority; can be implemented piece-meal.</td>
<td>Bus-only queue jumps tend to not be violated. HOV queue jumps would be more difficult.</td>
<td>Cost depends on pole, utility relocation; potentially moderate</td>
<td>A full-corridor HOV plan would be more effective at impacting mode choice; HOV queue jumps could be used as a stepping stone</td>
</tr>
<tr>
<td><strong>Wye Road / Sherwood Park Freeway</strong> from Highway 21 to 83 St NW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convert to median HOV 2+ lanes, 34 Street to Ordze Road, peak-period / peak-direction</td>
<td>Some time savings; will assist with schedule adherence</td>
<td>Less transit demand than Baseline / 98</td>
<td>Improvement over current conditions</td>
<td>No change in non-peak periods; moderate use in peaks</td>
<td>Enhances Strathcona transit and reaches broader market</td>
<td>Moderate, peak-only use;</td>
<td>Low cost of conversion</td>
<td>As with Baseline / 98, peak-period &amp; direction HOV would support commuter transit and ridesharing in this corridor. Baseline / 98 is stronger candidate though.</td>
</tr>
<tr>
<td>Bus-on-shoulder operations in median between 17 and 50 Streets, peak-period, peak direction</td>
<td>Moderate time savings possible</td>
<td>Bare minimum usage for BOS purposes</td>
<td>Functions as an exclusive bus lane on an as-needed basis</td>
<td>None</td>
<td>Targeted to specific needs; sets scene for BOS plans elsewhere</td>
<td>Fewer enforcement issues than HOV</td>
<td>Low cost; study to determine safety &amp; feasibility</td>
<td>Would also be effective. In lieu of HOV, but only 4 bus/h; study needed to assess extent of shoulder modifications needed.</td>
</tr>
<tr>
<td>Queue jump lanes, eastbound into the Park &amp; Ride lot at Ordze Road and on 82 Ave at 71 St, 75 St</td>
<td>Less than a minute per transit trip</td>
<td>Less important for queue jumps; moderate bus use</td>
<td>Buses will gain time and reliability advantage at key locations</td>
<td>Small delay for non-transit vehicles</td>
<td>A good first step for transit priority; can be implemented piece-meal.</td>
<td>Compliance may be an issue at the outset</td>
<td>Minimal cost</td>
<td>Queue jumps would give buses a slight edge over traffic in the corridor and help decrease travel time.</td>
</tr>
<tr>
<td>Alternative</td>
<td>Travel Time Savings</td>
<td>Person Throughput</td>
<td>Bus Operations</td>
<td>Impact on Traffic Operations</td>
<td>Strategic Planning</td>
<td>Usage / Enforceability</td>
<td>Cost-Effectiveness</td>
<td>Conclusions</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>--------------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Use of service roads for transit, west of 75 Street</td>
<td>Low max speed on service roads; minimal time savings</td>
<td>Not an issue</td>
<td>Narrow ROWs, greater potential for delays and safety issues</td>
<td>No impact on main roads; probable impact on service road intersections</td>
<td>Limited application region-wide; unlikely to be locally supported</td>
<td>n/a, would be mixed traffic</td>
<td>Low cost to re-route buses</td>
<td>Compared to HOV and BOS, this is a less attractive option due to conflict with role of service roads as local streets.</td>
</tr>
<tr>
<td>Highway 15 from Ft. Saskatchewan to Clareview LRT Station (137 Ave NW)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park &amp; Ride lots near Anthony Henday Drive</td>
<td>None</td>
<td>I/ia</td>
<td>Potential negative due to out-of-way travel to serve lots</td>
<td>Minimal impact</td>
<td>Good; could facilitate mode shift to buses</td>
<td>Compliance initially may be a problem</td>
<td>Relatively low-cost; can be phased in as needed</td>
<td>Would help support transit use; design lots for efficient access and transit use.</td>
</tr>
<tr>
<td>Queue jump lane at the approaches to the Highway 37 intersection (widen shoulder to create a peak-period HOV-on-shoulder lane at either approach)</td>
<td>Less than a minute per transit trip</td>
<td>Less important for queue jumps; moderate bus use</td>
<td>Very good</td>
<td>Contingent upon peak HOV each direction;</td>
<td>Design of and signage for reversible lane will have to be very good to avoid safety issues</td>
<td>High cost of widening; low incremental cost for HOV</td>
<td>A possible interim solution until Highway 15 can be widened to accommodate HOV in both directions, but reversible lane comes with fewer advantages and more risks. Low demand makes this likely not cost-effective.</td>
<td></td>
</tr>
<tr>
<td>Single reversible median lane between Anthony Henday Drive and Ft. Saskatchewan, reserved for HOVs during weekday peaks (outbound AM, inbound PM)</td>
<td>Reliability plus some time savings expected</td>
<td>HOV use only ~ 0.2 x general traffic lane</td>
<td>Helpful for private buses reverse commuting to Redwater; less useful for ETS 198</td>
<td>Total impact due to signals and buses, net time savings for buses</td>
<td>Good; provides better connection between Edmonton and industrial areas NE of the city</td>
<td>Greater cost than HOV is probable, but still a relatively low-cost option</td>
<td>Few issues with peak-period HOV each direction; relies upon widening of highway. Low demand makes this not cost-effective.</td>
<td></td>
</tr>
<tr>
<td>Peak-period median HOV lane in each direction</td>
<td>Some time savings expected</td>
<td>HOV use only ~ 0.2 x general traffic lane</td>
<td>Beneficial for both inbound and outbound buses</td>
<td>Contingent upon widening of Hwy 15</td>
<td>Good; could increase transit use among Hwy 28 users; intercepts external trips before they enter congestion</td>
<td>Design of and signage for reversible lane can be designed for self-enforcement.</td>
<td>High cost of widening; low incremental cost for HOV</td>
<td>Few issues with peak-period HOV each direction; relies upon widening of highway. Low demand makes this not cost-effective.</td>
</tr>
<tr>
<td>Highway 28 / 97 St NW from Township Road 544 to 118 Ave NW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park &amp; Ride lots on Highway 28</td>
<td>None</td>
<td>I/ia</td>
<td>No impacts if designed for good access</td>
<td>Additional minor traffic due around P &amp; R lots</td>
<td>Good; could increase transit use among Hwy 28 users; intercepts external trips before they enter congestion</td>
<td>No issues foreseen</td>
<td>Relatively low-cost, depending on amenities</td>
<td>Would help support transit use in Sturgeon County; study should be done to determine best locations and potential impacts.</td>
</tr>
<tr>
<td>Improve design of bus lanes on 97 Street and extend north</td>
<td>Moderate time savings for buses</td>
<td>Significant transit ridership</td>
<td>Very good; benefits both inbound and outbound buses</td>
<td>May negatively impact non-transit vehicles</td>
<td>Builds on success of existing bus lanes</td>
<td>Extension of lanes likely not an issue</td>
<td>Moderate cost of extending bus lanes</td>
<td>Clear advantage for transit, especially when combined with Park &amp; Ride lots.</td>
</tr>
<tr>
<td>Expand current bus lane operation to 24/7</td>
<td>Time savings for buses but not cars</td>
<td>Bus ridership drops off in off-peak</td>
<td>Very good for service reliability</td>
<td>May negatively impact non-transit vehicles</td>
<td>Builds on success of existing bus lanes</td>
<td>Possible issues at first</td>
<td>Nominal costs</td>
<td>Advantage for transit, but may create impacts for other traffic.</td>
</tr>
<tr>
<td>Convert existing bus lanes to HOV operation</td>
<td>Time savings for HOV but not buses</td>
<td>Increases corridor-wide person throughput</td>
<td>Very good for autos if given access to another lane</td>
<td>Good for autos if given access to another lane</td>
<td>HOV lanes are a plus, but comes at the expense of bus lanes</td>
<td>Careful design for enforcement needed; likely to be an ongoing concern</td>
<td>Relatively low cost conversion</td>
<td>Buses would compete with carpools in curb lanes; due to signals and buses, net time savings for carpools unlikely to be large and reliable enough to trigger mode shifts.</td>
</tr>
<tr>
<td>Signal priority for transit vehicles</td>
<td>Slight time savings for buses</td>
<td>Bus volumes already high enough to warrant bus lanes</td>
<td>Advantageous for buses</td>
<td>Good for Hwy 28 and 97 St; less desirable for cross-streets</td>
<td>Good test bed for application of new technology, for future region-wide rollout</td>
<td>No issues foreseen</td>
<td>Relatively low cost for hardware and programming</td>
<td>Easy and suitable option, design to minimize negative impacts to cross-traffic.</td>
</tr>
<tr>
<td>Alternative</td>
<td>Travel Time Savings</td>
<td>Person Throughput</td>
<td>Bus Operations</td>
<td>Impact on Traffic Operations</td>
<td>Strategic Planning</td>
<td>Usage / Enforceability</td>
<td>Cost-Effectiveness</td>
<td>Conclusions</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Added HOV 2+ lanes in freeway segment only (Stony Plain / Spruce Grove - 149 St), peak-period / peak-direction</td>
<td>Some time savings expected, plus reliability</td>
<td>HOV use only &lt; half of adjacent lane</td>
<td>HOV lanes provide fast and reliable operating conditions to all HOVs, including buses</td>
<td>Freeway widening improves operating conditions for all users</td>
<td>Enhances commutes &amp; improves connections to/from Parkland Co.</td>
<td>Enforcement may be required at least initially</td>
<td>High cost of widening; higher priority is to upgrade arterial segment.</td>
<td>High-cost option should not precede upgrade of arterial segment, so this will be many years away. When the time comes, consider widening for HOV rather than general traffic</td>
</tr>
<tr>
<td>HOV 2+ lanes in six-lane signalized arterial segment only (66 St - 149 St) peak-period / peak-direction</td>
<td>Some time savings expected</td>
<td>Minimal bus use hampers person throughput ratio</td>
<td>HOV lanes provide fast and reliable operating conditions to all HOVs, including buses</td>
<td>Reduced capacity for general traffic; weaving required for turns</td>
<td>Interim measure to be superseded once upgraded to freeway.</td>
<td>Enforcement may be required at least initially</td>
<td>Relatively low cost conversion</td>
<td>Less attractive HOV option as it does not serve Stony Plain, Spruce Grove, or Acheson. Lane conversion should have greater HOV use (esp. transit) than this corridor does.</td>
</tr>
<tr>
<td>Bus-only queue jumps at signalized intersections (6 locations)</td>
<td>As much as several minutes per transit trip</td>
<td>Less important for queue jumps, moderate bus use</td>
<td>Very good; buses will gain time and reliability advantage at key locations</td>
<td>Slight delay for non-HOVs</td>
<td>A good first step for transit priority; can be implemented piece-meal.</td>
<td>Bus facilities readily enforced</td>
<td>Cost depends on pole, utility relocation; potentially moderate</td>
<td>Decided advantage for transit, but current bus use unlikely to warrant significant investment.</td>
</tr>
<tr>
<td>HOV queue jumps at signalized intersections (6 locations)</td>
<td>As much as several minutes per HOV</td>
<td>Carpool volumes enhance rationale</td>
<td>Good, as above, but inclusion of carpools may limit benefits to buses</td>
<td>Slight delay for non-HOVs</td>
<td>A good first step for carpool and transit priority; can be implemented piece-meal.</td>
<td>Enforcement may be required at least initially</td>
<td>Cost depends on pole, utility relocation; potentially moderate</td>
<td>Positive for HOVs and buses; design to minimize delays for others. Consider supplementing with Carpool Parking Lots in the western portion of the corridor.</td>
</tr>
</tbody>
</table>

### Highway 16 (East) from Highway 21 to 97 St NW

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Travel Time Savings</th>
<th>Person Throughput</th>
<th>Bus Operations</th>
<th>Impact on Traffic Operations</th>
<th>Strategic Planning</th>
<th>Usage / Enforceability</th>
<th>Cost-Effectiveness</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOV 2+ Lanes (converted W of 50 St; added E of 50 St)</td>
<td>Potentially significant for HOVs</td>
<td>Unlikely to exceed 0.5 due to lack of transit</td>
<td>iv/a</td>
<td>Loss of traffic lane may accentuate congestion at peak times</td>
<td>Potentially connected with Hwy 16 West treatments to provide spine across region. Can use HOV as an interim plan pending freeway completion.</td>
<td>Converted lanes need 25 to 30% of all traffic to be HOVs; actual volume likely closer to half that, which translates to lane underutilization and enforcement issues.</td>
<td>Conversion is low cost but widening much higher, relative to demand.</td>
<td>Little merit in pursuing at this point, without transit presence. Corridor should be monitored for operational performance and future HOV potential.</td>
</tr>
<tr>
<td>Westbound HOV queue jump at 66 St</td>
<td>Moderate for HOVs; unlikely great enough (&gt;5&quot;) to trigger mode shift</td>
<td>Unlikely to exceed 0.5 due to lack of transit</td>
<td>iv/a</td>
<td>Loss of traffic lane likely to accentuate congestion at peak times</td>
<td>Can use as an interim measure pending conversion of intersection to full interchange</td>
<td>Site-specific situation is easily enforceable.</td>
<td>Relatively low cost; flexible application (peak period peak direction rather than 24/7)</td>
<td>Potentially useful standalone piece as interim measure, but would only make sense as part of a broader regional HOV initiative because time savings is not great enough to impact mode choice, particularly with no transit option.</td>
</tr>
</tbody>
</table>
7. Recommendations

7.1 Conclusions re: HOV / TPM in Capital Region

In a broader sense, this study helps demonstrate the merit of HOV and Transit Priority Measures within a multimodal regional transportation context, and highlights the ways in which a variety of physical and operational treatments in specific corridors can work with bus operations, employer-based Transportation Demand Management initiatives, and governmental policy directions to promote and support the most efficient and effective use of limited transportation infrastructure. Government authorities are encouraged to continue to work to embed such thinking in official planning documents and practices.

Responding to Growth

Inasmuch as the Capital Region is continuing to grow and change – with significant population growth anticipated over the coming decades – the pressure on its transportation system will not abate and it will be increasingly important to make the greatest possible use of existing infrastructure as part of a multimodal solution. For roads, this point inherently directs policy-makers to higher-occupancy vehicles (buses and carpools) which can move more people in less space and in less time than private single-occupant autos are capable of in a constrained environment.

Shaping Travel Demand

Efforts to influence travel demand towards shared-ride modes and to optimize use of transportation infrastructure thus reflect the values and policies of the Regional planning framework, and are consistent with the approaches taken by other metropolitan regions of comparable size and structure. Other regions (Toronto, Calgary, Vancouver, etc.) are further advanced than the Edmonton region in terms of applying these policies, and there is a rich worldwide menu of HOV and TPM projects in operation to emulate and learn from. The Capital Region transportation agencies can learn from Best Practices elsewhere and shape them to reflect the immediate needs and opportunities of the Edmonton area.

Building a Flexible, Evolving, Multimodal Transportation System

HOV and TPM initiatives are complementary to, rather than competitive with, Edmonton’s LRT plans. As illustrated in the Toronto area, transit priority can play a vital role in building demand and moving people in a corridor as a precursor to LRT implementation; it is important to consider that although specific techniques may evolve over time (e.g. from HOV lanes to bus lanes to LRT) they are all manifestations of the same principle of public transit being prioritized over private auto use of public transportation corridors.

A Strategic Approach

As a basis to move in this direction, this study does observe that the demand for intermunicipal transit service in the Capital Region is relatively low at present, with service in several corridors running at four buses per hour or less in peak directions during weekday peak periods (although the study has identified three corridors with notably higher bus volumes). In such corridors, it is difficult to rationalize investing significant capital for transit priority when
Demand is only a fraction of the total traffic capacity. This is where HOV facilities have the potential to expand the shared-ride market while providing transit priority in the process; carpools typically already make up 10% - 15% of the demand so that provides a stronger base to work from. The other strategic direction is to continue to implement infrastructure and services that builds the transit market – park & ride lots, more frequent services, consolidation of routes, employer-based Transportation Demand Management programs, coordination between public and private operators – so that it becomes easier to implement TPMs as just one piece of an integrated puzzle rather than as standalone and isolated measures.

It is important to focus the Region’s investments in HOV / Transit priority. Since a key driver of mode choice is travel time savings and reliability, and research demonstrates that a 5 – 10 minute threshold of time savings is required to initiate mode shift, an effective HOV / TPM program uses a “whole of corridor” strategy; an investment in six TPMs working together in a single corridor to create a ten-minute travel time advantage is more likely to be effective at impacting transit mode choice than building those same six TPMs to create a 1.5 minute advantage in each of six separate corridors. A single strong pilot project corridor then creates the confidence among the public, agencies, and elected officials that supports moving forward with more investment, whereas a scattering of only moderately useful investments never gets to that critical mass.

A Practical, Cost-Effective Approach

While cost-effectiveness is always a significant measure, careful and strategic implementation of HOV / TPMs need not be particularly (incrementally) costly. Redesignation of existing traffic lanes to HOV or Bus use during peak periods can be done with signage and pavement markings; intersection queue jumps require only focused site-specific changes; bus-on-shoulder facilities are less costly than a new lane; and even new HOV lanes can often be created at minimal net new cost by adapting a previously committed road widening program. All of the HOV / TPMs investigated in the current study reflected this focus on practical, low-cost strategies.

HOV / TPM in the Bigger Picture

In terms of the overall impact on transit use, mode choice, and economic competitiveness of implementing HOV / TPMs in selected intermunicipal corridors, the numbers suggest a minor-to-moderate positive impact. Simply put, the number of people using these particular corridors during peak periods as a proportion of the entire Edmonton Region multimodal transportation demand is relatively small, and the fraction of those corridor users who will be affected by and benefit from the suggested measures is also a minority. These measures on their own do not propose to overturn the current and future preponderance of single-occupant car and truck use in the regional transportation system. And although current transit riders and carpoolers would benefit from a 5 or 10 minute improvement in their commute time, the investment in priority measures will not change their already-established mode choice; it is primarily aimed at attracting today’s auto users and shaping the travel habits of a generation of future commuters.

Governmental investment in road infrastructure to date has also kept reasonable pace with demand, such that the Edmonton region does not face crippling large-scale congestion problems. Certainly, some corridors and locations experience traffic delays during peak periods, and this affects cars, buses, and carpools equally. But the recent economic downturn actually creates an opportunity to implement HOV / TPMs with less disruption than during busier periods of the recent past, and history demonstrates that the region will indeed become more congested as the recovery continues.

Going forward, broader decisions related to land use, density, growth, transit service frequency and orientation, and investment in general road improvements (including tolling) will influence travel patterns on a larger scale than a set of bus queue jumps. Many other factors will also affect the transit and ridesharing market now and over the coming decades, such as changing fuel prices, house prices, the nature of employment with the rise of telecommuting and
flexible working hours and locations, the use of social media (particularly in ridesharing, where apps such as Uber are tapping in to and expanding the carpool market in a disruptive and significant way), lifestyle decisions (e.g. to not buy a car), advances in technology (e.g. self-driving cars, “smart” roadways, safety systems), and fluctuating economic conditions.

Manage for Success

Once established, HOV and TPM infrastructure is an ideal platform to continue to manage use in sync with changing demands. A general traffic lane is always free, always open, and essentially uncontrolled; an HOV or transit facility can be managed by access control, type of user, time of use, price of admission, and conditions of use. It can evolve over time to adapt to new situations. Being restricted in its use, it is well-suited to performance monitoring that supports today’s data-driven analytic processes. It is an adaptable, flexible tool in the transportation management toolkit, in a world that increasingly demands such flexibility from its infrastructure systems.

A Commitment

In this context, investment in HOV / TPM to support intermunicipal transit in the Edmonton Region may be seen as an entirely reasonable thing to do, to increase system operational flexibility, to increase the capacity of constrained corridors to carry people under changing and evolving circumstances for years to come, to undo the fixed tie between “traffic” demand and road capacity, to target investments in areas that will benefit the most people, and to point to where trends in other aspects of society are already going. If a commitment to further investment in HOV / TPM is not made at this time, opportunities will be missed (e.g. widening roads for general traffic purposes rather than HOV) and the ultimate need to shift towards more transit and private rideshare use (per the Regional Plan) will not go away – it will just become more difficult to achieve as corridors become more physically constrained, as general traffic demand grows, and one more generation enters the commuting world with an assumption that driving alone is the default.

More To Do

Regional stakeholders consulted with over the course of this study identified several additional corridors and situations that were, unfortunately, out-of-scope for the funding and schedule currently available. The use of HOV/TPMs as interim measures in corridors slated for future LRT lines is one example of such suggestions. Furthermore, more detailed investigation of each of the corridors studied would reward agencies with greater insight as to the ways bus and carpool priority can be implemented in a cost-effective and strategic manner. This study is therefore not the end of the process, but the beginning of a long-term effort to embed priority for higher-occupancy vehicles in the Capital Region road system.

7.2 Summary of Corridor Recommendations

Within the scope and level of detail of the current assignment, as summarized in the preceding sections and in Table 6.2, and considering input from stakeholders, the following is a summary of HOV and TPM recommendations for the seven intermunicipal corridors investigated.

It is recognized that all of the proposed initiatives will require additional planning, design, and operational study, along with institutional and stakeholder buy-in. These are intended to be relatively simple, low-cost, near-term, achievable projects that can set the table for future more extensive interventions. It is assumed that basic day-to-day initiatives such as signal timing coordination, transit signal priority, effective signage and geometric design will continue to be carried out by the appropriate authorities; such efforts are not highlighted here as “new” work.
Highway 2 (QE2 Highway) from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW:

- Park & Ride lots. Carefully design and select locations to enhance access.
- HOV 2+ Lanes. Convert existing median lane in each direction to 24/7 HOV operation.

Baseline / 98 Ave from Highway 21 to 85 St NW:

- HOV 2+ lanes, from Highway 21 to 50 Street. Convert median lanes each direction to peak-period / peak-direction operation.
- Park & Ride lots. Select locations at each end of the corridor and study to assess impacts.

Wye Road / Sherwood Park Freeway from Highway 21 to 83 St NW

- The parallel Baseline / 98 corridor presents a stronger near-term case for HOV / TPM than Wye / Sherwood Park
- HOV 2+ lanes, from 34 Street to Ordze Road. Convert median lane each direction to peak-period / peak-direction operation.
- Bus queue jumps eastbound into the Park & Ride lot at Ordze Road and on 82 Avenue at 71 and 75 Streets.
- As an initial measure prior to HOV lane implementation, consider bus-on-shoulder operations between 17 and 50 Streets.

Highway 15 from Fort Saskatchewan to Clareview LRT Station (137 Ave NW)

- Park & Ride lots near Anthony Henday Drive
- Not enough bus or HOV demand at present to warrant significant widening needed to create continuous bus or HOV lanes
- Seriously consider peak-period / peak-direction HOV lanes when Highway 15 is widened in the future
- Monitor traffic conditions to reassess rationale for an HOV queue jump at congestion spots

Highway 28 / 97 St NW from Township Road 544 to 118 Ave NW

- Add Park & Ride lots on Highway 28. Study for best locations and benefits to transit ridership.
- Improve design of bus lanes on 97 Street and extend farther north. HOV designation would counteract transit benefits and is not recommended.
- Expand hours of bus lane operation and consider permanent 24/7 designation, which would permit stronger markings and segregation from general traffic, for self-enforcing operation
- Signal priority for buses. Study to determine probable effects on traffic in corridor and on cross streets.

Highway 16 and 16A (West) from Stony Plain (Highway 779) to 97 St NW

- HOV queue jumps at six signalized intersections, supplemented by carpool lots at interchanges west of Anthony Henday Drive (as far west of Hwy 770)

Highway 16 (East) from Highway 21 to 97 St NW

- Monitor for operational performance and future HOV potential; no near-term HOV / TPM investment
- Consider implementing carpool lots in the corridor.

### 7.3 Pilot Project

Of the six corridors in the study area, Highway 2 (QE2) is the strongest candidate for a pilot project based on the following factors:

- Stakeholders indicated that this corridor is deserving of HOV / transit priority treatment owing to its connection to Edmonton International Airport.
- Although the industrial / commercial park at Nisku has lost jobs in recent years, communities along the corridor in southern Edmonton and Leduc County are projected to add significant population and employment over the next decade.
- The existing highway lends itself well to median-lane HOV conversion.
- The corridor sees traffic at all times of day and a fair bit of reverse commuting. Reviewing Park & Ride lot opportunities and developing Park & Ride lot operation at both ends of the corridor would facilitate transit use in ways that are impossible now.
- The effect of travel time savings for buses, carpoolers, and airport-related vehicles could serve as a template for building HOV and transit demand in other corridors around the region.
- The scale of the project is large enough to establish some visibility for HOV within the Capital Region, to build support for similar initiatives elsewhere in the Region.
- The project has relatively low capital cost and little risk; if HOV lanes prove to be a problem, they can be managed through tweaking eligibility criteria and hours of operation, and if necessary can revert to general traffic use.
- Previous high levels of congestion on Highway 2 have dissipated with recent economic conditions; the current era presents a unique opportunity to implement low-cost converted HOV lanes without significantly impacting existing (lower-volume) traffic while being in a position to function well if/when demand returns in the future.
- An HOV facility would reach every potential market segment (scheduled public transit, reverse commuting, park & ride users, rural-to-city commutes, private carpooling, private shuttle bus and taxi services) and provide a rich situation for performance monitoring and analysis, as input to future HOV / TPM initiatives in the region.

Alberta Transportation, as the agency responsible for Highway 2, will be the key stakeholder in this initiative. The concept needs additional more detailed study to move towards implementation.

In addition to the Highway 2 initiative, this study highlights the potential role Park & Ride lots can play when strategically located in high-volume corridors, by providing a focus for intercepting external trips, facilitating private ridesharing, and supporting intermunicipal transit use. All of these results help build transit / HOV support in a corridor, even prior to or in the absence of dedicated linear facilities. In many cases, informal Park & Ride lots are already on the ground. Accordingly, it is recommended that a Park & Ride lot strategy be developed and pilot projects selected within that; each of the corridors highlighted in this study demonstrate opportunities for such lots.
Appendices

Appendix A: Stakeholder Consultation

Appendix B: Case Study Background Information

Appendix C: Corridor Information

Appendix D: Traffic Observations
Appendix A:

Stakeholder Consultation
Telephone Interviews

Stakeholders were selected on the basis of being representative of provincial and municipal governments, transit authorities, and elected offices. CRB Project Manager, Neal Sarnecki, initiated the consultation process with an email to stakeholders (see Appendix A.1), informing them about the study, and advising them that they would be contacted and interviewed in the near future. A comprehensive fact sheet (also in Appendix A) was provided to these stakeholders to share background information pertaining to the study.

After stakeholders had the opportunity to become familiar with the study via the fact sheet, individual teleconference interviews were held with 16 stakeholders who expressed interest and agreed to participate in the study. Four more stakeholders were not able to be reached by phone after multiple tries; however, three of them attended the stakeholder workshop in May.

AECOM staff contacted the following stakeholders between March and May 2016 to gather information regarding the six study corridors, transit priority measures / HOV, and input into identifying potential transportation improvements and evaluating alternatives. The participant stakeholders included:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Department / Division</th>
<th>Contact Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Alberta Transportation</td>
<td>Strategy and Policy Branch</td>
<td>Orlando Rodriguez, Robert Duckworth</td>
</tr>
<tr>
<td>2 Alberta’s Industrial Heartland</td>
<td>Executive Director</td>
<td>Neil Shelly</td>
</tr>
<tr>
<td>3 City of Edmonton</td>
<td>Transportation Infrastructure</td>
<td>Rob Gibbard</td>
</tr>
<tr>
<td>4 City of Edmonton</td>
<td>Transportation Policy</td>
<td>Sarah Feldman</td>
</tr>
<tr>
<td>5 City of Edmonton</td>
<td>Edmonton Transit Service</td>
<td>Ken Koropeski</td>
</tr>
<tr>
<td>6 City of Fort Saskatchewan</td>
<td>Public Works</td>
<td>Chad Paddick</td>
</tr>
<tr>
<td>7 City of Spruce Grove</td>
<td>Planning and Infrastructure</td>
<td>Patrick Inglis</td>
</tr>
<tr>
<td>8 City of St. Albert</td>
<td>St. Albert Transit</td>
<td>Kevin Bamber</td>
</tr>
<tr>
<td>9 City of St. Albert</td>
<td>Engineering Services</td>
<td>Dean Schick</td>
</tr>
<tr>
<td>10 Leduc County</td>
<td>Community Services</td>
<td>Rick Thomas</td>
</tr>
<tr>
<td>11 North West Redwater Refinery</td>
<td>Transportation Coordination</td>
<td>George Matwychuk</td>
</tr>
<tr>
<td>12 Parkland County</td>
<td>Transit / Engineering Services</td>
<td>Erin Felker, Jody Hancock</td>
</tr>
<tr>
<td>13 Strathcona County</td>
<td>Strathcona County Transit</td>
<td>Wade Coombs</td>
</tr>
<tr>
<td>14 Town of Beaumont</td>
<td>Infrastructure</td>
<td>Kathy Lewin</td>
</tr>
<tr>
<td>15 Town of Morinville</td>
<td>Planning &amp; Economic Development</td>
<td>Tim Vrooman</td>
</tr>
<tr>
<td>16 Town of Stony Plain</td>
<td>Engineering</td>
<td>John Illingworth</td>
</tr>
</tbody>
</table>

When each stakeholder was called, they were asked to confirm the name of their agency and their position or responsibility at it. They were informed that the call would take about 20 minutes, and that we wanted their input on three key areas: the study corridors, transit priority measures / HOV, and identifying and evaluating alternatives.

At the end of the call, stakeholders were told that there will be a follow-up Stakeholder Workshop within the next two months, and that they will receive an invitation when the date, time, and location are confirmed. They were also provided with contact information for the project team, if they wanted to follow up with additional information.

Summary of Recurring Themes

All of the stakeholders contacted said they were aware of the CRB study and had a chance to review the fact sheet before the call. Reactions to the study ranged from enthusiastic to somewhat muted, but all seemed pleased to be included and were happy to discuss transportation issues facing their agency or jurisdiction. Some stakeholders had a lot to say, others had less to say, and others did not return emails or phone messages at all.
The following summarizes recurring themes that emerged from conversations with stakeholders. Detailed summaries of individual comments are provided in Appendix A.2.

**General**

a. There was a consensus that the region is growing, but transit and road construction is lagging behind this growth. Every stakeholder acknowledged the need to address transportation problems now.

b. Very little push-back on the suitability of the corridors in the study, although several stakeholders were surprised that Highway 2 between St. Albert and Edmonton was not included. Whitemud Road was also mentioned as a candidate for study.

c. Consensus that HOV / transit lanes are a good idea, but only if roadways have three lanes in each direction.

d. Most stakeholders looked favourably on transit priority measures, but cautioned to use queue jumps and transit priority signals sparingly, as they can negatively affect cross-street traffic.

e. The main barrier to implementing TPMs on these corridors is not so much resistance on the part of engineers and planners, but lack of funding and sometimes wavering political support.

f. CRB should look at long-range LRT plans and future travel demand before making recommendations about HOV and transit priority.

g. Many stakeholders reported a need for more park & ride lots that eclipses the need for HOV or TPMs.

Stakeholder comments specific to individual corridors have been included in Section 5.1.

**Stakeholder Workshop**

On Thursday, May 26, 2016, a two-hour workshop was held in Edmonton to further engage with stakeholders about HOV and transit priority.

The workshop began with introductions, an overview of the study, and background provided by CRB’s Neal Sarnecki. AECOM then delivered a 20-minute presentation about HOV and Transit Priority concepts. It included measures being considered in the study, how they operate, and examples of cities in which they have been implemented with success. The presentation addressed the six corridors in the study and opportunities and challenges facing each one in terms of HOV and Transit Priority.

Participants then split into two groups for an hour-long discussion of which HOV and Transit Priority measures are right for the corridors being reviewed, and specific locations where they might best be applied. The way in which the groups were split up was loosely based on geography, with one table focusing on the Baseline, Sherwood Park, Highway 15, and Highway 16 East corridors, and the other table focusing on Highway 28, Highway 16 West and 16A, and Highway QE2.

Participants were encouraged to think about constraints and opportunities relating to each corridor being analyzed. Maps and aerial photos of the corridors were provided, and the discussion at each of the two tables was facilitated by a member of the study team. Stakeholders’ comments were written down by another member of the study team.

Finally, participants came back together as one group to reveal what was discussed in their breakout session.
Stakeholders participating in the workshop included:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Department / Division</th>
<th>Contact Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Alberta Transportation</td>
<td>Strategy and Policy Branch</td>
<td>Orlando Rodriguez</td>
</tr>
<tr>
<td>2 City of Edmonton</td>
<td>Transportation Policy</td>
<td>Sarah Feldman</td>
</tr>
<tr>
<td>3 Edmonton Transit Service</td>
<td></td>
<td>Ken Koropeski</td>
</tr>
<tr>
<td>4 City of Fort Saskatchewan</td>
<td>Public Works</td>
<td>Chad Paddick</td>
</tr>
<tr>
<td>5 City of Leduc</td>
<td>Leduc Transit</td>
<td>Kevin Wenzel</td>
</tr>
<tr>
<td>6 City Councillor</td>
<td>City Councillor</td>
<td>Dana Smith</td>
</tr>
<tr>
<td>7 City of Spruce Grove</td>
<td>Planning and Infrastructure</td>
<td>Patrick Inglis</td>
</tr>
<tr>
<td>8 City of St. Albert</td>
<td>St. Albert Transit</td>
<td>Kevin Bamber</td>
</tr>
<tr>
<td>9 Next Generation Transit</td>
<td>n/a</td>
<td>Hameet Sandhu</td>
</tr>
<tr>
<td>10 Parkland County</td>
<td>Transit / Engineering Services</td>
<td>Erin Felker</td>
</tr>
<tr>
<td>11 Strathcona County</td>
<td>County Councillor</td>
<td>Brian Botterill</td>
</tr>
<tr>
<td>12 County Councillor</td>
<td>Transit</td>
<td>Lindsay Radford</td>
</tr>
<tr>
<td>13 Capital Planning and Construction</td>
<td></td>
<td>Steven Johnson</td>
</tr>
<tr>
<td>14 Sturgeon County</td>
<td>General Manager Integrated Growth</td>
<td>Susan Evans</td>
</tr>
</tbody>
</table>

Comments Received

The following is a summary of comments received from stakeholders at the workshop, organized by corridor.

1. General
   a. Factor in employment areas: Where are people going to work? Check the GP policy.
   b. Traffic variability affects transit reliability.
   c. For new roads (e.g. 628), design with HOV and transit priority in mind.
   d. How do transit exchanges fit into this study? They seem less like a TPM and more like an amenity.
   e. How do bus-on-shoulder operations work at high speeds on approach to interchanges? Is the interchange modified, or does a merge occur? Merging buses and cars at high speeds on a freeway could be dangerous.
   f. For the evaluation framework, what does the level of service need to be to warrant a transit priority measure?
   g. Understanding the Growth Plan is critical to modelling and planning these potential changes.
   h. Are there planned improvements for which HOV and TPM changes could be implemented concurrently?
   i. The main evaluation criteria should be: Does HOV / TPM fit in a corridor, and does it not interfere with traffic?
   j. Generally, it takes at least 5 minutes of travel time savings for people to consider carpooling.
   k. Queue jumps: concerned about safety for right-turning vehicles.

2. Sherwood Park Freeway / Wye Road
   a. Portions of Sherwood Park Freeway would be good for HOV lanes.
   b. Does HOV gain or lose efficiency when a road has many signalized intersections?
   c. HOV seems to make less sense east of Ordze.
   d. West of Ordze, from 17 to 50 Street, bus-on-shoulder operations could work. Safety issues?
   e. A queue jump lane might work, eastbound into the P & R lot at Ordze.
   f. Opportunity for queue jumps on 82 Avenue at 71 and 75 Streets. Plenty of space.
g. Turning right from 82 Ave onto 75 St (westbound), the turn is not channelized. So buses would be turning with cars, which would defeat the purpose of a queue jump lane. Right turn lane often backs up here.

h. Westbound, west of 75 St, congestion gradually builds. This segment is where TPMs would work best. Much of the congestion is due to left-turning vehicles. So with the constraint of no left-turn lanes, TPMs may not be effective. Lots of signals, but left-turn lanes are needed before any TPMs should be considered.

i. 79 St: left-turn issues to local roads.

j. From 81 St on, the corridor is constrained. Could possibly use the service road for through traffic, if there wouldn’t be too great an impact on residential traffic.

k. West of 95 St, lots of signalized intersections. Future LRT corridor.

l. Sherwood Park freeway is six lanes, so it’s possible to have a dedicated transit lane here.

m. Potential for transit exchange at Bonnie Doon.

3. Baseline Road / 98 Avenue

a. Most of Strathcona County’s commuter buses run on Baseline.

b. It’s a minimum of six lanes all the way out to Highway 21. HOV is possible; but how would it affect signal phasing?

c. Support among the group for HOV 2+ during peak periods in this corridor. They believe it is feasible from Highway 21 to 50 St.

d. There are a number of studies coming up looking at several intersections in this corridor.

e. The Valley Line LRT will be complete in 202, and the Festival Line will be constructed after that. How will this affect bus service in the corridor? What will bus route connections with LRT stations be like?

f. There is a lot of congestion around Baseline & Broadmoor, which creates delays for transit. A queue jump would help here. But the traffic queues can be very long, even backing up to the previous intersections on Baseline. So the question becomes: how far does a queue jump lane extend back before you consider it a bus-only lane?

g. HOV and transit priority might help create a mode shift on Baseline; more so than on Wye Road.

h. The primary factor for creating a mode shift to transit on Baseline is significant time savings. More than cost or reliability or any other factor. There’s still very much a car-centric culture in Edmonton, so the best way to get people on transit is to make it competitive in terms of time savings.

i. Reliability is the top problem for transit in this corridor, but much of the delay is due to construction.

j. Evaluate each intersection in this corridor for a transit priority signal. West of 50 St., signal priority would be most helpful.

k. Baseline would be a good LRT corridor in the future.

l. Strathcona County already has bus ramps to highways and special bus access to P & R lots.

4. Highway 15


b. Transit delays are all incident-based along here. One lane each direction for part of the corridor, so when there’s a crash or breakdown, everything sops.

c. Currently, there are no detours or other contingency plans in place for transit for when there is an incident.

d. Although transit is inbound AM and outbound PM, there is much reverse commuting for drivers of cars and trucks.

e. Intersection improvements are planned for the intersection of Hwy 15 & Hwy 37, as well as for the bridge over the N. Saskatchewan River. But it’s difficult to say when the construction will begin and end.

f. If widening and other improvements happen on Hwy 15, bus-on-shoulder operation would be a good option.

g. HOV would also be good if widening occurs, but adequate enforcement would be necessary.
h. Any TPMs on Hwy 15 are contingent upon much-needed infrastructure improvements along the entire corridor.

5. Highway 16
a. Constrained infrastructure.
b. Two lanes only outside Edmonton. Plans to widen are in place; AT has already done a study of improvements.
c. Strathcona County has talked about eventually adding bus service on Yellowhead Trail, but traffic is too heavy and service would be unreliable.
d. The issue here is the variability of traffic. This is where bus-on-shoulder operation would be useful.
e. HOV makes more sense than TPMs along this corridor, since there are no buses running presently.
f. Not much merit for HOV or transit on Hwy 16.
g. Consider leaving Hwy 16 for goods movement and making 16A the commuter corridor.
h. Trucks are not allowed in the left lane (the “fast” lane) on Yellowhead Trail.
i. Signals within city limits make for good queue jump opportunities.
j. Need a high-functioning 16A (with rail overpass) at 60.
k. North-south rail crossing is a key issue in the west end.
l. Trucks are permitted in all lanes at signals. They are very slow and move off the stop bar too slowly.
m. Better tie-ins to transit hubs?

6. Highway 28 / 97 Street
a. Replace this corridor in the study with St. Albert Trail. Hwy 28 is not an intermunicipal priority.
b. Hwy 28 not as important as St. Albert Trail or Hwy 15.
c. 97 St can be congested; but outside the city limits, there is less traffic and a more rural character.
d. 97 has much bus service, would benefit from TPMs.
f. Lots of potential north of 137 Ave, but what is the demand?
g. SB left onto 137 Ave is an issue, but no demand NB.
h. Signal priority south of 137 Ave has been modelled by U of A. Looking to invest in that (quickest win).

7. Highway QE2
a. Corridor Improvements Study currently underway.
b. Key issue: how can Alberta Transportation commit to this?
c. Many employment centres along here. Plans exist for future development around the airport, including an outlet mall, Aerotropolis, and Port Alberta.
d. Massive business park in Nisku. Severely congested in the past, but 1/3 of jobs have been lost. Currently an opportunity for improvements, owing to decrease in congestion.
e. Reverse commutes are common. More transit needed in both directions, all times of day.
f. Recommendations should consider TDM, Park & Ride lots, and carpool lots.
g. Fare integration is important – riders on Leduc Transit transfer to ETS and vice-versa. Would make commutes more convenient.

8. Pilot Project. From an intermunicipal perspective, pilot projects would be best on:

• Hwy QE2
• St. Albert Trail
• Baseline (as a precursor to or in place of LRT)
Appendix A.1:
Good afternoon,

As you may be aware, the Capital Region Board (CRB) has begun a study to develop and evaluate alternatives for high-occupancy vehicle (HOV) lanes and Transit Priority Measures (TPM) on selected intermunicipal transportation corridors in the region.

Please see the attached PDF. It’s a fact sheet that serves as an introduction to this study. In it, you will find information about the corridors under review, the types of Transit Priority Measures being considered, the criteria that will be used to determine the appropriateness of these measures, and more.

The goal of the study is to produce a set of alternatives for HOV and Transit Priority that will be recommended for approval and implemented over time. But, to accomplish this, we need your help.

That’s why members of the study team will be reaching out to each of you over the next few weeks. We want to get your views on HOV and TPM concepts, how they should be evaluated, and whether they are suitable for the Capital Region.

After you’ve read the fact sheet, think about the issues that are most important to you and your municipality/agency:

Which Transit Priority Measures would you most like to see implemented, and where? What combination of measures will produce faster, more reliable transit? Which measures do you expect to be well received by decision-makers and the public? How can the region claim a larger mode share for transit? Which corridor should be chosen for a pilot project?

Staff from AECOM, our study consultant, will be contacting you soon to set up a phone interview, to discuss these and other relevant topics. The interview should take about 20 minutes.

The purpose of this study is to open a dialogue between CRB and regional transportation stakeholders, so that we can make the best recommendations to influence policy and help move transportation forward in the Capital Region. Thanks in advance for your participation in this important study!

Cheers!

Neal Sarnecki  
RPP, MCIP  
Manager, Regional Projects
High Occupancy Vehicle (HOV) Transit Priority Study

Capital Region Studying HOV, Transit Priority for Edmonton-area Roadways

The Capital Region Board (CRB) has begun a study to develop and evaluate alternatives for high-occupancy vehicle (HOV) lanes and Transit Priority Measures (TPM) on selected intermunicipal transportation corridors in the region.

Part of the study’s effort also includes gathering input from regional stakeholders about potential transportation improvements. CRB will reach out to transit service providers, local planning departments and elected officials, and other interested parties in the region to discuss HOV and TPM concepts and whether they are suitable for the Edmonton area.

HOV lanes and Transit Priority are not new technologies, but they would be new to the Capital Region corridors for which they are being considered. In the 10-year timeframe, they include QEII Highway, Baseline Road / 98 Avenue, and Wye Road / Sherwood Park Freeway. Corridors being studied for HOV and Transit Priority in the long-term include Highway 15, Highway 16 / 16A, and Highway 28 from CFB Edmonton to Downtown.

Transit Priority Tools Being Studied:

- HOV Lanes
- Bus-Only Lanes
- Bus-on-Shoulder Operations
- Dedicated Bus Ramps to Highways
- Transit Priority Signals
- Queue Jump Lanes
- Bus Priority Access to Park & Ride Lots
- Transit Exchanges

This new study supports previous planning efforts such as the Capital Region Growth Plan and the Interim-Regional Transit Network Plan. These documents identified Transit Priority Measures as cost-effective, helpful ways to improve bus service and operations around Edmonton.

One of the challenges facing communities is that planners, decision-makers, and stakeholders need a shared vocabulary to help understand issues and inform the best policy choices. This study will help provide that vocabulary and promote dialogue among groups that have a common interest in moving transportation forward in the Capital Region. The study will define HOV and Transit Priority Measures; create a “menu” of HOV and TPM strategies; develop a framework to evaluate those strategies; apply the evaluation framework to the six identified corridors; make recommendations for implementing HOV and TPMs locally; and select one of the corridors for a pilot project.

Please see the reverse side of this fact sheet for an explanation of how HOV and Transit Priority can be designed to improve transportation in the Edmonton area.
Features of High-Occupancy Vehicle (HOV) Lanes

HOV lanes are a type of restricted traffic lane that only vehicles with multiple occupants are permitted to use. In most cases, two people are required to be in the vehicle, but some jurisdictions require three. Exceptions are often made for motorcycles, electric vehicles, and hybrids. Buses and law enforcement vehicles are, of course, exempt as well. Arterial HOV lanes may also make provisions for cyclists.

Typically, enforcement of HOV lanes is done by spot-checking vehicles in traffic and timing offenders. In many instances, HOV lanes are designated only during peak travel, peak direction times. They are open to all vehicles during non-peak periods and on weekends.

HOV lanes are intended to provide faster and more reliable travel times for buses and carpools. This is an incentive for people to travel in shared-ride vehicles, which allows more efficient use of limited road space. Environmental benefits follow as well.

Although HOV lanes were introduced to Canada in the early 1990s, recent years have seen more advanced versions of the concept. Some cities have protected HOV lanes with separate access and exit points; while others have constructed reversible HOV lanes – inbound in the AM and outbound in the PM. HOV lanes can work together with carpool promotion programs at workplaces.

Types of Transit Priority Measures (TPMs) Under Consideration

This study is also examining ways to improve the speed and reliability of buses in key commuter corridors. There are a number of ways to accomplish this:

- Buses can make use of HOV lanes (as outlined above) or special bus-only lanes could be used. A bus-only lane can be center-running (and even reversible), or curb-running with a route having its own lane in each direction. Another option is to improve the existing shoulder of a roadway and allow buses to travel on it.

- Other time-saving TPMs include giving buses their own access points to Park & Ride lots, and constructing bus-only ramps onto and off of highways.

- Many transit networks have installed technology on their buses that give them priority at traffic signals. A bus fitted with a device can, when approaching a signal that is about to turn yellow, automatically send a signal to the traffic light that maintains the green phase for a few more seconds. After a red light, a bus can be given a head start over general traffic. The system can be modified to allow transit priority only when a bus is running behind schedule, or only during certain times of day.

- And intersections themselves can be modified to give priority to transit, often in the form of queue jump lanes. These are lanes at an intersection in which only buses are permitted to queue up. The traffic signal has a light which allows the bus to enter the intersection before other vehicles – essentially jumping the queue. Giving transit this advantage, especially during peak travel times, helps buses make up for lost time and maintain the schedule.

- All of these TPMs listed here will be evaluated for suitability in the corridors being studied.

Get Involved!

The CRB will be reaching out to stakeholders to gather input about HOV, Transit Priority, and the future of transportation in the Capital Region. To be part of the study, contact us at:

Neal Sarnecki, Manager, Regional Projects
Phone: 780.636.6003
Email: nsarnecki@capitalregionboard.ab.ca

The evaluation framework for this study will be based, in part, on the experience of other North American cities that have already implemented inter-municipal HOV and Transit Priority measures. Case studies will include Vancouver, Seattle, Calgary, San Jose, Ottawa, and Toronto.

During the study process, alternatives for HOV and Transit Priority will be generated. These options will be evaluated based on criteria such as:

- Cost-effectiveness
- HOV annual travel time savings
- Impacts to parking, businesses, property, and streetscaping
- The ability of buses to effectively use HOV lanes and Transit Priority measures
- The impact of HOV and TPMs on general traffic and bus times
- Safety impacts to pedestrians and cyclists
- Enforceability
- Integration of HOV and TPMs into the transportation network (other corridors, Park & Ride lots, etc.)
- Person throughput, or the ratio of people in HOV/buses versus the adjacent general lane
- HOV travel time reliability

<table>
<thead>
<tr>
<th>Sep 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB approves the Integrated Regional Transportation Master Plan (ITMP). The list of 10-year investment priorities in the plan includes Transit Priority on several corridors in the region.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feb 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study begins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mar-Apr 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder consultation and documentation of input from stakeholders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apr 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft report chapters for definitions, overview, and environmental scan of HOV and TPMs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>May 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary evaluation of alternatives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jun 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refine evaluation and draft recommendations; craft pilot project program</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aug 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft final report</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oct 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final report and presentation to Capital Region Board</td>
</tr>
</tbody>
</table>
Appendix A.2:
Initial Contact Date: emailed Ashley Bhatia on Mar 31; she replied right away, asking me to contact Orlando Rodriguez and Robert Duckworth instead. Emailed them both on the afternoon of March 31. Orlando confirmed time on Apr 1.

Date and Time of Interview: Fri, Apr 1, 5 pm Eastern. Orlando and Robert said they work on modelling and have less to do with policy or transit issues; but they answered the questions as best they could from a forecasting/TDM perspective.

1. Corridors

   a. Review the corridors one-by-one as appropriate. They asked where these six corridors came from; were they recommended for study in the 2011 IRTMP?

   b. Do you know of any current problems, or do they anticipate any future problems, in any of the corridors that would preclude recommendations for improvements? No, but they added that HOV lanes work best when there are three lanes in each direction. Some of these corridors have segments that are only two lanes each way, and should probably be removed from consideration for HOV / transit priority.

   c. Do these all seem like corridors that are worthy of evaluation for the study? They would not remove any from the list, but thought it was odd that the corridor between St Albert and Edmonton (Rt. 2, St Albert Trail) isn’t being considered.

2. Transit Priority Measures

   a. Is HOV suitable for these corridors? Certain segments? Generally, yes – as long as they are three lanes each way. No issues with any of the corridors being studied, in terms of suitability for TPMs.

   b. Would traffic or transit operations suffer as a result of HOV in any of these corridors? They would have to run models to determine that.

   c. HOV and TPM types and strategies:

      • In favour of buses in HOV lanes, bus-only lanes, and bus-on-shoulder operations.
      • Transit Priority Signals – Outside of the Edmonton city limits, there are few signals that would be affected by this in these corridors.
      • Queue Jump Lanes – Same thing; would really only apply to corridor segments within city limits.

   d. What specific alternatives would you like the study to evaluate? Recommended that CRB look at future demand in the corridors before making any policy recommendations about HOV, transit priority, higher-order transit, etc. Also suggested we look at long-range LRT plans.

3. Other Comments

   a. Said they would be happy to provide us with traffic and forecast data for our analysis, if we need it.
Initial Contact Date: emailed on Mar 31; he replied within the hour.

Date and Time of Interview: Fri, Apr 1, 12:15pm Eastern

1. Corridors
   a. No issues with any of the corridors.
   b. Do you know of any construction projects, widenings, or other pending improvements? None of the corridors would be affected by planned improvements, in terms of HOV and TPMs. Improvements are already planned for Yellowhead Trail, to convert it into a freeway facility over the next two decades.
   c. Do these all seem like corridors that are worthy of evaluation for the study? Yes, but also look into the Valley Line corridor. LRT is planned, but won’t be built for some time. HOV and TPMs could be helpful in SE Edmonton.

2. Transit Priority Measures
   a. No issues with specific corridors re: TPMs. Much of Sherwood Park Freeway has just been improved. TPMs on Baseline Road would be particularly helpful.
   b. Is HOV suitable for these corridors? Certain segments? If there is space in the roadway, then yes. Problem is that these corridors have high truck volumes, and HOV lanes are a detriment to truck movements. Traffic on Yellowhead Trail (Hwy 16) is 18 percent trucks during peak periods.
   c. Would traffic or transit operations suffer as a result of HOV in any of these corridors? There will be a diversion of traffic into HOV lanes, but also a diversion of traffic onto other adjacent streets.
   d. Would you expect your transit service’s performance to improve with HOV? In time, it will probably increase the mode share for transit. Performance is a more complicated issue.
   e. HOV and TPM types and strategies: He’s in favour of buses in HOV lanes, bus-only lanes, and bus-on-shoulder operations. Transit priority signals and queue jump lanes are okay, but should be used sparingly as they can negatively impact cross-street traffic flow.

3. Other Comments
   a. As Rob is the head of capital planning for facilities in Edmonton, he’ll be an important source for information on upcoming highway construction and improvements in the city. He expressed interest in participating in the study as it moves forward, including the stakeholder meeting.
Initial Contact Date: emailed on Mar 31; replied that afternoon

Date and Time of Interview: Fri, Apr 1, 4:30 pm Eastern

1. **Corridors**
   a. The corridors “look right” to her, but she added that Whitemud Road is also worthy of study for improvements. Also said that LRT won’t come to St. Albert for at least another 10 years, so there should be some examination of potential transportation improvements between St. Albert and Edmonton.
   b. She noted that the study applies more to suburban corridors than the City of Edmonton itself; but that she understands the travel patterns and would like to see a “big mode shift” for suburban Edmonton toward transit.
   c. Sarah’s office doesn’t deal with infrastructure; only transportation policy. This is divided into modelling, monitoring, and policy groups. She is the main P.M. for transit strategy.

2. **Transit Priority Measures**
   a. HOV and TPM types and strategies: No objection to any of the TPM types or possible locations.
   b. Does the Edmonton area already have TPMs in some locations? Yes – said that carpool lanes are already in effect on Hwy 28 and Wye Rd / Sherwood Park Freeway. [I looked on Google Streetview; these roadways do not have markings or signage for HOV lanes. Either the photos are out of date, or she got them confused with other roads that do have carpool lanes.] There is a reversible lane on 97 Street closer to Downtown.

3. **Other Comments**
   a. Fairly quick phone call. She supports the study and would like to participate in the upcoming stakeholder meeting.
Initial Contact Date: emailed on Mar 31; he replied immediately

Date and Time of Interview: Fri, Apr 1, 11:30 am Eastern

1. Corridors

a. Changes in traffic conditions. Highway 2 to Nisku has become much more congested in recent years.

b. Do you know of any construction projects, widenings, or other pending improvements? Work on Hwy 16 to Sherwood Park was just completed in the past year. EIA will almost certainly need new interchanges in the future.

c. Do you know of any current problems, or anticipate any future problems, in any of the corridors that would preclude recommendations for improvements? Question probably better asked of Alberta Transportation.

d. Are these corridors worthy of evaluation for the study? Yellowhead Trail doesn’t make a whole lot of sense—it’s a tight right-of-way, and not a very high priority. Hwy 15 to Fort Sask isn’t too congested. Hwy 28 isn’t really congested until it reaches Edmonton. 50 Street between Beaumont and Edmonton does have congestion issues.

e. How specifically does your transit service (if applicable) interface with these corridors? Not much, actually. Edmonton Transit’s service is mainly in the urban core, whereas these improvements are mostly in suburban parts of the region. However, ETS does run service to EIA, and improvements to Hwy 2 would be of great benefit to ETS vehicles going to and from the airport.

2. Transit Priority Measures

a. Did not take exception to any of the specific TPMs or locations.

b. Is HOV suitable for these corridors? Certain segments? Would traffic or transit operations suffer as a result of HOV in any of these corridors? HOV and TPMs would be of much more benefit to suburban parts of the region than Edmonton itself, but improvements to Hwy 2 would help make ETS service to the airport more reliable.

c. Would you expect your transit service’s performance to improve with HOV? Do you think HOV lanes encourage driving over transit use? Would you expect HOV to negatively affect your ridership numbers? He doesn’t believe TPMs or HOV would have a huge impact on ETS ridership or performance one way or the other.

d. HOV and TPM types and strategies. He thinks the bus-on-shoulder approach could work well; he saw it in operation in Minneapolis. He said that signal priority has already been implemented on 97 Street, and that there are queue jumps at some intersections in Edmonton. In general, would like to see more of these kinds of strategies tried out in the region.

e. Should bus-only lanes be centre- or curb-running? It depends on how they’re designed. Operational safety is the most important thing to consider.
3. **Other Comments**

   a. He’s generally supportive of whatever transit improvements and TPMs the region can afford and implement, but is aware of the reality that lack of funding and sporadic political support often holds these things back. ETS itself lacks the staff resources and funding to do everything it would like to do.
Initial Contact Date: emailed on Mar 31; he replied that afternoon

Date and Time of Interview: Fri, Apr 1, 3 pm Eastern

1. Corridors

   a. St. Albert is a suburb of about 60,000 northwest of Edmonton. It’s an affluent and growing city and requires good connections to Edmonton, where many of the residents work. St. Albert Transit has 21 local circulator routes plus seven commuter routes to Edmonton. There are long-range plans for expansion of the area’s light rail system to St. Albert.

   b. Traffic conditions – Fairly steady in St. Albert itself. No real impact on St. Albert Transit.

   c. Do you know of any current problems, or do they anticipate any future problems, in any of the corridors that would preclude recommendations for improvements? He stressed that more needs to be done to improve transportation in the region. Edmonton is very sprawled out and traffic is getting worse, so it’s good that agencies are taking a long view and look at options that can be helpful in 30 years.

   d. Do these all seem like corridors that are worthy of evaluation for the study? Hwy 16 will be tough to put HOV / transit lanes on because parts are only two lanes each direction. Unless the road is widened, you’d be taking away 50 percent of the roadway for general traffic, and probably end up creating more congestion.

   e. How specifically does your transit service (if applicable) interface with these corridors? It doesn’t. St Albert Transit doesn’t use any of the six corridors. The one closest to the city is Hwy 16.

2. Transit Priority Measures

   a. Is HOV suitable for these corridors? It would be good for some of the corridors, but probably not Hwy 16. St Albert is more interested in transit signal priority and queue jumps than HOV.

   b. Would traffic or transit operations suffer as a result of HOV in any of these corridors? Not in St Albert.

   c. Do you think HOV lanes encourage driving over transit use? Would you expect HOV to negatively affect your ridership numbers? Not really connected.

   d. HOV and TPM types and strategies: He likes all of these options, but mostly would like to see more park & ride lots in rural and exurban areas to encourage people to take transit. This would be of great benefit, especially if buses had their own lanes to run in.

   e. Are there specific intersections or locations where they would not work at all? HOV could be helpful on some of these corridors, but not Hwy 16 as much.

   f. Does the Edmonton area already have signal priority in some locations? If so, does it work well? Yes, and they’re beginning to explore it as an option for St Albert as well.

3. Other Comments
a. St. Albert Transit is a small system, and the corridors don’t pass through the city. But he’s interested in participating in the study and would like to have a say in the outcome.
Initial Contact Date: emailed on Mar 31 and Apr 11, left voicemail. Returned email on Apr 29 to confirm call.

Date and Time of Interview: Wed, May 4, 12 pm Eastern

1. Corridors
   a. Relevant to St. Albert: Highway 16 / 16A and Highway 28 from CFB Edmonton to Downtown: Highway 16 / Yellowhead Trail is often used by St. Albert residents. Hwy 28 less so; however, the completion of the Henday ring road may alter traffic patterns around the region.
   b. Traffic conditions? Locations of congestion/delays? Locals say that congestion is bad on Hwy 2 (St. Albert Trail), but really it’s only the half-hour “peak of the peak” in the morning and afternoon that can be tough. The other 23 hours of the day are generally not congested. Average travel times from the northern part of St. Albert to Hwy 216 (Henday Drive) are 15 minutes inbound in the AM peak and 20 minutes outbound in the PM peak. The distance is roughly 5 km.
   c. Do you know of any construction projects, widenings, or other pending improvements? Transportation improvements in the near term (5 years) for St. Albert involve implementing ITS and improving intersections. They plan to improve signal coordination and give priority to emergency service vehicles. They also want to provide real-time traffic information to drivers so they can make better choices about which routes to take. Intersections will be improved on arterials leading to Hwy 2 (redesign and widening) to accommodate increases in volume.
   d. Any other corridors worthy of evaluation in the study? Surprised that St. Albert Trail wasn’t included; it’s the main road between Edmonton and St. Albert.

2. Transit Priority Measures
   a. Is HOV suitable for the corridors in the study? Yes, but it will take time to catch on and gain acceptance.
   b. HOV and TPM types and strategies: No objection personally to the suggested TPMs, but it’s important to remember that Edmonton is a very car-centric region, and that a lot of convincing will need to be done to make HOV and TPMs happen.
      - Transit Priority Signals – Yes, but maybe only during peak periods

3. Identifying and Evaluating Alternatives
   a. What are the key obstacles you see in creating TPMs? In these specific corridors or Edmonton in general? There is some congestion in the Edmonton area, but he thinks it isn’t bad enough yet to force the mode shift from cars to transit. Not to imply that transit shouldn’t be expanded, but many in the region haven’t yet warmed up to the idea of giving priority to transit over cars.
Initial Contact Date: emailed on Mar 31 and Apr 11; left voicemail May 6. Emailed back on May 9.

Date and Time of Interview: Mon, May 9, 3 pm Eastern

1. Corridors
   a. Relevant to the City: Highway 15. Capacity is good, congestion generally isn’t too bad. But connections between Hwy 15 and roads that intersect with it could be improved.

   b. Traffic conditions? Locations of congestion/delays? Delays are usually incident-based. One problem area is the bridge at Hwy 15 over the N. Sask. River. Hwy 15 drops to one lane each direction SE of the river and doesn’t go back up to 2 lanes each way until west of Hwy 37. This segment can see significant delays during peak periods – as much as 40 minutes.

   c. Do you know of any construction projects, widenings, or other pending improvements? The province is now studying the feasibility of widening Hwy 15 west of Ft. Sask.

2. Transit Priority Measures
   a. Is HOV suitable for Hwy 15? Unfortunately, HOV would only complicate things for this corridor. Only one lane (sometimes two) each way. Also, there is a lot of reverse commuting on Hwy 15 – people from Edmonton going north to work in the mornings.

   b. HOV and TPM types and strategies to evaluate: HOV and transit-only lanes wouldn’t be of much help; not much transit ridership in this area. Many workers are in trades and have trucks full of tools and other equipment, so transit isn’t useful to them. Park & ride lots, however, are appealing for those who do commute to Edmonton.

3. Identifying and Evaluating Alternatives
   a. What other issues or alternatives would you like the study to evaluate? Would like more emphasis to be placed on ITS and variable signage that helps people make better decisions when driving. For instance, on occasions when there’s an incident on Hwy 15, it would benefit drivers to see a sign telling them to take Highways 21 and 16 as a detour. Ft. Sask. doesn’t currently have such a system in place, but it would be a great help.
Strathcona County
Transit
Wade Coombs, Director
780-417-7181
wade.coombs@strathcona.ca

Initial Contact Date: emailed on Mar 31; replied that afternoon

Date and Time of Interview: Fri, Apr 1, 3:30 pm Eastern

1. Corridors
   a. Strathcona County, in the suburbs immediately east of Edmonton, has three of the corridors in the study: Hwy 16, Baseline Road / 98 Avenue, and Wye Road / Sherwood Park Freeway. He would also like to see more emphasis placed on improving roads to and from the university (e.g. 82 Ave).
   b. How specifically does your transit service (if applicable) interface with these corridors? Strathcona Co. Transit has local and paratransit service as well as commuter routes into Edmonton. The commuter routes run on Baseline Road / 98 Ave and Sherwood Park Freeway, so the agency has an interest in the outcome of the study.
   c. Traffic on the relevant corridors has worsened in recent years; at times, there has been only one lane running out of the downtown core in the PM peak. He has had to put additional buses into service to increase reliability. So having dedicated lanes for transit or HOV lanes could save his transit agency platform time and money.

2. Transit Priority Measures
   a. Baseline Road / 98 Avenue and Sherwood Park Freeway: Is HOV suitable for these corridors? He “definitely” likes the idea of HOV and transit-only lanes on these roadways, as it would help their transit operations. Inbound AM and outbound PM congestion can make it difficult for their commuter buses to run on schedule.
   b. HOV and TPM types and strategies: In addition to being in favour of HOV / transit-only lanes, he would also like to see more done with signal priority for transit vehicles. Park & ride lots are also a priority for the county; they built a new one in 2014, and already it’s near capacity. LRT is still 20 to 30 years away for Strathcona Co., but in the meantime, he can envision BRT service on the main roads in and out of Edmonton. For that to happen, bus-only lanes would be vital.

3. Other General Comments
   a. Strathcona Co. is growing and demand for transit is expanding along with it. He’s interested in the study because it will help determine the decisions his transit agency makes over the long-term. He expressed an interest in attending the stakeholder meeting.

Forest Yang, Manager of Planning & Customer Service at Strathcona County transit (forest.yang@strathcona.ca; 780-417-7182) was also contacted. He replied via email on Apr 4 to say he didn’t have anything to add beyond what Wade Coombs had already told me.
1. **Corridors**
   
a. Highway 2 (QE2) is the only corridor in the study relevant to Leduc Co. The county is growing, EIA is a huge economic driver, and Nisku has a lot of new jobs. Traffic is growing along with it. Every day there is congestion or an incident that backs things up.

b. Do you know of any construction projects, widenings, or other pending improvements? No. An outlet mall is scheduled to be built near the airport. Won’t affect the roadways, but will add to traffic volume.

c. Do you know of any current problems, or do they anticipate any future problems, in any of the corridors that would preclude recommendations for improvements? Not preclude, but Leduc Co is very much in favour of HOV lanes, transit priority, widening Hwy 2, and anything else that will better accommodate new growth and transit.

d. How specifically does your transit service interface with these corridors? Leduc Transit is a small system that only runs in peak periods. It circulates through Nisku and EIA, and service runs up Hwy 2 to Century Park in downtown Edmonton. The agency is expected to grow and add more routes and vehicles. He is unsure at this time what effect congestion is having on Leduc Transit operations.

2. **Transit Priority Measures**
   
a. Is HOV / transit priority suitable for these corridors? **Definitely would be “fantastic” on Hwy 2.**

b. Would you expect your transit service’s performance to improve with HOV? Yes, especially for the service running into downtown Edmonton.

c. Do you think HOV lanes encourage driving over transit use? Would you expect HOV to negatively affect your ridership numbers? Expects it to encourage transit use. Leduc Co. just completed three new Park & Ride lots to promote transit use in Leduc.

d. HOV and TPM types and strategies. **Approves of buses in HOV lanes, bus-only lanes, and bus-on-shoulder operations. Not much need on Hwy 2 for transit signal priority and queue jump lanes. The county is planning for more Park & Ride lots; any more would be helpful.**

3. **Other Comments**
   
a. He’s generally in favour of improving Hwy 2 to decrease congestion and encourage transit use.

b. Said that EIA has to be a stakeholder in this process; suggested we contact Myron Keane, who handles many transportation-related issues for the airport.
Initial Contact Date: emailed on Mar 31; replied that afternoon

Date and Time of Interview: Wed, Apr 6, 5:30 pm Eastern

1. Corridors
   a. Relevant to the City: Highway 16 / 16A. “Significant issues” with these two roadways. Congestion is mostly inbound AM and outbound PM, but it can be bad anytime day or night. Probably worse during PM peak.

   b. Do you know of any construction projects, widenings, or other pending improvements? Not in Spruce Grove itself. The road system as it is has been in place for some time and traffic circulates well in the town. No plans to widen any collector roads at this time.

   c. How specifically does your transit service (if applicable) interface with these corridors? Spruce Grove has seven inbound buses to Edmonton in the AM and eight outbound buses back to the town in the PM. The commuter service is operated by Edmonton Transit Service. The buses do a figure-eight pattern within Spruce Grove to circulate somewhat within the town, and then run express along Hwy 16 to Edmonton. The service began in 2004 and has become popular; ridership increases an average of 4 percent per year, and now stands at 87,000 riders annually. They are in the process of buying new buses and plan to operate additional routes along 16A. These will also likely be operated by ETS.

2. Transit Priority Measures
   a. 16 and 16A would be fine for HOV, but only if major changes take place. There is simply too much volume now, so an expansion from two to three lanes each way is needed. Also, the closer you get to Edmonton, the more traffic lights there are. If one or both of these roads were made completely limited-access, that would make HOV and transit priority worthwhile, otherwise you’re just dealing with the same issues as before.

   b. Would you expect your transit service’s performance to improve with HOV? Hard to say. ETS operates their commuter buses and getting specific data from them on performance and reliability has been difficult. He rides the routes himself now and then and they seem to operate reliably, but it’s very weather-dependent. HOV / transit lanes would be good for transit, but only if Hwy 16 is widened.

   c. HOV and TPM types and strategies: He’s seen queue jump lanes and transit priority signals work effectively in Calgary, but is skeptical that they would perform as well on Hwy 16. Major changes would have to be made to the design of the roadway for either HOV or other transit priority methods to work properly.

3. Other Comments
   a. He said he’d like to participate in the stakeholder meeting, if he has time.
Initial Contact Date: emailed on Mar 31, wrote back on Apr 6 to confirm interview

Date and Time of Interview: Wed, Apr 6, 3:30 pm Eastern

1. Corridors

   a. Stony Plain is one of the smaller jurisdictions in the region – about 17,000 residents. But it’s growing rapidly, as is all of Parkland County. The only transit service they have is the paratransit Handy Bus. Of the six corridors in the study, only Hwy 16 and 16A are relevant to Stony Plain.

   b. Do you know of any construction projects, widenings, or other pending improvements? In the Alberta Transportation capital plan, the only two roadways in Stony Plain scheduled for improvements are 48 Street and 628. He described the condition of 628 as “brutal”.

   c. How specifically does your transit service interface with these corridors? No current transit service, but the town is planning to conduct a feasibility study for transit. They conducted one 5 to 10 years ago and found that transit wasn’t needed at the time. But the town has grown since then, and reportedly many Stony Plain residents are using Spruce Grove’s commuter buses to get to and from Edmonton. So the town council is looking into the issue again. His personal feeling is that the town is too rural to justify transit, and that most residents prefer to drive; but it won’t hurt to investigate the possibility.

2. Transit Priority Measures

   a. Hwy 16 and 16A: Congestion is a major issue inbound in the AM and outbound in the PM. He described the condition as “gridlock”. Meanwhile, there is little to no traffic outbound in the AM or inbound in the PM. He thought the notion of a centre reversible lane probably wouldn’t go over too well in Alberta.

   b. As for Stony Plain itself, he reported no capacity issues on secondary roads. The main problem for the town is the condition of the roads.

   c. Is HOV suitable for 16 / 16A? Possibly, but the priority is adding another lane. Both roadways are currently only two lanes each way. Increased capacity is needed first; then they can consider HOV or transit-only lanes.

3. Other Comments

   a. He seemed enthusiastic about attending the stakeholder meeting, and is looking forward to being part of the study.

   b. For questions related specifically to transit in Stony Plain, he suggested we contact his colleague, Miles Dibble (m.dibble@stonyplain.com).
Initial Contact Date: emailed on Mar 31; replied on Apr 1, said she’d be in touch next week to confirm

Date and Time of Interview: Wed, Apr 6, 1 pm Eastern

1. Corridors

   a. Highway 16 / 16A is the only corridor in the study that applies to Parkland County, which is in the western suburbs of Edmonton. It doesn’t have the population or density of St Albert or Sherwood Park, but the county is growing fast. Jody lived in Spruce Grove for 12 years and said that, in just the last decade, the population of that town has grown from 17,000 to about 27,000; and neighbouring Stony Plain has gone from 10,000 to 17,000. This has placed a large demand on local roads, especially 16 and 16A, which take commuters to and from Edmonton.

   b. Do you know of any construction projects, widenings, or other pending improvements? There are plans for widening Hwy 16 from 4 to 6 lanes; however, this project is not funded or programmed yet. They said it’s long overdue, as it’s a national road through Edmonton and carries a lot of vehicles. Jody is interested to see what the impact will be of the new ring road, Anthony Henday Drive (Rt. 216), which is almost fully open to traffic. Part of it opened in 2011 and the remainder is set to open this year.

   c. How specifically does your transit service interface with the 16 / 16A corridor? Spruce Grove has a contract with Edmonton Transit Service to run several commuter buses per day to and from Edmonton. But the county doesn’t have a transit service of its own, per se. They are starting a new service at the end of April – six bus trips per day between Edmonton and the Acheson Industrial Area. This will be a reverse-commute service, with buses counter-flowing on Hwy 16A. It’s a 2-year pilot project. They will wait to see how it goes before making any decisions on future transit services.

2. Transit Priority Measures

   a. Hwy 16 is a 110 km/hr freeway, while 16A is 100 km/hr with more traffic lights. HOV would be helpful on Hwy 16, but it’s only 2 lanes each way with many left-hand exits. The road would probably need to be widened to six lanes for HOV to be effective. 16A also has constraints that may discourage the implementation of HOV; more signals will be added to the road in the next 1 to 2 years, which will slow down traffic operations.

   b. HOV and TPM types and strategies: Most of the TPMs being explored in the study do not apply to Parkland Co., as it doesn’t have a transit service. But given the county’s rapid growth, more transit service will have to be considered for the future above the modest amount currently offered. The two items they would most like to see are park & ride lots and transit exchanges. The Acheson industrial area would be a good place to start for those.

3. Other Comments

   a. They are interested in being a part of the study and participating in the stakeholder meeting.
1. **Corridors**
   a. Morinville is a bedroom community of about 10,000 in Sturgeon Co. north of Edmonton. A lot of young families; growing at an annual rate of 2.5 percent. Doesn’t have the major employment or economic drivers of some other towns in the region.

   Highway 28 from CFB Edmonton to Downtown is the only corridor in the study that is used by Morinville residents. Downtown Edmonton is the number one destination for Morinville commuters, followed by the CFB – so Hwy 28 is important. However, residents are as likely to take Route 2 south to St. Albert or drive north toward the oil sands for work.

   b. How specifically does your transit service interface with these corridors? Neither Morinville nor Sturgeon Co. has a transit service as such. Towns in the county sometimes have their own specialized or paratransit service, but that’s all. There are no plans at this time to form a county-wide transit service. Most people in Morinville prefer to drive; a bus service was created a few years ago to St. Albert, but it was discontinued due to low ridership.

2. **Transit Priority Measures**
   a. Highway 28 from CFB Edmonton to Downtown: He would like to see transit service extended farther up Hwy 28 with park & ride lots. It’s easier to imagine Morinville residents taking transit to CFB and downtown Edmonton if they could park their cars and then hop on a bus.

   b. Is HOV suitable for this corridor? HOV / transit lanes would be beneficial on Hwy 28. TPMs under consideration in the study would, in the main, not affect Morinville.

3. **Other Comments**
   a. Reaction to the study and to the HOV / TPM improvements was tempered; a general sense that much of this does not apply to Morinville. However, he is in favour of increased transit and park & ride facilities, and said he is willing to participate in the stakeholder meeting in a few months. Morinville residents do commute to destinations all over the region, and he’d like to be kept in the loop on developments.
1. Corridors
   a. QE2 Highway. Beaumont is a town of 17,000 in Leduc Co., south of Edmonton, east of Nisku and EIA. She estimates that about 8,000 – almost half the town’s population – commutes north to Edmonton every day. Others work in Nisku or at the airport. Some in Beaumont take Hwy 2 for commuting, but the vast majority use Hwy 814 (50 St.) instead. This is not one of the corridors in the study, but it’s a lifeline for Beaumont.

   b. Congestion or delay points? Some delays on Hwy 2 (QE2), but 814 is a bigger issue. There are points where it drops to only one lane in each direction, creating a terrible bottleneck inbound in the AM and outbound in the PM. She would like for Beaumont and Edmonton to collaborate on widening the road, but plans are not yet in the works. It would be “hugely beneficial” for Beaumont to have two lanes each way to and from Edmonton.

   c. How specifically does your transit service (if applicable) interface with these corridors? Beaumont does not have its own transit service, and Leduc County transit does not currently serve Beaumont. Even if Leduc did run service, it would probably be east-west between EIA/Nisku and Beaumont, which wouldn’t help commuters to Edmonton. Strathcona County doesn’t serve Beaumont either (Beaumont is in Leduc Co.), but she would not be opposed to working with Strathcona Transit to expand their service south.

2. Transit Priority Measures
   a. QE2 Highway: Is HOV suitable for this corridor? She would like to see more transit, HOV lanes, and other improvements on Hwy 2; but, again, 814 is a larger concern for Beaumont. She added that, if HOV lanes and more transit were added to QE2, more Beaumont residents would be likely to use that instead of driving on 814.

   b. HOV and TPM types and strategies. She responded very favourably to the idea of increased transit service to Beaumont: LRT expansion “in a perfect world”, but even bus-only lanes and BRT would be helpful. She estimated that a BRT service in a transit-only lane connecting Beaumont with Century Park LRT station would save commuters 10 to 15 minutes per trip, and would be a very popular service.

3. Other Comments
   a. She was enthusiastic about the study and participating in it, and equally enthusiastic about the prospect of HOV and transit priority coming to Edmonton-area roads, particularly ones that extend south to Beaumont.

   b. General impression is that Beaumont is a growing bedroom community with more and more commuters, but it doesn’t have the budget or staff to tackle infrastructure problems on its own. Which is why she’s eager to cooperate with Edmonton, Strathcona Co., and other jurisdictions in solving problems together.
1. Corridors

a. Industrial Heartland is a very large industrial park northeast of Edmonton and Fort Sask. The only corridor in the study that applies is Highway 15, which is the main artery through the complex. It has 7,000 daily full-time staff (management, admin, etc.) with about another 7,000 part-time staff (construction workers, truck drivers, etc.)

The complex does not currently provide transit or a system for encouraging carpooling among its workers; however, it is currently looking into options as employment continues to grow in the corridor. He estimates that about 75 percent of the nearly 14,000 workers come from Edmonton and points south, while the other 25 percent come from around Fort Sask. Reverse commuting is the norm.

Industrial Heartland is planning an O-D survey of employees, which probably will be conducted in May. With this information they hope to put plans in motion for some kind of shuttle service or other private transit system.

b. Anticipation of future transportation needs. One of the largest projects in Alberta is now taking place on the north side of Industrial Heartland – construction of the NW Redwater facility. The number of employees will reach its peak this summer – around 5,000. Redwater will have its own shuttle service; they expect that 75 percent of workers will be bused in and out of the site every day.

c. Are these corridors worthy of evaluation for the study? Hwy 15 should be considered for improvements, at a minimum.

2. Transit Priority Measures

a. Highway 15 – Usually traffic moves pretty well along here; it’s heavy, but not overly congested. Back-ups are common in the PM peak inbound (toward Edmonton). There is also pinch-point at Hwy 28. Where the highway drops to two lanes each way, traffic gets heavier.

b. Is HOV suitable for this corridor? Certain segments? Probably not. Again, most workers reverse commute, and anything that takes away lanes from truck traffic might only make congestion worse. Really it depends on commuters’ willingness to form carpools and use the lanes. He’s more interested in seeing shuttles or a transit service implemented that will ease traffic on Hwy 15.

c. Are there specific intersections or locations where transit priority would work well? Local traffic moves very well in the Industrial Heartland; it’s mainly Hwy 15 that occasionally gets congested. He’s curious to see what the impacts will be from the re-opening of the Henday Bridge, which has been under construction for a few years.
Initial Contact Date: left voicemails on Apr 11 and 29; called back on May 9

Date and Time of Interview: Mon, May 9, 2 pm Eastern

1. Corridors
   a. Relevant to the site: Highway 15 is the road that leads to Redwater; however, the refinery is in a large construction phase through 2017, and the site operates private buses that pick up workers from all parts of the Edmonton area. So transportation issues on all of the corridors actually affect their workforce.

   b. Traffic conditions – congestion and delays? There are significant backups on Hwy 37, which leads to Rt. 643 and the refinery. Most buses come from the Edmonton area; but some come from Ft. Saskatchewan, and there are delays from there as well. A lot of reverse commuting takes place on Highways 15 and 28.

   c. How specifically does the shuttle service operate? They operate 97 buses on 97 routes in the AM from a number of locations around greater Edmonton to the refinery and the same in the PM back to those locations. Coach buses run from 7 am to 5 pm Monday through Friday. Workers swipe their ID on board to ride for free. Their average daily ridership is around 3,100, so each bus carries an average of 16 riders. Workers at the construction site use the “find my bus” page on the refinery’s website (nwrsturgeonrefinery.com) to use the shuttle service. This service is temporary until the construction project is complete in mid-2017. After that, they may continue to run some buses for maintenance crews, but they’re not certain yet.

2. Transit Priority Measures
   a. Is HOV suitable for Hwy 15? Certain segments? HOV and transit-only lanes would be “great” for the region, provided some of the roads were widened.

   b. HOV and TPM types and strategies:
      - Buses in HOV lanes; Bus-Only Lanes; Bus-on-Shoulder Operations; Dedicated Bus Ramps to Highways: Would all be useful to their private shuttle service. But by the time they are constructed, the refinery may not be shuttling nearly as many workers to the Redwater site.

3. Other Comments
   a. The intersection of highway 15 & 28A needs to be safer. The merge is very difficult here; extend the turn lane and speed-up lane.
Initial Contact Date: Sent email on May 4 to request interview. Replied the following morning.

Date and Time of Interview: Thu, May 5, 4 pm Eastern. Wes was in the transit field for 35 years and is now the chairman of the Transit Committee, so he had many candid opinions to share on these matters. He’s very much in favour of implementing HOV, TPMs, and adding more transit in the region. Likes all the options and says it’s good for CRB to “raise the temperature” on these issues now. Especially for St. Albert, since it’s possible that the city may have as many as 100,000 residents in 20 years and the Edmonton region may hit the 2 million mark in 30 years.

1. Corridors

a. Relevant to St. Albert: Hwy 16 and 28. Any other corridors worthy of evaluation in the study? Hwy 28 doesn’t affect St. Albert much. But like others in St. Albert, he’s surprised that Hwy 2 / St. Albert Trail isn’t part of this study. The road is at capacity and “packed” in both peak periods. But he says it’s difficult to expand the road in the town due to space constraints (3 lanes each direction, divided), so other solutions must be devised.

b. Transportation issues most important to constituents in St. Albert? Primarily congestion. There had been plans to extend Ray Gibbon Drive to Hwy 37 and convert it into a bypass around downtown St. Albert, which would’ve added capacity and offered another route for commuters to get to and from Edmonton. But he’s not sure what the timetable is for this now. He cites a poll that says that 80 percent of St. Albert residents understand the need for more transit in the future. Still, he adds that it might be difficult to convince most residents that TPMs are good for the city, as 30 percent of daily auto trips in St. Albert are 5 minutes or less. But he’d like the CRB to highlight the need on a regional level for alternate transportation such as transit and bike lanes, and begin promoting them.

c. What kind of transit improvements would you like to see in St. Albert or in the study corridors? He’d especially like to see plans for the LRT system to be expanded northwest of the city to St. Albert. Apparently this was once in the TMP, but was taken out after some political pressure was applied. Even though plans to expand LRT to St. Albert were 20 years in the future, and even though only 8 percent of residents were against the LRT coming to St. Albert, the plans were scuttled. Many worry about the high cost being pushed onto local residents, and were concerned that taking away two lanes of traffic on St. Albert Trail would only increase congestion.

2. Transit Priority Measures "Edmonton will be more metropolitan if it implements HOV and transit priority."

a. HOV and TPM types and strategies: All of these are “worthy of investigation”.
   - HOV / Transit-only lanes – Yes. People in Edmonton have seen HOV lanes in operation in Vancouver and Toronto, and it would not be a hard sell here
   - Bus-on-Shoulder Operations – Yes. There were plans to do this on Hwy QE2 to and from Edmonton Int’l Airport, but a study “put the kibosh on it”, reporting that the shoulders couldn’t support the weight of buses.
   - Dedicated Bus Ramps to Highways and Bus Priority Access to Park & Ride Lots – Okay
   - Transit Priority Signals – Okay to some degree
   - Queue Jump Lanes – Doesn’t mind them

3. Other General Comments
a. Henday Drive has been a “godsend” for St. Albert – it linked the south part of the town with important destinations, and business development is starting to occur in St. Albert as a result.

b. Alberta Transportation has been a “highways only” agency that regards transit as a municipal thing. They haven’t focused on ITS or TPMs, unless it helps facilitate the movement of trucks. He wants to see this change.
Initial Contact Date: Sent email on May 4 to request interview. Assistant Mike Vivian replied to say Walters would be calling on May 9.

Date and Time of Interview: Mon, May 9, 4:30 pm

1. Corridors
   a. Most relevant to City of Edmonton? He represents South Edmonton, one of the busiest parts of the city; but all six corridors are relevant to Edmonton. The corridor between the University and EIA is some of the “most coveted real estate in the region” and it’s growing rapidly.
   b. Transportation issues most important to constituents in Edmonton? There are two categories of people who talk to him about transportation: 1) those who want Edmonton to build more transit so they can ride it, and 2) those who would never ride transit but don’t mind it being built, as it may lead to less traffic on the roads.
   c. Traffic conditions? Locations of congestion/delays? He speaks of Edmonton’s transportation issues in a big-picture context rather than pointing out individual locations for improvements. Congestion is increasing all over the area, but he wants to see Edmonton thought of as a region instead of individual jurisdictions making transportation decisions independently.

2. Transit Priority Measures
   a. HOV and TPM types and strategies:
      - Buses in HOV lanes – Yes
      - Bus-Only Lanes – Too early for this; Edmonton is still a car-centric place, and shared HOV / transit lanes are more practical at this time.
      - Bus-on-Shoulder Operations – The province currently doesn’t allow this (an old policy based on safety concerns), but it came up as a possibility in their April 20 meeting, and the province may lift this prohibition.
      - Transit Priority Signals and Queue Jump Lanes – These are not new ideas in Edmonton and they may work to some degree in these corridors.
      - Bus Priority Access to Park & Ride Lots – More P&R lots are being built all the time.

3. Other General Comments
   a. CRB’s goal is to build a single regional entity in which land use policies are better integrated with transportation. He wants Edmonton to be less auto-dependent, an idea which is supported in the city’s Growth Plan. The region’s built form needs to change, driven by more infill development and transit, especially LRT.
   b. CRB should push for better fare integration among different transit providers in the region. Make things simpler and more convenient for riders.
Initial Contact Date: Sent email on May 4 to request interview; left message on May 6. Jonathan Milke, administrative assistant, said to speak with Troy Fleming, GM of Infrastructure for the city instead.

Date and Time of Interview: Troy Fleming – Mon, May 9, 3:30 pm

1. Corridors
   a. Relevant to Ft. Sask: Hwy 15. Transportation issues most important to constituents in Ft. Sask? There’s a significant traffic management issue in the city, especially at the intersection of Highways 15 and 37. Most drivers are passing through Ft. Sask on their way to or from work, and it can get very congested around this point.
   b. Traffic conditions? Locations of congestion/delays? Hwy 15 has a bridge with only one lane each direction. Traffic can back up several km on either side of it. The bridge is at capacity – around 23,000 AADT.
   c. What kind of transit improvements would you like to see in Ft. Sask or in the study corridors? The province has agreed to a 3-year plan for the intersection of Highways 15, 37, and 825, which will involve “quick fixes”. They are studying solutions now, but the intersection will probably need a flyover in the long-term.

2. Transit Priority Measures
   a. HOV and TPM types and strategies:
      - HOV lanes and Buses in HOV lanes: These will be productive if the roads are expanded to accommodate.
      - Bus Priority Access to Park & Ride Lots: Ft. Sask has one P&R lot, but would like more in the future.

3. Identifying and Evaluating Alternatives
   a. What other issues or alternatives would you like the study to evaluate? Local transit seems to work well for now in Ft. Sask. Ridership is “okay”. Commuter buses run every 30 to 45 minutes to and from Edmonton, and this “seems to do the trick”.

4. Other General Comments
   a. He would like to participate in the stakeholder workshop on May 26.
Initial Contact Date: Sent email on May 4 to request interview, replied on May 6.

Date and Time of Interview: Mon, May 9, 12 pm Eastern

1. Corridors

   a. Relevant to Leduc: Hwy QE2. Transportation issues most important to constituents in Leduc? The #1 issue for Leduc residents is congestion. 30,000 people currently in Leduc and more development is planned, but the roads can’t keep up. Leduc needs highway improvements and more transit immediately.

   b. Traffic conditions? Locations of congestion/delays? Not just Hwy QE2, but many other roads in the Leduc area are “non-functional”. “Busy all times of day, but especially in the peaks, when there can be gridlock.” The Nisku business park is particularly heavy with traffic.

   c. What kind of transit improvements would you like to see in Leduc or in the study corridors? Leduc City and County have entered into a transit partnership with Edmonton, St. Albert, and Strathcona. They are hoping to increase transit connections between Leduc and other parts of the region. They currently have commuter buses and a circulator service (an internal loop within Leduc), both of which are well used; but they’re looking to add more service and destinations.

2. Transit Priority Measures

   a. Is HOV suitable for Hwy QE2? Yes, but one of the challenges is that there is a lot of reverse commuting from Edmonton to Nisku and EIA, and heavy traffic at all times of day. So the usual rules about inbound AM / outbound PM for HOV don't really apply. She’s in favour of HOV and any TPMs that will help, but adds that HOV will take time to get “buy-in” from the local community.

   b. HOV and TPM types and strategies:
      - Buses in HOV lanes, Bus-Only Lanes – Yes and yes.
      - Bus-on-Shoulder Operations – Province doesn’t allow it, but they’re working to change that policy.
      - Dedicated Bus Ramps to Highways, Transit Priority Signals, Queue Jump Lanes – Yes
      - Bus Priority Access to Park & Ride Lots – They have some now, but could always use more P&R lots.

3. Identifying and Evaluating Alternatives

   a. What other issues or alternatives would you like the study to evaluate? Stresses that fare integration needs to happen to facilitate people’s use of transit. Many commuters in the region are paying one fare for one system and then another when they transfer. She’d like one seamless fare payment across multiple systems, which will make it a lot more convenient for transit users coming from farther outside the city centre.
Initial Contact Date: Sent email on May 4 to request interview. Wrote back within the hour.

Date and Time of Interview: Thu, May 5, 12:30 pm Eastern. Call 780-490-8361

1. Corridors
   a. Relevant to Spruce Grove: Hwy 16. Any other corridors worthy of evaluation in the study? 16 and 16A are priorities, but also Route 628. Spruce Grove would like to see it upgraded to a highway arterial.
   b. Transportation issues most important to constituents in Spruce Grove? Congestion is bad 2.5 hours inbound in the AM, and 2.5 hours outbound in the PM. Even gridlocked for about a half hour in the peak of the peak. Capacity is an issue; residents are clamoring for widening of these roads. Spruce Grove would also like to see transit improvements made to prompt a mode switch for more residents.
   c. Traffic conditions? Locations of congestion/delays? Yellowhead Trail (16) @ Devonian, and Parkland Hwy (16A) to Acheson (second largest industrial park in western Canada), are main areas of congestion. The majority of Spruce Grove residents commute either to Edmonton or Acheson for work, so anything that can remove those pinch points and smooth their commutes would be welcome.
   d. What kind of transit improvements would you like to see in Spruce Grove or in the study corridors? A big part of the problem for Spruce Grove residents is that there is no LRT station on the west side of Edmonton to connect to via bus. Unlike residents of Leduc or Sherwood Park or a number of other locations, commuters west of the city are taking buses all the way into the city centre, which makes for longer travel times. This, combined with the fact that Spruce Grove is much farther out than other Edmonton suburbs (20 km or so), and it’s easy to see why residents aren’t as keen on transit. Spruce Grove has purchased six new commuter buses and they are being used, but he sees an LRT connection on Edmonton’s west side as a big piece of the puzzle.

2. Transit Priority Measures
   a. Is HOV suitable for the 16 and 16A corridors? Yes – “100 percent in favour” of HOV, transit-only lanes, and any other measure that can help Spruce Grove residents to start carpooling or using transit more often.
   b. HOV and TPM types and strategies:
      • Buses in HOV lanes, Bus-Only Lanes, Bus-on-Shoulder Operations – Yes
      • Transit Priority Signals, Queue Jump Lanes – Will have less of a lasting impact, in his view

3. Identifying and Evaluating Alternatives
   a. What other issues or alternatives would you like the study to evaluate? Would like CRB to explore a rural transit strategy. There is a First Nations community 40 km west of Spruce Grove that has little access to jobs in and around Edmonton. The region needs to provide transport link to this community. He understands that this may be more of a provincial or federal issue, but it couldn’t hurt to suggest it in the course of this study.
Initial Contact Date: Sent email on May 4 to request interview. Wrote back within the hour.

Date and Time of Interview: Thu, May 5, 1:00 pm Eastern. He only had 10 minutes to talk, as it’s a busy week for him; but he had reviewed the fact sheet and relayed several items he’d particularly like to see for Strathcona County.

1. Corridors
   a. Relevant to Strathcona County: Baseline / 98 Ave, Wye Road / Sherwood Park Freeway. Of the three corridors in his county, the two that are a priority to him are Baseline and Wye/Sherwood. There are the two that Strathcona Transit uses, so it makes more sense to implement improvements on them. In a perfect world, they would have transit-only lanes during peak periods, but he realizes that the combination Transit / HOV lanes would also be an acceptable improvement over the current situation.
   b. Transportation issues most important to constituents in Strathcona County? Most people are concerned with congestion on roads, but completion of the Henday ring road is expected to solve a lot of traffic problems. He’s less concerned with traffic and more concerned with improving transit and transit facilities in Strathcona County.
   c. What kind of transit improvements would you like to see in Strathcona County or in the study corridors? Strathcona is already making strides: new park & ride lots have been successful, and the county is now putting emphasis on transit routing and accessibility. They are also “hyper-focused” on getting HOV on main arterials.

2. Transit Priority Measures
   a. Relevant to Strathcona County: Baseline / 98 Ave, Wye Road / Sherwood Park Freeway.
   b. Is HOV suitable for these corridors? Definitely. They’re already exploring and planning for this.
   c. HOV and TPM types and strategies:
      - Buses in HOV lanes – Yes
      - Bus-Only Lanes – Preferable, but okay to share with HOV
      - Bus-on-Shoulder Operations – Yes, if it’s safe
      - Dedicated Bus Ramps to Highways – Sure
      - Transit Priority Signals – Yes, would like to see this; or at least better coordination of signals
      - Queue Jump Lanes – Doesn’t think these would be especially helpful
      - Bus Priority Access to Park & Ride Lots – Currently do not have these at park & ride lots, but likes the idea

3. Other General Comments
   a. Very much behind any effort to implement HOV and transit-only lanes on arterials in Strathcona County.
Initial Contact Date: Sent email on May 4 to request interview; replied May 6.

Date and Time of Interview: Mon, May 9, 1 pm Eastern

1. Corridors

   a. Relevant to Sturgeon County: Hwy 28. Transportation issues most important to constituents? Sturgeon's rural roads weren't designed for current volumes. She calls the county "rurban" – it's still rural, but close enough to the city to have urban problems like highway congestion. People are also concerned about safety issues with truck traffic through the county.

   b. Traffic conditions? Locations of congestion/delays? Highways 28 and 28A have some congestion. The intersection of 28 and 37 has back-ups "all the time". She says that Route 44 north also has "very heavy" traffic.

   c. What kind of transit improvements would you like to see in Sturgeon County? Residents of the county are not yet thinking about transit; the character is still too rural and car-centric for most. She added that if more transit would be effective anywhere, it would be to serve CFB Edmonton.

2. Transit Priority Measures

   a. Is HOV suitable for Hwy 28? Although she personally likes the idea of HOV and TPMs, she said that there is "very little buy-in for HOV" in Sturgeon Co. at the moment, and that it may take a few years for people to warm up to it. She added that the county doesn't have a typical inbound-AM / outbound-PM pattern, that many people are reverse commuting from Edmonton to points north of Sturgeon Co.

   b. HOV and TPM types and strategies:
   - Buses in HOV lanes; Bus-Only Lanes – HOV lanes may be effective, but it will take a lot of effort to get people in the county to carpool.
   - Transit Priority Signals; Queue Jump Lanes – Doesn’t apply much at this time.
   - Bus Priority Access to Park & Ride Lots – Transit will work better for Sturgeon Co. if it had more park & ride lots; otherwise the county doesn’t really have enough density to support it. The area north of St. Albert might be a good location for a P&R lot.
Appendix B:

Case Study Background Information

Vancouver / Lower Mainland

Ottawa / Gatineau

Seattle / Tacoma

San Jose / Santa Clara

Greater Toronto
Vancouver / Lower Mainland
## HOV Facilities in Metro Vancouver

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Road</th>
<th>On</th>
<th>From</th>
<th>To</th>
<th>Description</th>
<th>Transit Priority Type</th>
<th>PO</th>
<th>Year</th>
<th>km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burnaby</td>
<td>MRN</td>
<td>Hastings St</td>
<td>Boundary Rd</td>
<td>Cliff Ave</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>Peak periods</td>
<td>1996</td>
<td>9.6</td>
</tr>
<tr>
<td>Burnaby</td>
<td>MRN</td>
<td>Inlet Dr- Barnet Hwy</td>
<td>Cliff Ave</td>
<td>Clark St</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>Peak periods</td>
<td>1996</td>
<td>11.6</td>
</tr>
<tr>
<td>Burnaby</td>
<td>MRN</td>
<td>Willingdon Ave (NB)</td>
<td>Moscrop St</td>
<td>Canada Way</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2000</td>
<td>1.3</td>
</tr>
<tr>
<td>Burnaby</td>
<td>MRN</td>
<td>Willingdon Ave (SB)</td>
<td>Canada Way</td>
<td>Moscrop St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2000</td>
<td>1.3</td>
</tr>
<tr>
<td>Coquitlam</td>
<td>P</td>
<td>Highway 1 (EB / WB)</td>
<td>Port Mann Bridge (mid-span)</td>
<td>Government Street bus-only ramp</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>2012</td>
<td>10</td>
</tr>
<tr>
<td>Delta</td>
<td>P</td>
<td>Highway 17A (NB)</td>
<td>Ladner Trunk Rd</td>
<td>Highway 99</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>1990</td>
<td>2.1</td>
</tr>
<tr>
<td>Delta</td>
<td>P</td>
<td>Highway 99 (NB)</td>
<td>89th St</td>
<td>Highway 17</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>2000</td>
<td>2.8</td>
</tr>
<tr>
<td>Delta</td>
<td>P</td>
<td>Highway 99 On-ramp (NB)</td>
<td>Highway 17</td>
<td>George Massey Tunnel</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>1990</td>
<td>1</td>
</tr>
<tr>
<td>North Vancouver District</td>
<td>P</td>
<td>Marine Dr (WB)</td>
<td>Tatlow Rd</td>
<td>Lions Gate Bridge</td>
<td>Bus-only lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>1.1</td>
</tr>
<tr>
<td>Pitt Meadows</td>
<td>P</td>
<td>Lougheed Hwy (WB)</td>
<td>Meadow Gardens Way</td>
<td>200m E of Old Dewdney Trunk Rd</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>Peak periods</td>
<td>1990</td>
<td>2.75</td>
</tr>
<tr>
<td>Port Moody</td>
<td>MRN</td>
<td>Barnet Hwy</td>
<td>North Rd</td>
<td>St John St</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>AM peak</td>
<td>1996</td>
<td>6.4</td>
</tr>
<tr>
<td>Port Moody</td>
<td>MRN</td>
<td>Clarke St (WB)</td>
<td>Moody St</td>
<td>Barnet Hwy</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>AM peak</td>
<td>1996</td>
<td>1.3</td>
</tr>
<tr>
<td>Port Moody</td>
<td>MRN</td>
<td>St John St (NB)</td>
<td>Clearview Dr</td>
<td>Moody St</td>
<td>HOV lane (2+)</td>
<td>HOV lane</td>
<td>AM peak</td>
<td>1996</td>
<td>1.4</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (NB)</td>
<td>Highway 91 Off-ramp</td>
<td>Bridgeport Off-ramp</td>
<td>Shoulder bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2009</td>
<td>1.5</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (NB)</td>
<td>Steveston Hwy</td>
<td>Westminster Hwy</td>
<td>Shoulder bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>4.1</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (NB)</td>
<td>Westminster Hwy</td>
<td>Bridgeport Rd</td>
<td>Shoulder bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>2.8</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (NB)</td>
<td>King George Blvd.</td>
<td>Highway 91</td>
<td>Shoulder bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2012</td>
<td>6.2</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (SB)</td>
<td>Steveston Hwy Off-ramp</td>
<td>Steveston Hwy On-ramp</td>
<td>Bus/ramp</td>
<td>Bus ramp</td>
<td>24 hr</td>
<td>1980</td>
<td>0.2</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (SB)</td>
<td>Steveston Hwy On-ramp</td>
<td>Massey Tunnel</td>
<td>Bus-only QJL</td>
<td>Bus QJL</td>
<td>24 hr</td>
<td>2008</td>
<td>0.75</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (SB)</td>
<td>Sea Island Way</td>
<td>Westminster Hwy</td>
<td>Shoulder bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>3.5</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 (SB)</td>
<td>Westminster Way</td>
<td>Steveston Hwy</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>2000</td>
<td>3.5</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Highway 99 On-ramp(SB)</td>
<td>Highway 99</td>
<td>Steveston Hwy</td>
<td>Bus-only ramp</td>
<td>Bus ramp</td>
<td>24 hr</td>
<td>2000</td>
<td>0.1</td>
</tr>
<tr>
<td>Richmond</td>
<td>P</td>
<td>Miller Rd (EB)</td>
<td>Airport Station</td>
<td>Moray Channel Bridge</td>
<td>Bus-only ramp</td>
<td>Bus ramp</td>
<td>24 hr</td>
<td>2001</td>
<td>0.1</td>
</tr>
<tr>
<td>Richmond</td>
<td>YVR</td>
<td>Russ Baker Way (NB)</td>
<td>Gilbert Rd</td>
<td>Cessna Dr</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2007/08</td>
<td>0.7</td>
</tr>
<tr>
<td>Richmond</td>
<td>YVR</td>
<td>Russ Baker Way (NB)</td>
<td>Miller Rd</td>
<td>Arthur Laing Bridge</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>2001</td>
<td>0.4</td>
</tr>
<tr>
<td>Surrey</td>
<td>P</td>
<td>Highway 1 (EB / WB)</td>
<td>Port Mann Bridge (mid-span)</td>
<td>202 St</td>
<td>HOV lane (2+)</td>
<td>HOV lane (2+)</td>
<td>24 hr</td>
<td>2012</td>
<td>27</td>
</tr>
<tr>
<td>Surrey</td>
<td>P</td>
<td>Highway 1 (EB)</td>
<td>Port Mann Bridge</td>
<td>~1.3km N of 152 St</td>
<td>HOV lane (2+)</td>
<td>HOV lane (2+)</td>
<td>24 hr</td>
<td>2001</td>
<td>2.4</td>
</tr>
<tr>
<td>Surrey</td>
<td>MRN</td>
<td>King George Hwy (NB)</td>
<td>Hwy 10 (EB)</td>
<td>~210 m N of Hwy 10 (EB)</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2006</td>
<td>0.21</td>
</tr>
<tr>
<td>Surrey</td>
<td>MRN</td>
<td>King George Hwy (SB)</td>
<td>Hwy 10 (WB)</td>
<td>~185 m S of Hwy 10 (WB)</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2006</td>
<td>0.185</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Broadway (EB)</td>
<td>Arbutus St</td>
<td>Clark Dr</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>PM peak</td>
<td>2008</td>
<td>5.5</td>
</tr>
<tr>
<td>Municipality</td>
<td>Road</td>
<td>On From</td>
<td>To To</td>
<td>Description</td>
<td>Transit Priority Type</td>
<td>PO</td>
<td>Year</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>---------</td>
<td>------</td>
<td>-------------</td>
<td>----------------------</td>
<td>----</td>
<td>------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Broadway (E8)</td>
<td>Arbutus St</td>
<td>Clark St</td>
<td>Bus/bike lane</td>
<td>Bus/bike lane</td>
<td>Peak periods</td>
<td>2006</td>
<td>5.5</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Broadway (W8)</td>
<td>Commercial Dr</td>
<td>Arbutus St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>AM peak</td>
<td>2008</td>
<td>6</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Broadway (W8)</td>
<td>Commercial Dr</td>
<td>Arbutus St</td>
<td>Bus/bike lane</td>
<td>Bus/bike lane</td>
<td>Peak periods</td>
<td>2006</td>
<td>6.3</td>
</tr>
<tr>
<td>Vancouver</td>
<td>M</td>
<td>Burrard St (NB/SB)</td>
<td>Burrard Bridge</td>
<td>Pender St</td>
<td>Bus lanes</td>
<td>Bus only lane</td>
<td>Peak periods</td>
<td>--</td>
<td>6.4</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Georgia St (W8)</td>
<td>Denman St</td>
<td>Chilco St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>1980</td>
<td>0.3</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Georgia St (W8)</td>
<td>Nicola St</td>
<td>Denman St</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>24 hr</td>
<td>1980</td>
<td>0.45</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Georgia St (W8)</td>
<td>Burrard St</td>
<td>Nicola St</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>PM peak</td>
<td>1990</td>
<td>0.85</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Georgia St (W8)</td>
<td>Richard St</td>
<td>Burrard St</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>PM peak</td>
<td>2003</td>
<td>0.5</td>
</tr>
<tr>
<td>Vancouver</td>
<td>M</td>
<td>Granville St (NB/SB)</td>
<td>63rd Ave</td>
<td>Milton St</td>
<td>HOV lane (3+)</td>
<td>HOV lane</td>
<td>Peak periods</td>
<td>1990</td>
<td>1.1</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Hastings St (E8)</td>
<td>Boundary</td>
<td>Carrall St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>PM peak</td>
<td>2010</td>
<td>6.6</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Hastings St (W8)</td>
<td>Boundary</td>
<td>Carrall St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>AM peak</td>
<td>2010</td>
<td>5.9</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>McGill St (E8)</td>
<td>Renfrew St</td>
<td>Ironworker Memorial Bridge</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>1993</td>
<td>1</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>Pender St</td>
<td>Cambie St</td>
<td>Howe St</td>
<td>Bus/bike lane</td>
<td>Bus/bike lane</td>
<td>24 hr</td>
<td>1999</td>
<td>3.5</td>
</tr>
<tr>
<td>Vancouver</td>
<td>M</td>
<td>Rupert St (NB)</td>
<td>1st Ave</td>
<td>Graveley</td>
<td>Bus QJL</td>
<td>Bus QJL</td>
<td>24 hr</td>
<td>1993</td>
<td></td>
</tr>
<tr>
<td>Vancouver</td>
<td>P</td>
<td>Stanley Park Causeway</td>
<td>Chilco St</td>
<td>Pipeline Rd Overpass</td>
<td>Bus QJL</td>
<td>Bus QJL</td>
<td>24 hr</td>
<td>2003</td>
<td>0.1</td>
</tr>
<tr>
<td>Vancouver</td>
<td>MRN</td>
<td>SW Marine Dr (W8)</td>
<td>Arthur Laing Bridge</td>
<td>Granville St</td>
<td>Bus lane</td>
<td>Bus only lane</td>
<td>Daytime</td>
<td>2001</td>
<td>0.3</td>
</tr>
<tr>
<td>West Vancouver</td>
<td>MRN</td>
<td>Marine Dr (E8)</td>
<td>Pound Rd</td>
<td>Taylor Way</td>
<td>Bus only lane</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>0.7</td>
</tr>
<tr>
<td>West Vancouver</td>
<td>P</td>
<td>Marine Dr (W8)</td>
<td>Lions Gate Bridge</td>
<td>Marine Dr</td>
<td>Bus lane for N8-to-WB buses</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>1970 (upgraded 2011)</td>
<td>0.1</td>
</tr>
<tr>
<td>West Vancouver</td>
<td>P</td>
<td>Marine Dr (W8) and interchange to Lions Gate Bridge (SB)</td>
<td>Glaia</td>
<td>Lions Gate Bridge</td>
<td>Bus only lane (shared with bikes until interchange)</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>0.1</td>
</tr>
<tr>
<td>West Vancouver</td>
<td>P</td>
<td>Marine Dr (W8) and interchange to Lions Gate Bridge (SB)</td>
<td>Glaia</td>
<td>Lions Gate Bridge</td>
<td>Bus only lane (shared with bikes until interchange)</td>
<td>Bus only lane</td>
<td>24 hr</td>
<td>2011</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: TransLink, Engineering Department (March 2016)
Some of the HOV and bus shoulder lanes in Metro Vancouver are described and illustrated below.

**City of Vancouver – Granville Street**

Granville Street (Highway 99 in the City of Vancouver) is a six-lane arterial that serves as an important north-south link between downtown Vancouver / North Shore, Vancouver International Airport, Fraser Delta Thruway, and the US border. As part of a bus priority effort, a long segment of southbound HOV 3+ lanes between 63 Avenue and the Arthur Liang Bridge over the north arm of the Fraser River opened in mid-1995, to operate during the PM peak period. The northbound priority lane is only open to buses and bikes, and operates between 6:30 AM and 6:30 PM on weekdays.

**Georgia Street**

Georgia Street is a major commercial artery in downtown Vancouver that serves as the primary feeder to Stanley Park and the south end of Lion’s Gate Bridge. Afternoon peak period traffic can result in queuing from the bridge to downtown. A westbound curb lane was, therefore, designated for buses and 3+ HOVs in the mid-1990s. The HOV lane originally extended five blocks from Burrard Street to Nicola Street during the PM peak (3:00 to 7:00 PM); however, in 2003, it was extended five blocks easterly – now beginning at Richards Street. The HOV lane is in effect at all times between Nicola Street and Stanley Park. At the Stanley Park entrance, a raised median is used to separate bridge-bound commuter traffic from park traffic, but buses can use the Stanley Park road then later re-join the bridge route via a special bus-only transfer lane.

**Marine Drive at Lions Gate Bridge**

There are extensive recurring queues at the northern approach to the Lions Gate Bridge – one of two bridges between the north shore and downtown Vancouver. In 2015, TransLink, area municipalities, and the Ministry of Transportation and Infrastructure implemented a transit priority project at Marine Drive / Lions Gate – along Marine Drive from Tatlow Avenue in north Vancouver to the east abutment of the new Capilano River bridge, including ramps, a loop, an overpass, and an approach to the Lions Gate Bridge in West Vancouver.

**Cities of Vancouver, Burnaby, and Port Moody – St. Johns Street / Clarke Road and Barnet Highway and Hastings Street**

Barnet Highway runs along the foot of Burnaby Mountain through a rural park-like setting, with service to various residential and industrial uses along the Burrard Inlet shoreline. A September 1996 project widened Barnet Highway from two to four lanes, with peak-period HOV lanes. HOV priority was extended to the east and west, via
curbside lane conversions on Hastings Street in Vancouver, and a westbound AM peak (6:00 – 8:30 AM) HOV lane on St. Johns Street / Clarke Road through central Port Moody. St. Johns Street, initially a four-lane roadway with on-street parking, was converted to accommodate the HOV lane alongside four general purpose lanes, by restricting parking. Similarly, Clarke Road was reconstructed from a two-lane to a three-lane cross section, allowing the St. Johns Street HOV lane to continue via Clarke Road to Barnet Highway. The third component of the Barnet-Hastings project was the reconfiguration of Hastings Street – a major commercial artery. On-street parking was removed in order to accommodate HOV operations in the curb lane in the peak direction during peak periods. The loss of on-street parking was a matter of considerable controversy in the community. The Hastings Street HOV lanes terminate at the City of Vancouver boundary (the limit of provincial jurisdiction), although Hastings Street itself continues into downtown. The City has subsequently considered extending bus or HOV lanes along this segment, but nothing has been implemented to date.

The original plans for a transit-oriented HOV 3+ facility with frequent articulated bus service were re-oriented towards carpools and HOV 2+ operations midway through the project when the provincial government introduced the West Coast Express commuter rail service in the same corridor, thereby making the bus plans redundant. Nevertheless, the regional HOV plans focused on an HOV 3+ operation, so there was considerable debate right up to opening day.

City of Burnaby – Willingdon Avenue

Willingdon Avenue is a major north-south six-lane arterial in Burnaby. A major traffic generator in the corridor is the main campus of the BC Institute of Technology. The City studied TPMs in 1999-2000 and settled on a “bus lane with signal priority” strategy. This involved removing on-street parking and designating the curb lanes for buses and vanpools (i.e., HOV 6+) between Moscrop Street / Deer Lake Parkway and Canada Way, along with transit signal priority, improved bus stops, and pedestrian/bicycle provisions. The HOV 6+ designation is unique in the world and reflects the active regional vanpool program operated by the Jack Bell Foundation.

City of Richmond – Russ Baker Way

A 9-month pilot project was implemented in 2001 on part of the road system at Vancouver International Airport on Sea Island in Richmond. It allowed HOVs traveling between the south and main terminals to bypass the queue of Vancouver-bound traffic on Russ Baker Way backing up from the Arthur Laing Bridge. An HOV 3+ designation was applied. As part of the airport’s critical goods movement strategy, commercial vehicles (trucks) or HPVs (“High Priority Vehicles”) were also allowed to use the HOV lane. The section from Miller Road to Arthur Laing Bridge is used mainly as a bus queue jump lane for the 98-B line. The pilot project operated successfully and was made permanent.
Cities of Maple Ridge and Pitt Meadows

Lougheed Highway is a major high-capacity route passing through Pitt Meadows. Although the highway was a six-lane facility, it narrowed to cross the Pitt River on a pair of two-lane bridges. Contraflow lanes were installed along the two Pitt River Bridges in 1996 to provide three lanes operating in the peak direction during peak periods (AM westbound, PM eastbound). A 2.8 km long westbound bus/vanpool (HOV 6+) lane from Harris Road to the bridge was constructed at the same time, to allow buses and carpools to jump the queue that formed each morning on the eastern bridge approach. In 2014, the two bridges were replaced with a single wider span structure which accommodates both general traffic and HOVs.

The new Pitt River Bridge was upgraded to include bus queue jump lanes in both directions at the Kennedy Road intersection at the east end of the bridge, thereby providing time savings to bus riders heading east to the City of Coquitlam. The HOV lane that begins west of Harris Road now extends east for about 2 km to Dewdney Trunk Road.

City of Richmond and District of Delta

Highway 17 from Highway 99 to Ladner Trunk Road (Highway 10) is a five-lane north-south highway in southwest Delta, serving traffic from the Ladner and Tsawwassen neighbourhoods, the Tsawwassen Ferry Terminal, and the Deltaport container terminal. A northbound bus-only lane was provided on Highway 17 in the left lane. The bus-only lane was converted to HOV 3+ operation in June 2000 and revised to HOV 2+ in November 2004. The HOV lane on Highway 17 feeds into the Highway 99 (freeway) right curb HOV queue jump lane on the southerly approach to the Massey Tunnel under the Fraser River. To avoid having HOVs cross the general traffic queue at the Highway 99 interchange, an innovative left lane ramp and left turn signal is used.

The Port Mann / Highway 1 Project (Gateway Program) included the widening of Highway 1, a new Port Mann Bridge (one additional lane in each direction), and upgrades to interchanges on British Columbia Highway 1 to address congestion through this corridor. The Port Mann Bridge was replaced with a new 10-lane tolled bridge. The project features rapid bus lanes, transit priority ramp access to Highway 1, park-and-ride facilities, new transit loops in Surrey, and separated pedestrian and cycling lanes. It is also designed to accommodate the eventual addition of light rail transit underneath the bridge. The project includes widening Highway 1 between McGill Street in Vancouver and 216 Street in Langley, with HOV lanes to 200 Street in Surrey. The bridge itself features five new lanes, two for HOVs and commercial vehicles.
As part of the Gateway Program, peak period HOV lanes were implemented along Grandview Highway (both directions) between Rupert Street and Boundary Road. The curbside westbound lane was previously used for parking, and the curbside eastbound lane was converted from a general purpose traffic lane.

**Interview Findings**

In March/April 2016, AECOM contacted TransLink staff to gather insight into existing transit priority measures (TPMs). This section provides a summary of commentary from:

<table>
<thead>
<tr>
<th>Department / Division</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Project Development &amp; Management</td>
<td>Helen Cook, <a href="mailto:helen.cook@translink.ca">helen.cook@translink.ca</a>, 778-375-7500</td>
</tr>
<tr>
<td>2 Infrastructure Program Management</td>
<td>Jon Navarra, <a href="mailto:jon.navarra@translink.ca">jon.navarra@translink.ca</a>, 778-375-7815</td>
</tr>
<tr>
<td>3 Project Manager</td>
<td>Vikki Kwan, <a href="mailto:vikki.kwan@translink.ca">vikki.kwan@translink.ca</a></td>
</tr>
</tbody>
</table>

**Types of services that can benefit from TPMs**

HOV lanes can be used by transit vehicles, taxis, carpools (2+), and motorcycles. In all cases, transit vehicles are entitled to use all TPMs, including HOV lanes, and can also be used by taxis in some cases.

**Types of TPMs being used (signal priority, busways, bus lanes, QJLs, HOV lanes, etc.), Hours of operation of TPMs, statistics available relating to the extent of TPMs (lane km)**

See previous table (HOV Facilities within Metro Vancouver) and table below.

**Transit Priority Measures in Metro Vancouver (2016)**

<table>
<thead>
<tr>
<th>Bus exclusive road km</th>
<th>7.8 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus mall</td>
<td>3.0</td>
</tr>
<tr>
<td>Bus ramp</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>Bus lane km</strong></td>
<td><strong>160.6 km</strong></td>
</tr>
<tr>
<td>Bus only lane</td>
<td>57.6</td>
</tr>
<tr>
<td>Bus QJL</td>
<td>2.2</td>
</tr>
<tr>
<td>Bus/bike lane</td>
<td>15.3</td>
</tr>
<tr>
<td>HOV lane</td>
<td>85.2</td>
</tr>
<tr>
<td>Right turn exemption</td>
<td>0.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus bulge</td>
<td>21</td>
</tr>
<tr>
<td>Transit priority signal</td>
<td>36</td>
</tr>
<tr>
<td>Turn exemption</td>
<td>10</td>
</tr>
</tbody>
</table>

**Planning and implementation responsibility and process for TPMs**

TPMs are planned by TransLink and/or the Ministry of Transportation and Infrastructure, especially in regard to highway HOV or bus shoulder lanes, and in close coordination with the 21 municipalities. Implementation is undertaken by the municipalities and/or the Ministry of Transportation and Infrastructure (on highways). With funding being limited at TransLink, opportunities for new TPMs are examined on a project-by-project basis.
Locations of TPMs, creation of TPMs (i.e., conversion of lanes vs. widening of roads)

In most cases, except where there are new road or bridge projects, and widening of the facility cannot be undertaken, TPMs can be accommodated by reallocation of road space. However, this is becoming more difficult as streetscaping / complete streets projects (widening of sidewalks, installation of cycling lanes, new landscaping, etc.) are becoming more popular. The City of Vancouver has a strict policy that road space is allocated and prioritized as follows:

- Pedestrians
- Cyclists
- Transit vehicles

Details regarding any transition to higher levels of transit service along these transit priority corridors over time:

A dedicated 2-km busway was implemented on Granville Street in Richmond, for the City of Richmond to Vancouver Waterfront Station 98 B-line BRT service. This median busway corridor conveniently provided the right-of-way in 2010 for the introduction of the new Canada Line SkyTrain service between the Vancouver International Airport and the Waterfront Station in downtown Vancouver.

Enforcement of TPMs, Penalties for illegal use of TPMs

There is limited enforcement of TPMs by police, due to other more pressing demands on their time. The penalty for illegal use of HOV lanes is $121 and 2 demerit points, and the penalty for illegal use of bus lanes is $109 and 2 demerit points.

Key constraints (e.g., funding, political opposition, etc.) regarding the implementation of TPMs

The implementation of TPMs across the 21 municipalities is aided by the fact that TransLink has adopted Transit Infrastructure Design Guidelines for transit facilities. The key constraint regarding implementation of TPMs is funding; funding for improved transit service has a higher priority.
Interview Findings

In March/April 2016, AECOM contacted City of Ottawa staff to gather insight into existing bus-on-shoulder/bus bypass shoulder (BOS/BBS) operations on Highways 174 and 417. This section provides a summary of commentary from:

<table>
<thead>
<tr>
<th>Department / Division</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Planning – Transit Services</td>
<td>Matthew Wolstenholme, <a href="mailto:matthew.wolstenholme@ottawa.ca">matthew.wolstenholme@ottawa.ca</a></td>
</tr>
<tr>
<td></td>
<td>613-842-3636 Ext. 52318</td>
</tr>
</tbody>
</table>

Limits of the BOS/BBS on Highways 174 and 417

On Highway 174, BOS/BBS exists between Blair Road and Place d’Orleans; and on Highway 417 between Eagleson Road and Moodie Drive. The BOS/BBS facilities are not continuous through two intermediate interchanges; instead, they begin as a continuation of the acceleration lane at each interchange and end as the deceleration lane for the next interchange. On Highway 174, the BOS/BBS facilities start/end just east of Blair Road, where there are dedicated ramps directly to/from the Transitway.

History of implementation of BOS/BBS facilities

The first shoulder bus lane on a freeway opened in Ottawa in 1991, on Highway 174, between Montreal Road and the Transitway (just east of Blair Road). Highway 174 was a provincial facility at the time, but was later transferred to the municipality. Other sections along Highway 174 opened in 1992 and 1997. The sections on Highway 417 (provincial highway) between Eagleson Road and Moodie Drive opened in 1995 and 1996, respectively.

In addition to the OC Transpo-only bus lanes on the right side of the highway, MTO built HOV lanes on the left side of Highway 417 between Palladium Drive and Moodie Drive. They opened in stages in 2010 and 2014.

Ridership and support from the City, Province, transit provider, and stakeholders

The BOS/BBS facilities continue to operate well, with high ridership. There continues to be support from various levels of government and stakeholders.

Maximum speed allowed on the BOS/BBS facilities

The speed limit is 100 km/h (the same for all other traffic travelling on the highway).

Time of usage

In Mississauga, on sections of Highway 403, once highway speeds fall below 40 km/h, bus drivers can use the shoulders. In Ottawa, however, bus lanes are available for use during all time periods. There are no restrictions on speed, or forcing buses to use the lanes, or not use the lanes. They are considered regular traffic lanes, except that only buses are allowed to use them.
Consideration of expanding along either corridor, or implementing similar treatments elsewhere due to their success

Having bus lanes on the right side of the highway only works when interchanges are spaced far apart. There were sections in the west end of Highway 417 where bus lanes would have been useful, but the close spacing of interchanges meant that buses would gain little benefit from the lanes while weaving in and out of the lanes frequently due to on-ramps and off-ramps. New transitway construction has been able to provide benefits to some of these sections. There are no plans to pursue additional bus lanes on highways at this time.

Additional information

Most interchanges (including some not connected to bus lanes) have short sections of bus-only ramps that allow buses to “ramp surf” to avoid congestion on the highway, while other vehicles are prevented from ramp surfing at most interchanges. Priority is usually provided for buses at the traffic signals. Bus operators on express routes have the option to use regular traffic lanes to travel through the interchange if traffic is light, or to use the ramps for surfing if they feel that it would be advantageous.

Major Transitway routes serve bus stops at most interchanges to allow transfers to routes on the cross streets, and for walk-in / bike & ride / kiss & ride customers. At two locations, buses do not have to stop at the interchange if there are no passengers wishing to board or alight. A special system has been set up so that a passenger waiting at the stop can signal a bus on the highway.

In addition to the long-established bus lanes east of Blair Road and west of Moodie Drive, there are also temporary bus lanes on sections of Highway 417 and Highway 174 between Nicholas Street and Blair Road to accommodate Transitway buses that have been diverted to the highway while the parallel section of Transitway is being converted to accommodate LRT. Ramp surfing is obligatory for buses at many locations along this section due to geometric constraints.

Start of the eastbound bus lane on Highway 174 at the end of the on-ramp from Montreal Road / St. Joseph Boulevard

End of the westbound bus lane on Highway 174 as it becomes the off-ramp for Montreal Road / St. Joseph Boulevard

End of the westbound bus lane on Highway 417 as it becomes the off-ramp for Eagleson Road
Interview Findings

In March/April 2016, AECOM contacted Washington State Department of Transportation (WSDOT) staff to gather insight into existing TPMs used in the City. This section provides a summary of commentary from:

<table>
<thead>
<tr>
<th>Department / Division</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolling Division</td>
<td>Rob Fellows, <a href="mailto:rob.fellows@wsdot.wa.gov">rob.fellows@wsdot.wa.gov</a>, 206-464-1257; 206-399-0482 Toll Planning and Policy Manager, WSDOT</td>
</tr>
</tbody>
</table>

Types of services that can benefit from TPMs

HOV lanes can be used by transit vehicles, vanpools, private buses with 16 passenger capacity, carpools (2+ or 3+, depending on the facility), and motorcycles. Most arterial priority facilities are intended to accommodate transit only, but some are open to all traffic, except through intersections.

Types of TPMs being used, hours of operation, statistics available relating to the extent of TPMs

The Puget Sound region has a system of approximately 400 lane km of freeway HOV lanes (with the majority accommodating 2+ occupants per vehicle, and one facility accommodating 3+ occupants per vehicle), as well as transit-supportive auxiliary facilities (including Park & Ride lots, park and pool leased lots, direct access ramps, and freeway transit stations). HOV lanes were introduced in the region in the early 1980s to free capacity along the highway system and provide transit time savings and enhanced reliability.

Planning and implementation responsibility and process for TPMs

WSDOT has implemented freeway HOV and express toll lanes, but works closely with transit agencies on policy, design, and operation. Local transit agencies work with local jurisdictions to plan and implement arterial TPMs, with a variety of funding strategies and partnerships.

Locations of TPMs, creation of TPMs (conversion of lanes vs. widening of roads)

The locations of HOV and express toll facilities in Washington are presented in Section 4.3. The majority of HOV lanes (almost 95 percent) have been implemented by reducing the width of medians, rather than converting existing lanes, which is far more acceptable to over 95 percent of the public. Lanes along I-90 were converted, since there was excess capacity leading into a bottleneck. By converting the lanes to HOV, there was reduced traffic into the bottleneck without negative impacts on users. The lanes were initially implemented along the outside lanes, but now exist along the inside lanes. There is improved continuity with the HOV lanes being located along the inside, because buses can more easily access median stations, and there are fewer conflicts with traffic entering and exiting the highways.

Time savings and reliability associated with the use of TPMs

Express toll lanes on I-405 regularly achieve 10- to 20-minute travel time savings for peak-period users travelling the length of the corridor. Travel time savings along HOV lanes have been decreasing as they have become congested over the past decade, especially due to the economic recovery and a hot economy in Seattle.
Details regarding transition to higher levels of transit service along transit priority corridors over time

The Puget Sound region has committed to a regional light rail network that is incrementally replacing express bus service, which currently operates along HOV lanes. The continued need for buses is expected as these rail corridors become fully utilized, and more work trips move to non-downtown Seattle centres.

Enforcement of TPMs, penalties for illegal use of TPMs

Enforcement is undertaken by police through visual inspection; however, this does not occur very often due to other policing priorities, and the difficulties involved during periods of heavy traffic. However, there is an active program in place, which enables violators to be reported⁷. Self-enforcement is especially strong when there is enforcement presence, even if vehicles are not being stopped regularly. The compliance rate is high, with less than 10 percent observed violators. Fines for illegal entry into HOV or express toll lanes can surpass US$136.

Key constraints (funding, political opposition, etc.) regarding the implementation of TPMs

Public acceptance is the most important facet in preserving the effectiveness of TPMs. Key considerations for fostering public acceptance include:

- Developing a long-term plan to manage traffic demand if HOV volumes increase
- Ensuring TPMs are additive, rather than conversions, as much as possible
- Ensuring that incremental investments add value to users (especially for tolling)

Additional comments

Highway engineers rarely have an understanding of transit operational needs, such as the challenge of weaving a 60-ft bus across four lanes of traffic, and the need to make intermediate stops. It has been a challenge to convince engineers that inside-lane ramp access or transit stations are a make-or-break requirement for effective transit, especially for BRT-type service. On the flip side, most transit planners have a logistics mentality; they make do with existing facilities and have a difficult time imagining how transit services could be improved with different facilities. A key challenge has been facilitating collaboration and understanding between disciplines to take full advantage of freeway facilities designed to accommodate rapid transit.

WSDOT is not able to achieve its highway performance targets (where traffic is anticipated to travel at an average speed of 70 km/h, for 90 percent of the time), due to extreme congestion. As a result, express toll lanes are now being more widely considered and implemented by WSDOT. Dynamic pricing applies for use of express toll lanes, and depends on traffic conditions and time of day; charges may range from US $1.80 to $5.55. To use the lanes, a user must register in the Good to Go! program and obtain a pass which costs US $5 to $15 (depending upon use).

Express Toll Lanes between Bellevue and Lynnwood

The introduction of express toll lanes on I-405 between Lynnwood and Bellevue (approximately 30 km) is a critical step to help reduce congestion in the Eastside of Seattle. Express toll lanes provide a choice for a faster, more reliable trip.

---

³ WSDOT has established a HERO call-in line, whereby residents can report HOV / express toll lane violators. Additional information relating to the HERO program is attached.
Tolls

Toll rates adjust depending on real-time traffic conditions; the rate displayed upon entering the lanes applies. Solo drivers and two-person carpools during peak periods can pay a toll to use the express toll lanes with any current Good To Go! pass, or by using Pay By Mail at a US $2 higher rate per toll.

To use express toll lanes free of charge, carpools will need to meet the HOV occupancy requirement and have a Good To Go! account with Flex Pass set to HOV mode.

The long-term vision includes an express toll lane system between SR 167 at the Pierce / King County line and the I-405 / I-5 interchange in Lynnwood (approximately 65 km).

2007 HOV User Survey – Summary of Findings

Approximately 30,000 questionnaires were distributed through the mail and in-person to carpoolers, bus riders, and vanpoolers during December 2005 and January 2006. Additional phone surveys of carpoolers were also performed. The study achieved an overall response rate of 19.3 percent, with a margin of error of ±1.3 percent.

Main findings include:

- **HOV lanes do provide an incentive to use shared-rides.** 15-18 percent (depending of type of travel) of HOV lane users during the peak commuting periods, and 18-23 percent of HOV lane users during the mid-day, reported they would switch to solo driving if the HOV lanes were not available.
- **HOV lane closure would impact both freeways and side streets, and lengthen peak commuting hours.** Approximately 26 percent of carpoolers said they would continue carpooling, but switch to driving either on a different route (19 percent) or on the same route during different hours (7 percent) if HOV lanes were no longer available.
- **People choose shared rides for reasons other than time savings and reliability.** Users cited saving time and money, reduced stress, and convenience as the main reasons they use the HOV system.
- **Ride-sharing is a choice.** Almost 99 percent of HOV lane users have at least one working vehicle in their household, and 80 percent have two or more. Driving alone to work is common one day per week or more for a large percentage of HOV lane users.
- **Employer incentives play a large role in the decision to take shared rides.** 87 percent of bus riders and vanpoolers, and 24 percent of carpoolers, use employer rideshare incentives such as free bus passes, discounted parking, flextime, etc. Without those incentives, between 40 and 60 percent (depending on the type of travel) would either stop ride-sharing, or are not sure how they would travel.
San Jose / Santa Clara

Interview Findings

In March/April 2016, AECOM contacted Santa Clara County staff to gather insight into the operations of HOV lanes along the expressways. This section provides a summary of commentary from:

<table>
<thead>
<tr>
<th>Department / Division</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads and Airports Department</td>
<td>Ananth Prasad, Senior Civil Engineer, Santa Clara County 408-494-1342; <a href="mailto:ananth.prasad@rda.sccgov.org">ananth.prasad@rda.sccgov.org</a></td>
</tr>
</tbody>
</table>

Background

Consideration for HOV lanes along the expressways was driven by the need to reduce congestion, by encouraging carpooling and transit use. The HOV lanes along San Tomas Expressway, Montague Expressway, Central Expressway, and Lawrence Expressway were first introduced during the 1980s-90s; while the HOV lanes along Capitol Expressway were introduced circa 2000.

The HOV lanes were implemented within the right lane of the existing expressways, primarily to accommodate efficient transit operations. Existing lanes were not converted to HOV lanes; generally, roadways were widened to accommodate the HOV lanes. In some cases, shoulders were used temporarily during peak hours for HOV operations, but the roadways were then widened at a subsequent time.

Since 1991, policies were put in place to accommodate cyclists and pedestrians along the expressways. Signal timing is adjusted at intersections to provide benefits to the active transportation modes.

Responsibility

Prior to 1995, Santa Clara County and the transit authority belonged to a unified organization. After the mid-1990s, Santa Clara County and the Valley Transportation Authority (VTA) separated; however, they still collaborate on relevant expressway improvements.

Operations

HOV lanes are in effect from 6-9 AM and 3-7 PM, on weekdays. The expressways are unique, and provide effective travel across multiple cities. They accommodate high commuter demand in the peak hours.

Considerations

Bus-only vs. HOV

There is not enough transit demand to justify bus-only operations; HOV lanes offer more advantages.

Transit Priority Measures

As buses utilize HOV lanes, and signal coordination is good, the need to provide additional priority measures has not been considered to offer any further benefits. However, priority signals are provided along crossing roads of Montague, Central, and Lawrence Expressways, where LRTs operate.
Queue Jump Lanes

Queue jump lanes (QJL) have previously been considered (and implemented), but were not observed to be successful; thus, there has actually been conversion of QJL after 2008, to accommodate mixed-flow traffic along Central Expressway.

Issues

Funding of recommended improvements remains the biggest issue (same $ per mile for expressways and other streets).
**Capitol Expressway** | **Fact Sheet**

**EXISTING CONDITIONS AND ACCOMPLISHMENTS**

**Expressway Characteristics**
- 8.7 miles long
- 6-8 lanes wide, including HOV lanes
- 18 signalized intersections
- 3 freeway connections: SR 87, US 101, I-680
- 256,000 vehicle trips daily
- Adjacent jurisdiction: San Jose

**Improvements Completed Since 2008**
- Pedestrian and landscaping improvements from Capitol Ave to Quimby (by VTA)
- Pavement rehabilitation between Quimby and Silver Creek
- Third left-turn lane from NB Aborn to WB Capitol Expressway
- Second right-turn lane from EB Capitol Expressway to SB Aborn

**In the Works**
- Intelligent Transportation System (ITS)/Signal Infrastructure Project and traffic responsive signal timing
- New sidewalks to fill in all gaps along developed frontages
- New sound walls to fill in gaps between I-680 and Capitol Ave
- VTA Bus Rapid Transit (BRT) from Capitol Ave to Eastridge
- US 101/Capitol Expressway interchange improvements (by VTA) – finishing soon
- Pavement rehabilitation: Tully to Quimby and US 101 to Seven Trees
- Communications Hill development traffic mitigations on Capitol Expressway

Expressway Plan 2040  ❖  County of Santa Clara Roads and Airports Department  ❖  www.expressways.info
Central Expressway | Fact Sheet

EXISTING CONDITIONS AND ACCOMPLISHMENTS

Expressway Characteristics
- 9.6 miles long
- 4-6 lanes wide
- 17 signalized intersections
- 94,000 vehicle trips daily
- Access to 3 freeways: US 101, SR 237, SR 85 and 2 expressways: San Tomas, Lawrence
- Adjacent jurisdictions: Palo Alto, Mountain View, Sunnyvale, Santa Clara, San Jose

Improvements Completed Since 2008
- HOV queue jump lane at Bowers converted to mixed flow
- Median and frontage curbs installed
- WB auxiliary lane between Fair Oaks and Mathilda
- Flashing beacon indicating bicycle presence at Fair Oaks on-ramp to WB Central

In the Works
- Add EB auxiliary lane Mathilda to Fair Oaks (Finishing soon!)
- Construct sidewalk improvements near San Tomas Expwy and from Moffett Blvd to Gemini Ave
- Install bicycle detection and implement bicycle adaptive signal timing

Expressway Plan 2040 • County of Santa Clara Roads and Airports Department • www.expressways.info
Lawrence Expressway | Fact Sheet

EXISTING CONDITIONS AND ACCOMPLISHMENTS

Expressway Characteristics
- 8.7 miles long
- 6-8 lanes wide, including
- HOV lanes
- 23 signalized intersections
- 253,000 vehicle trips daily
- Adjacent jurisdictions: Saratoga, San Jose, Cupertino, Santa Clara, Sunnyvale

Improvements Completed Since 2008
- Bicycle signal detection at all signalized intersections
- Bicycle adaptive signal timing
- Interim channelization improvement to reduce crossing conflicts at Granada Ave
- Traffic responsive signal timing

In the Works
- Grade Separation Concept Study for Reed/ Monroe, Kifer, and Arques
- Add 2nd left turn lane EB Prospect to NB Lawrence
- Pavement rehabilitation from Homestead to SR 237
San Tomas Expressway | Fact Sheet

EXISTING CONDITIONS AND ACCOMPLISHMENTS

2003 Conditions

Expressway Characteristics
- 8.5 miles long
- 6-8 lanes wide, including HOV lanes
- 19 signalized intersections
- 2 freeway connections: SR 17, US 101
- 211,000 vehicle trips daily
- Adjacent jurisdictions: Campbell, San Jose, Santa Clara

2013 Conditions

Improvements Completed Since 2008
- Median and frontage curbs
- Bicycle delineation and improvements from Camden Ave. through SR-17 interchange
- San Tomas Aquino Creek Trail between Cabrillo and El Camino Real

In the Works
- Repair San Tomas Expressway Box Culvert
- Add sidewalks in the vicinity of Central Expwy
- Install bicycle detection and implement bicycle adaptive signal timing
- Add 2nd left turn lanes at El Camino Real intersection
- Widen San Tomas to 8 lanes El Camino Real to Homestead
- Extend San Tomas Aquino Spur Trail; El Camino Real to Homestead

Expressway Plan 2040 ♦ County of Santa Clara Roads and Airports Department ♦ www.expressways.info
Montague Expressway | Fact Sheet

EXISTING CONDITIONS AND ACCOMPLISHMENTS

Expressway Characteristics
- 6 miles long
- 6-8 lanes wide, including HOV lanes
- 13 signalized intersections
- 3 freeway connections: US 101, I-880, I-680
- 185,000 vehicle trips daily
- Adjacent jurisdictions: Santa Clara, San Jose, Milpitas

Improvements Completed Since 2008
- Pavement rehabilitation along entire length of the expressway
- Traffic responsive signal timing

In the Works
- Widen to 8 lanes Guadalupe River to Trade Zone Blvd (by San Jose)
- Widen to 8 lanes Great Mall to I-680
- Design for US 101/Montague interchange improvements with at-grade improvements at Mission College
- Design study for I-680 interchange modifications
- Install bicycle detection and implement bicycle adaptive signal timing
Greater Toronto

Bus-on-Shoulder (BOS) operations

The Don Valley Parkway in eastern Toronto is an example of a controlled-access expressway featuring bus-on-shoulder operations in the median. GO implemented the BOS lanes in 2010 as a way for transit vehicles to bypass congestion. Buses are permitted to operate no more than 20 km/h faster than other traffic on the Parkway. Studies are underway to examine whether extending the BOS lanes is feasible.

Highway 403 in Mississauga also features BOS lanes, but on the outside shoulder rather than the median.

Median busways on major arterial roads

The Toronto area also features median-running busways on major arterial roads, such as Highway 7 and Yonge Street in York Region. Highway 7 is the main east-west alignment for York’s vivaNext BRT system. The bus-only lanes reserved for vivaNext vehicles are known as Rapidways. Most of these are in the median; but some are curbside, and one in Markham Centre even runs through a pedestrian mall. A 2.6-km-long Rapidway was opened in 2015 along Davis Drive in Newmarket, which is used by the Viva Yellow line.

A rapidway is being constructed along Yonge Street (the main north-south BRT corridor in York Region) with an opening date set for 2018.

Dedicated bus-only roadways

In addition to BOS operations and median-running busways, the Toronto area is also home to two bus-only roadways. The York University busway runs between the university and Downsview TTC Station, and was opened in 2009 to alleviate overcrowding and reliability problems on Route 196 buses. The 6.5 km of dedicated lanes helped increase the average speed of Route 196 buses by 41 percent, to 33 km/h.

The City of Mississauga is also in the process of building its Transitway, which runs east-west across the City and carries four MiWay bus routes. Construction began in 2010, and eight of 12 stops have been completed. Apart from providing faster travel for transit vehicles, the stations offer enclosed shelters for waiting passengers. The Transitway is expected to be used by GO Transit buses and intercity buses in the future, as well as MiWay.
Bus queue jumps on suburban arterials

Brampton, Ontario’s ZÜM is an example of a transit service that uses queue jumps on a suburban arterial. The branded, limited-stop ZÜM buses use have been using queue jumps on Queen Street since 2010 to bypass traffic and save time on transit trips. The photo at right shows the right-turn / queue jump lane on the near side of an intersection on Queen Street.

Carpool parking lots

Ontario provides free lots near highway interchanges where commuters may form carpools. There are more than 100 such locations around the Province. The lots are unsupervised, but no permit or registration is required. Many of the lots are also served by transit. To facilitate the forming of carpools, the Province provides a Smart Commute web-based tool that allows potential carpoolers to match with others who are taking the same trip.

HOV

HOV 2+ lanes are a feature of major freeways in the Toronto area, including Highways 403, 404, and QEW.

HOV lanes also appear on major municipal arterial roads in the Toronto area: HOV 3+ on Dundas Street West and Eglinton Avenue East, and HOV 2+ on Dufferin Street in York Region.
Appendix C:

Corridor Information

Highway 2 (QE2 Highway)

Baseline Road / 98 Avenue

Wye Road / Sherwood Park Freeway

Highway 15 (Manning Drive)

Highway 16 and 16A (West)

Highway 16 (East)

Highway 28 / 97 Street NW
Highway 2 (QE2 Highway)

Study Segment: 65 Ave in Leduc to Century Park LRT Terminus via 23 Ave NW

Highway 2 is the primary connection for Edmonton to the south. Commuter traffic uses the highway to access from Leduc and other residential communities to Edmonton. The highway is also used by residents in Edmonton to go to work in Nisku, to Edmonton International Airport, and points beyond such as Red Deer and Calgary.

The highway from 65 Avenue in Leduc north is a six-lane controlled access divided highway, posted at 110 km/h. Intermunicipal buses use 23 Ave NW – the first interchange north of the Anthony Henday Drive ring road – to travel 1.5 km westerly to the Century Park LRT station at the south end of the Edmonton LRT system. 23 Ave is a high-standard four-lane divided arterial with signalized intersections and some intermediate access points.

Traffic Conditions

Traffic flow in the AM peak has been heavier outbound from Edmonton (see illustrations in Appendix D).

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (7:50 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Nothing to note</td>
<td>No considerable traffic</td>
</tr>
<tr>
<td>Tu</td>
<td>Considerable traffic on Gateway Blvd NW</td>
<td>No considerable traffic</td>
</tr>
<tr>
<td>W</td>
<td>Nothing to note</td>
<td>No considerable traffic</td>
</tr>
<tr>
<td>Th</td>
<td>Nothing to note</td>
<td>No considerable traffic</td>
</tr>
<tr>
<td>F</td>
<td>Nothing to note</td>
<td>No considerable traffic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Traffic build up at the Highway 2 / Highway 216 Interchange, West of Highway 216</td>
<td>Usual traffic leading to Calgary Trail NW (Eastbound)</td>
</tr>
<tr>
<td>Tu</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
<tr>
<td>W</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
<tr>
<td>Th</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
<tr>
<td>F</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
</tbody>
</table>

Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Rd</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>20 Ave</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Ellerslie Rd SW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Highway 216</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>23 Ave NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>34 Ave NW</td>
<td>Non-localized (Segment along Calgary Trail NW / Gateway Blvd NW)</td>
</tr>
<tr>
<td>Whitemud Dr NW</td>
<td>Non-localized (Segment along Calgary Trail NW / Gateway Blvd NW)</td>
</tr>
<tr>
<td>51 Ave NW</td>
<td>Non-localized (Segment along Calgary Trail NW / Gateway Blvd NW)</td>
</tr>
</tbody>
</table>

Google Maps Traffic
Transit Service

<table>
<thead>
<tr>
<th>Transit Service</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak (6 – 9)</td>
</tr>
<tr>
<td></td>
<td>Total 3h Bus/h</td>
</tr>
<tr>
<td>ETS 747</td>
<td></td>
</tr>
<tr>
<td>Century Park LRT – Edmonton Int’l Airport</td>
<td>6 SB 2 SB</td>
</tr>
<tr>
<td></td>
<td>5 NB 1.6 NB 7 NB 1 NB</td>
</tr>
<tr>
<td>Leduc 1</td>
<td></td>
</tr>
<tr>
<td>50 St / 47 Ave – Century Park LRT</td>
<td>6 SB 2 SB 1 SB 4 -</td>
</tr>
<tr>
<td></td>
<td>6 NB 2 NB 1 NB</td>
</tr>
<tr>
<td><strong>Total both directions</strong></td>
<td><strong>23 7.7</strong></td>
</tr>
</tbody>
</table>

ETS: Edmonton Transit Service
Leduc: Leduc Transit

While Leduc Transit Route 1 peak-direction buses run express between Leduc and Century Park, counter-peak trips take a 25-minute circuit through the Nisku employment zone between Leduc and Edmonton, which doubles the trip length for Leduc passengers and makes it unattractive for such commuters.

Planned Work

A fourth southbound lane is to be added to Highway 2 between 41 Avenue and Hwy 19 (Nisku) by the Province. This was added in the 2016 provincial budget so it may be assumed to be done in the next 2 to 3 years. It is mentioned on this web page: https://www.transportation.alberta.ca/5141.htm.

Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process.

The link between Downtown and the airport has grown considerably and become more congested in recent years. More development is expected in the neighbouring industrial area of Nisku.

Stakeholders south of Edmonton stressed the need for more transit. Fast, reliable transportation to the airport is essential. Small transit operators are eager to work with ETS, as little service of their own is offered here. HOV and transit lanes are also supported by stakeholders along this corridor.
Baseline Road / 98 Avenue

Study Segment: Highway 21 to 85 St NW

This is a major arterial road that connects Sherwood Park to Edmonton and the heavy industrial area between Edmonton and Sherwood Park.

Baseline Road from Highway 21 to 50 Street NW is a high-standard six-lane divided arterial posted at 70 km/h, featuring numerous signalized intersections. Between 34 St and 50 St in Edmonton, the road is named 101 Avenue. West of 50 Street, the road splits between a continuation of 101 Ave and Terrace Road NW, which shifts the alignment three blocks southerly to 98 Avenue NW. 98 Ave continues as a four-lane arterial, at points undivided with no left turn bays though some residential areas. The current study segment terminates at the large roundabout at 84 St NW.

A constrained environment may warrant a creative or unconventional approach in this corridor. Schemes may be developed in consideration of the ultimate re-calibration of this corridor as an LRT extension; we can draw from several examples of agencies using transit priority in busy corridors as stepping stones to establishing transit service spines which ultimately transform into rapid transit.
Traffic Conditions
Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (7:50 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
</table>
| M   | • Traffic increase on 98 Ave NW from 98A Ave NW to 84 St NW (Westbound)  
     • Traffic increase on 101 Ave NW between 49 St NW to Terrace Rd NW / 98 Ave interchange (Westbound)  
     • Traffic increase on Baseline east of Highway 216 (Westbound/Eastbound)  
     • Slow movement towards the 84 St NW / 98 Ave NW roundabout | • 9:30 AM  
     • Traffic continues on 98 Ave NW between 75 St NW to 79 St NW (Westbound)  
     • Traffic continues on Terrace Rd NW interchange with 101 Ave NW (Eastbound) |
| Tu  | • See Monday  
     • Traffic extended on 98 Ave NW from 67A Ave NW to 84 St NW (Westbound) | • 9:45 AM: Some slow movement east of 34 St on Baseline Rd |
| W   | • See Monday notes with the exception of bullet point (2) | • 8:00 AM  
     • Traffic on Terrace Rd NW / 98 Ave interchange and on 98 Ave NW leading to 75 St NW (Westbound)  
     • Traffic on Baseline leading to 17 St (Westbound) |
| Th  | • See Wednesday  
     • Some increase in traffic at the Baseline Rd / Highway 216 Interchange (Westbound) | • 7:30 AM: Traffic on Baseline leading to 17 St (Westbound) |
| F   | • See Tuesday | • 8:00 AM: Traffic on 98 Ave NW , just east of 75 St NW (Westbound) |

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
</table>
| M   | • High traffic build up on 98 Ave NW from 98A Ave NW to 79 St NW (Westbound)  
     • High traffic build up on 98 Ave NW from 84 St NW to Terrace Rd / 98 Ave NW interchange (Eastbound)  
     • Slow movement across Baseline crossing Highway 216 (Westbound/Eastbound)  
     • Slow movement on Highway 216 South entrance | • 4:00 PM  
     • Not as much traffic shown, except considerable build up on 98 Ave NW from 79 St NW to east of 75 St NW (Eastbound)  
     • 5:30 PM traffic decreases |
| Tu  | • See Monday | • 5:30 PM: Some slow movement east of 34 St on Baseline Rd |
| W   | • See Monday | • 4:45 PM: Some traffic east and west of 75 St NW |
| Th  | • See Monday  
     • Except traffic build up decrease on 98 Ave NW from 98A Ave NW to 79St NW (Westbound) | |
| F   | • See Tuesday | |
Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along 98 Ave NW)</td>
</tr>
<tr>
<td>75 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along 98 Ave NW)</td>
</tr>
<tr>
<td>Treed area</td>
<td>Non-localized (Segment along Terrace Rd NW)</td>
</tr>
<tr>
<td>57 St NW</td>
<td>Non-localized (Segment along Terrace Rd NW)</td>
</tr>
<tr>
<td>50 St NW</td>
<td>Localized – At intersection and Non-localated (Segment along 98 Ave NW / 101 Ave NW)</td>
</tr>
<tr>
<td>34 St</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>17 St</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Highway 216</td>
<td>Localized – At intersection and Non-localated (Segment along Baseline Rd)</td>
</tr>
<tr>
<td>Shivam Rd / Chippewa Rd</td>
<td>Non-localized (Segment along Baseline Rd)</td>
</tr>
<tr>
<td>Broadmoor Blvd</td>
<td>Non-localized (Segment along Baseline Rd)</td>
</tr>
</tbody>
</table>

Google Maps Traffic

Transit Service

<table>
<thead>
<tr>
<th>Transit Service</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>AM Peak (6 – 9)</td>
</tr>
<tr>
<td>ETS 85</td>
<td>Route</td>
</tr>
<tr>
<td>ETS 86</td>
<td>Route</td>
</tr>
<tr>
<td>SCT 411</td>
<td>Route</td>
</tr>
<tr>
<td>SCT 413</td>
<td>Route</td>
</tr>
<tr>
<td>SCT 414</td>
<td>Route</td>
</tr>
<tr>
<td>Total by direction</td>
<td></td>
</tr>
<tr>
<td>Total both directions</td>
<td>59 19.7 74 18.5 56 18.7 24 4.8</td>
</tr>
</tbody>
</table>

ETS: Edmonton Transit Service
SCT: Strathcona County Transit

Planned Work

No road changes are planned other than modifications related to the interchange at Anthony Henday Drive. This corridor is, however, ultimately planned to host a new LRT line which would supersede most current bus service.
Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process.

Several stakeholders said that transit priority measures would be especially helpful on Baseline Road, which carries considerable commuter bus traffic between Strathcona County and downtown Edmonton. Traffic congestion has worsened in recent years. HOV or bus-only lanes would be helpful along here.
Wye Road / Sherwood Park Freeway

Study Segment: Highway 21 to 83 St NW

This is another major arterial from Sherwood Park to Edmonton and crosses through similar areas to Baseline Road / 98 Avenue. A portion is a full freeway with 100 km/hr posted speed. East of Anthony Henday Drive and the road is a six-lane divided arterial. At the west end of the Sherwood Park Freeway, the road becomes a four-lane undivided arterial (82 Avenue, or Whyte Avenue). At major intersections, there are left-turn bays; but, at a number of connections to local roads, there are no turn bays. The University of Alberta is at the west end of Whyte Avenue. The transit priority measures would feed into the LRT line at Bonnie Doon and aid in flow towards the University until the future LRT is developed along the Whyte Avenue Corridor.

Traffic Conditions

Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (7:50 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Segments vary, considerable increase between 83 St NW to 71 St NW, both Eastbound and Westbound</td>
<td>• 8:15 AM Segments of congestion vary</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• 9:45 AM Slow movement between 34 St to 17 St (Eastbound)</td>
</tr>
<tr>
<td>W</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• 8:00 AM See Monday</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• 6:00 AM No considerable traffic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 8:15 AM See Monday</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Traffic build-up at the Highway 2 / Highway 216 interchange, west of Hwy 216</td>
<td>• Similar to AM Peak</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>W</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
</tbody>
</table>

Google Maps Traffic
## Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>95a St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>83 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along 82 Ave NW)</td>
</tr>
<tr>
<td>75 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along 82 Ave NW)</td>
</tr>
<tr>
<td>71 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>50 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>34 St</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>17 St</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Highway 216</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Ordze Rd / Ordze Cres</td>
<td>Non-localized (Segment along Wye Rd)</td>
</tr>
<tr>
<td>Sherwood Dr</td>
<td>Non-localized (Segment along Wye Rd)</td>
</tr>
<tr>
<td>Ash St</td>
<td>Non-localized (Segment along Wye Rd)</td>
</tr>
</tbody>
</table>

Google Maps Traffic

## Transit Service

<table>
<thead>
<tr>
<th>Transit Service</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak (6 – 9)</td>
</tr>
<tr>
<td>#</td>
<td>Total 3h Bus/h</td>
</tr>
<tr>
<td>ETS 90</td>
<td>Meadows - Downtown</td>
</tr>
<tr>
<td>SCT 401</td>
<td>Ordze Transit Centre - Edmonton City Centre</td>
</tr>
<tr>
<td>SCT 403</td>
<td>Ordze Transit Centre - Edmonton Gov’t Ctr.</td>
</tr>
<tr>
<td>SCT 404</td>
<td>Ordze Transit Centre - University of Alberta</td>
</tr>
<tr>
<td><strong>Total by direction</strong></td>
<td><strong>23 WB 7.7 WB 16 WB 2.3 WB 12 WB 4 WB 0 WB 0 WB</strong></td>
</tr>
<tr>
<td><strong>Total both directions</strong></td>
<td><strong>33 11 35 5 30 10 6 1.2</strong></td>
</tr>
</tbody>
</table>

ETS: Edmonton Transit Service  
SCT: Strathcona County Transit
Planned Work
As part of Northeast Anthony Henday Drive program the province will have Sherwood Park Freeway widened to six lanes as far west as 34 St NW (see plan below). The portion of Sherwood Park Freeway crossing Anthony Henday Drive is reduced to only four lanes between the on and off ramps.

Stakeholder Comments
Refer to Appendix A for details of the stakeholder engagement process.

As with Baseline Road, traffic congestion on Sherwood Park Freeway has worsened in recent years; although improvements were recently made to the road. Transit services would benefit from HOV / transit lanes on this corridor in terms of speed and reliability.
Highway 15 (Manning Drive)

Study Segment: Fort Saskatchewan to Clareview LRT (137 Ave NW)

Highway 15 is the primary link between the industrial employment areas northeast of Fort Saskatchewan and Edmonton:

- From the 99 Ave interchange in Fort Saskatchewan to 17 St. NE (Highway 28 Alt), Highway 15 takes the form of a two-lane undivided highway, featuring a bridge crossing of the North Saskatchewan River and periodic unsignalized intersections.
- From 17 St NE to Anthony Henday Drive (Highway 216), the road is a high-standard four-lane divided highway with several unsignalized intersections.
- Within Edmonton, the road is a four-lane divided arterial with numerous signalized major intersections but no intermediate driveways or accesses. The study segment ends at 137 Ave NW, adjacent to the Clareview terminal station of the LRT system.

Choke points such as this provide optimum conditions for effective transit priority measures such as queue jump lanes in the interim, paired with consideration for continuous HOV/transit lanes if and when a new bridge is implemented.

Traffic Conditions

Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (6:10 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Congestion near Highway 37 (Northbound), and between Meridian St NE and 28 Alt</td>
<td>9:30 AM no overwhelming traffic/ no slow movement</td>
</tr>
<tr>
<td>Tu</td>
<td>Considerably more traffic than Monday and Friday</td>
<td>9:45 AM same as Monday</td>
</tr>
<tr>
<td>W</td>
<td>Considerably more traffic than Monday and Friday</td>
<td>8:30 AM same as Monday</td>
</tr>
<tr>
<td>Th</td>
<td>Considerably more traffic than Monday and Friday</td>
<td>N/A</td>
</tr>
<tr>
<td>F</td>
<td>Nothing to note</td>
<td>6:30 AM heavy traffic between 33 St NE towards Highway 37 (Northbound)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Congestion near Highway 37 extending from 89 Ave (Southbound), and between Meridian St NE and 28 Alt</td>
<td>4:00 PM Some slow movement near Highway 37 (Southbound)</td>
</tr>
<tr>
<td>Tu</td>
<td>See Monday</td>
<td>4:30 PM Slow movement east of Highway 37 intersection (Southbound)</td>
</tr>
<tr>
<td>W</td>
<td>See Monday</td>
<td>4:45 PM See Monday</td>
</tr>
<tr>
<td>Th</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
<tr>
<td>F</td>
<td>Congestion decreases</td>
<td>See Monday</td>
</tr>
</tbody>
</table>

Google Maps Traffic
Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>167 Ave NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Meridian St NW</td>
<td>Non-localized (Segment along Highway 15 between Meridian St NW and 17 St NE)</td>
</tr>
<tr>
<td>17 St NE</td>
<td>Non-localized (Segment along Highway 15 between Meridian St NW and 17 St NE)</td>
</tr>
<tr>
<td>Highway 37</td>
<td>Non-localized (Segment along Highway 15)</td>
</tr>
<tr>
<td>Lamoureux Dr</td>
<td>Non-localized (Segment along Highway 15)</td>
</tr>
<tr>
<td>Highway 21 / 89 Ave</td>
<td>Localized – At intersection and Non-localized (Segment along Highway 15)</td>
</tr>
</tbody>
</table>

Google Maps Traffic

Transit Service

<table>
<thead>
<tr>
<th>Transit Service</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak  (6 – 9)</td>
</tr>
<tr>
<td></td>
<td>Total 3h Bus/h</td>
</tr>
<tr>
<td>ETS 198 Clareview LRT – Fort Saskatchewan</td>
<td>4 SB 1.3 SB 2 SB 0.3 SB 5 SB 1.7 SB 2 SB 0.4 SB 4.8 0.8</td>
</tr>
<tr>
<td></td>
<td>Total both directions</td>
</tr>
</tbody>
</table>

ETS: Edmonton Transit Service

Planned Work

The City of Edmonton is looking at changes to a couple of segments of Highway 15:

- Anthony Henday Drive to 137 Ave to be widened to six lanes. The project is not currently funded (therefore unlikely in next 3 years) but possible in 4 to 5 years. See: http://www.edmonton.ca/transportation/road_projects/manning-drive-planning-study.aspx for additional information.
- At the intersections of 18 St & Hwy 15 and Hwy 28A & Hwy 15, Edmonton is conducting a safety review. The results are unknown at this time, but may result in signalization in the short term. See here: http://www.edmonton.ca/transportation/road_projects/manning-dr-safety-review.aspx for additional information.

Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process.

Highway 15 is reported to have little congestion compared to other corridors. The road is often used for reverse commuting, with residents of northeast Edmonton going to work in Ft. Saskatchewan or oil facilities beyond.

The NW Redwater facility offers its own private shuttle service in the area, but it is seasonal and temporary.

The ring road around Edmonton (216, or Anthony Henday Drive) is scheduled to be complete by 2017. The last remaining link is between Route 15 and Route 16. Stakeholders are curious to see how the complete ring will influence traffic patterns and volumes on area roads when finished.
Highway 16 and 16A (West)

Study Segment: Stony Plain (Highway 779) to 97 St NW

Highway 16 (Yellowhead Trail) is the north leg of the TransCanada Highway through Alberta. The highway west of Edmonton connects to Stony Plain, Spruce Grove, and other bedroom communities.

Physically, Highway 16 is varied:

- Hwy 779 to Anthony Henday Drive (Highway 216) (21.5 km): controlled access four-lane freeway, with three diamond interchanges serving Stony Plain and Spruce Grove
- Anthony Henday Drive (Highway 216) to 149 St NW (5 km): controlled access six-lane freeway
- 149 St NW to 97 St NW (5.5 km): six-lane arterial, with direct accesses, signalized intersections, and one diamond interchange (St. Albert Trail)

The transition from freeway to arterial at 149 St is associated with recurring congestion, due to the change in road capacity.

Highway 16A (Parkland Highway) runs parallel to Highway 16 from Range Road 21 to Anthony Henday Drive (Highway 216). It is a high-standard arterial, four lanes west of Highway 779 and six lanes east of it.
### Traffic Conditions

Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (7:50 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Similar to live traffic, most of the congestion appears between 121 St NW to St. Albert Trail NW (EB)</td>
<td>• 9:30 AM, segments vary</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• 9:45 AM See Monday</td>
</tr>
<tr>
<td>W</td>
<td>• Most of the congestion appears between St. Albert Trail NW to 149 St NW (Westbound)</td>
<td>• 7:30 AM, congestion build-up between Broadmoor Blvd and Clover Bar Rd (Westbound)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Congestion build-up between 50 St NW up to west of North Saskatchewan River</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High degree of traffic between Winterburn Rd NW and Highway 60 (Eastbound)</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• 6:30 AM / 7:30 AM Congestion build-up between 156 St NW to 142 St NW, both</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Westbound and Eastbound</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• 8:15 AM See Thursday</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Very similar to Monday AM Peak</td>
<td>• 4:00 PM High degree of traffic between 91 St NW to 121 St NW (Eastbound)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High degree east of 149 St NW intersection (Westbound)</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• 4:30 PM High degree east of 149 St NW intersection (Eastbound and Westbound)</td>
</tr>
<tr>
<td>W</td>
<td>• See Monday</td>
<td>• 4:45 PM High degree of traffic between 91 St NW to 121 St NW (Eastbound)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High degree between 142 St NW to 156 St NW (Eastbound and Westbound)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High degree of traffic between Winterburn Rd NW and Highway 60 (Westbound)</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
</tbody>
</table>

*Google Maps Traffic*
Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devonian Way</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Winterburn Rd NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>170 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>156 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>149 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along Yellowhead Trail W)</td>
</tr>
<tr>
<td>St Albert Trail</td>
<td>Non-localized (Segment along Yellowhead Trail W)</td>
</tr>
<tr>
<td>127 St NW</td>
<td>Non-localized (Segment along Yellowhead Trail W between St Albert Trail / 127 St NW and 121 St NW)</td>
</tr>
<tr>
<td>121 St NW</td>
<td>Non-localized (Segment along Yellowhead Trail W between St Albert Trail / 127 St NW and 121 St NW)</td>
</tr>
<tr>
<td>107 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>97 St NW</td>
<td>Localized – At intersection and Non-localized (Segment along Yellowhead Trail W)</td>
</tr>
</tbody>
</table>

Google Maps Traffic

Transit Service

<table>
<thead>
<tr>
<th>Transit Service</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak  (6 – 9)</td>
</tr>
<tr>
<td>#</td>
<td>Total 3h Bus/h</td>
</tr>
<tr>
<td>ETS 560</td>
<td>Spruce Grove – Downtown</td>
</tr>
<tr>
<td></td>
<td>6 EB 2 WB</td>
</tr>
<tr>
<td></td>
<td>6 WB 2 WB</td>
</tr>
<tr>
<td>Total both directions</td>
<td>12 4 1 0.2 10 3.3 0 0</td>
</tr>
</tbody>
</table>

ETS: Edmonton Transit Service

Planned Work

Edmonton is preparing plans for upgrading Yellowhead Trail to a free-flow facility but is waiting on funding. There is no timeline at present. Additional information is contained here:

More specific Edmonton plans include removal of the 149 Street / Yellowhead Trail intersection. The intersection would be removed and two one way service roads would be provided along both sides of Yellowhead Trail from 142 St to 156 St. The concept was approved by Council and they are looking at alternative funding sources. There is no impact to Yellowhead Trail other than traffic signal removal. More information here:

Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process.

Of the six corridors in the study, stakeholders seemed most concerned about Highway 16 West. The main contention is that parts of Yellowhead Trail are only two lanes in each direction, and the road carries heavy traffic – much of which is truck traffic. In that context, it is difficult to see how HOV lanes could be implemented effectively, although there are plans to widen and make it a full limited-access highway facility over the next 10 to 20 years. For transit use, Route 16A may have more merit, but it is a slower-speed facility for intermunicipal travel.
West of the city, traffic volume is increasing, as is demand for transit. There is some skepticism as to whether queue jumps or other TPMs would work on 16 or 16A without a redesign of both roadways. Maintenance of the roadways is needed as well; they were described as being in the poorest condition of any area highways.
Highway 16 (East)

Study Segment: Highway 21 to 97 St NW

East of Edmonton, Highway 16 connects to Sherwood Park, rural residential subdivisions, and other residential communities. East of 62 St NW, Highway 16 is a four-lane controlled access divided highway. In the City, between 97 St and 62 St, the route is a six-lane divided arterial with signalized intersections. The road has a relatively high number of trucks on it.

With discontinuous lanes, intersection queue jumps, and different cross section types, this corridor may benefit from a variety of HOV / TPMs, but it is long enough that significant travel time benefits can accrue.

Traffic Conditions

Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (7:50 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Some slow movement near Fort Rd NW (Eastbound)</td>
<td>• No considerable traffic</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• No considerable traffic</td>
</tr>
<tr>
<td>W</td>
<td>• See Monday</td>
<td>• No considerable traffic</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• No considerable traffic</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• No considerable traffic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>• Similar to AM Peak</td>
<td>• Some segments of congestion throughout</td>
</tr>
<tr>
<td>Tu</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>W</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>Th</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
<tr>
<td>F</td>
<td>• See Monday</td>
<td>• See Monday</td>
</tr>
</tbody>
</table>

Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Rd NW</td>
<td>Non-localized (Segment along Yellowhead Trail E)</td>
</tr>
<tr>
<td>66 St NW</td>
<td>Non-localized (Segment along Yellowhead Trail E)</td>
</tr>
<tr>
<td>50 St NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Victoria Trail NW</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Highway 216</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Range Rd 232 / Sherwood Dr</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Clover Bar Rd</td>
<td>Localized – At intersection</td>
</tr>
<tr>
<td>Alberta 21</td>
<td>Localized – At intersection</td>
</tr>
</tbody>
</table>

Transit Service

There is no scheduled public transit service currently using Yellowhead Trail east of 97 St.
Planned Work

The Province is upgrading Hwy 16 East as part of NE Anthony Henday Drive work. Generally speaking, it won’t be significantly different for through traffic on the highway from what is there now. Construction of interchanges, etc. is to be complete by Fall 2016. See here: http://www.transportation.alberta.ca/3787.htm for AHD information. The functional plan that all the construction is based on is at the bottom of the page.

Edmonton is also preparing plans for upgrading Yellowhead Trail to a free-flow facility, but is waiting on funding. There is no timeline at present. Additional information is contained here: http://www.edmonton.ca/transportation/road_projects/yellowhead-trail-strategic-plan.aspx.

More specific Edmonton plans include:

- 66 St: closures of accesses to Yellowhead Trail to and from 67 St and 68 St. These are local roads and would not have any impact on the study.
- 89 St intersection closure: Another signalized intersection closure on Yellowhead Trail. A two-way service road would be created on the north side of Yellowhead Trail from 82 St to 97 St; there would be no impact to lanes on Yellowhead Trail. This and the 67 and 68 St closures are called Stage One of Yellowhead Trail improvements, as noted here: http://www.edmonton.ca/transportation/road_projects/stage-1-improvements-yellowhead-trail.aspx.

Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process.

As with Highway 16 West (Section 5.1.5), stakeholders are concerned about congestion and truck traffic on this four-lane roadway. HOV may be difficult to implement unless plans to widen and make it a full limited-access highway facility are realized in the next 10 to 20 years. With minimal public transit use at present, priority measures would focus on carpools alone.

Work on Highway 16 on the north side of Sherwood Park was just completed in the last year. There may not be any appetite in the near future to do more construction or change traffic patterns again there.
Highway 28 / 97 Street NW

Study Segment: CFB Edmonton to 118 Ave NW

Highway 28 is a three-lane rural road (two southbound lanes, one northbound) north of Valour Avenue. South of that point, it is known as 97 Street NW and becomes a four-lane high-standard divided arterial with signalized intersections. It widens to six lanes at 167 Ave NW, and becomes a busy divided commercial artery with unsignalized entrances and signalized intersections.

The Northgate Transit Centre is in the northeast quadrant of the intersection between 97 St and 137 Ave NW; south of that point, the curb lanes are designated as peak-period, peak-direction reserved bus lanes.

South of 135 Ave, the median island is replaced by a two-way left-turn lane, making a seven-lane cross section as far south as 127 Ave, just north of a major rail grade separation structure. Between 127 Ave and 118 Ave, 97 St operates with a reversible centre lane, allowing four lanes to run in the peak direction during peak periods (southbound in the morning, northbound in the evening). The curb bus lanes are part of this operation.

South of 118 Ave, 97 St converts to a four-lane, house-lined street for the remainder of the trip to downtown.

Traffic Conditions

Refer to illustrations in Appendix D.

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical AM (8:00 AM)</th>
<th>Observed AM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Do not differ from live screenshots too much, congestion in several segments of the corridor</td>
<td>8:15 AM/ 9:30 AM A bit of congestion in several segments of the corridor</td>
</tr>
<tr>
<td>Tu</td>
<td>See Monday</td>
<td>9:30 AM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traffic begins to extend, both Northbound and Southbound</td>
</tr>
<tr>
<td>W</td>
<td>See Monday</td>
<td>8:00 AM, traffic forms near 159 Ave NW intersection</td>
</tr>
<tr>
<td>Th</td>
<td>See Monday</td>
<td>6:30 AM, traffic near intersections</td>
</tr>
<tr>
<td>F</td>
<td>Traffic decreases but is still present</td>
<td>No considerable traffic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day</th>
<th>Typical PM (5:10 PM)</th>
<th>Observed PM 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Similar to AM Peak</td>
<td>Similar to AM peak</td>
</tr>
<tr>
<td>Tu</td>
<td>Higher congestion</td>
<td>4:30 PM high degree of traffic between 127 Ave and 137 Ave NW</td>
</tr>
<tr>
<td>W</td>
<td>Traffic segments vary</td>
<td>5:30 PM, see Monday</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4:45 PM, considerably more congestion between 107A Ave NW to 118 Ave NW</td>
</tr>
<tr>
<td>Th</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
<tr>
<td>F</td>
<td>See Monday</td>
<td>See Monday</td>
</tr>
</tbody>
</table>

Google Maps Traffic
Traffic Conditions (Observed Issues)

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>111 Ave NW</td>
<td></td>
</tr>
<tr>
<td>118 St NW</td>
<td></td>
</tr>
<tr>
<td>Yellowhead Trail</td>
<td></td>
</tr>
<tr>
<td>127 Ave NW</td>
<td></td>
</tr>
<tr>
<td>132 St NW</td>
<td></td>
</tr>
<tr>
<td>137 St NW</td>
<td>Non-localized (Segment along Highway 28)</td>
</tr>
<tr>
<td>144 Ave NW</td>
<td></td>
</tr>
<tr>
<td>153 St NW</td>
<td></td>
</tr>
<tr>
<td>160 Ave NW</td>
<td></td>
</tr>
<tr>
<td>167 Ave NW</td>
<td></td>
</tr>
<tr>
<td>176 Ave NW</td>
<td></td>
</tr>
<tr>
<td>Highway 216</td>
<td>Localized – At intersection</td>
</tr>
</tbody>
</table>

Google Maps Traffic

Transit Service

The plan and following table summarize Edmonton Transit services that use parts of Highway 28 / 97 Street; there are no routes that run the length of the study corridor.
Edmonton Transit Routes in the 97 Street Corridor

**North of 137 Ave**

**South of 137 Ave (Peak Period Bus Lanes between 118 Ave and 137 Ave)**

*Blue*: basic all-day service  
*Red*: peak-only service
### Edmonton Transit Service on 97 St

<table>
<thead>
<tr>
<th>Service / Pattern</th>
<th>Number of Weekday Transit Buses / Direction (per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak (6 – 9)</td>
</tr>
<tr>
<td></td>
<td>Total 3h</td>
</tr>
<tr>
<td>ETS 9 Southgate Transit Ctr – Eaux Claire Transit Ctr</td>
<td>12 NB</td>
</tr>
<tr>
<td></td>
<td>13 SB</td>
</tr>
<tr>
<td>ETS 15 Mill Woods Transit Ctr – Eaux Claire Transit Ctr</td>
<td>7 NB</td>
</tr>
<tr>
<td></td>
<td>12 SB</td>
</tr>
<tr>
<td>ETS 16 Castle Downs – Northgate – Gov’t Ctr.</td>
<td>6 NB</td>
</tr>
<tr>
<td></td>
<td>7 NB</td>
</tr>
<tr>
<td>ETS 130 Northgate – University</td>
<td>3 NB</td>
</tr>
<tr>
<td></td>
<td>7 SB</td>
</tr>
<tr>
<td>ETS 134 Northgate – Downtown</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>6 SB</td>
</tr>
<tr>
<td>ETS 140 Lago Lindo – Northgate – Downtown</td>
<td>4 NB</td>
</tr>
<tr>
<td></td>
<td>6 SB</td>
</tr>
<tr>
<td>ETS 145 Lago Lindo – 132 Ave &amp; 88 St</td>
<td>10 NB</td>
</tr>
<tr>
<td></td>
<td>10 NB</td>
</tr>
<tr>
<td>ETS 150 Eaux Claire – West Edmonton Mall</td>
<td>5 NB</td>
</tr>
<tr>
<td></td>
<td>13 SB</td>
</tr>
<tr>
<td>ETS 151 Castle Downs – Downtown – King Edward Pk</td>
<td>4 NB</td>
</tr>
<tr>
<td></td>
<td>9 SB</td>
</tr>
<tr>
<td>ETS 160 Oxford – Gov’t Ctr.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4 SB</td>
</tr>
<tr>
<td>ETS 161 Castle Downs – Northgate – Downtown</td>
<td>5 NB</td>
</tr>
<tr>
<td></td>
<td>9 SB</td>
</tr>
<tr>
<td>ETS 162 Castle Downs – Northgate – Downtown</td>
<td>6 NB</td>
</tr>
<tr>
<td></td>
<td>11 SB</td>
</tr>
<tr>
<td>ETS 163 Chambery – Eaux Claires</td>
<td>6 NB</td>
</tr>
<tr>
<td></td>
<td>6 SB</td>
</tr>
<tr>
<td>ETS 188 Kernohan – Eaux Claires</td>
<td>2 NB</td>
</tr>
<tr>
<td></td>
<td>2 SB</td>
</tr>
<tr>
<td>ETS 199 CFB Edmonton – Eaux Claires LRT</td>
<td>3 NB</td>
</tr>
<tr>
<td></td>
<td>3 SB</td>
</tr>
</tbody>
</table>

### Planned Work

No significant work is planned for Highway 28 except for the intersection of Highway 37, which is outside the study area.
Stakeholder Comments

Refer to Appendix A for details of the stakeholder engagement process. Highway 28 is reported to become congested only within Edmonton city limits.

No objections were voiced to HOV, transit priority, or more transit (other than that they are less of a concern for the rural or exurban areas of north Edmonton than for other parts of the region). Stakeholders along Hwy 28 are primarily interested in more Park & Ride facilities. The current bus lanes are reported to function reasonably well.
Appendix D:

Traffic Observations

The following maps show typical traffic conditions at different times of day on the six corridors in the study area. The information is drawn from Google Maps and reflects typical weekday conditions in March and April, 2016.
MONDAY

TUESDAY

WEDNESDAY

SOURCE: "TYPICAL TRAFFIC" - 6:10AM
www.google.ca/maps